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Automated telephone communication systems for preventive healthcare and management of long-term conditions (Review)

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TABLE OF CONTENTS

[Intervention Review]

Automated telephone communication systems for preventive healthcare and management of long-term conditions

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A B S T R A C T

Background

Automated telephone communication systems (ATCS) can deliver voice messages and collect health-related information from patients using either their telephone's touch-tone keypad or voice recognition software. ATCS can supplement or replace telephone contact between health professionals and patients. There are four different types of ATCS: unidirectional (one-way, non-interactive voice communication), interactive voice response (IVR) systems, ATCS with additional functions such as access to an expert to request advice (ATCS Plus) and multimodal ATCS, where the calls are delivered as part of a multicomponent intervention.

Objectives

To assess the effects of ATCS for preventing disease and managing long-term conditions on behavioural change, clinical, process, cognitive, patient-centred and adverse outcomes.

Search methods

We searched 10 electronic databases (the Cochrane Central Register of Controlled Trials; MEDLINE; Embase; PsycINFO; CINAHL; Global Health; WHOLIS; LILACS; Web of Science; and ASSIA); three grey literature sources (Dissertation Abstracts, Index to Theses, Australasian Digital Theses); and two trial registries (www.controlled-trials.com; www.clinicaltrials.gov) for papers published between 1980 and June 2015.

Selection criteria

Randomised, cluster- and quasi-randomised trials, interrupted time series and controlled before-and-after studies comparing ATCS interventions, with any control or another ATCS type were eligible for inclusion. Studies in all settings, for all consumers/carers, in any preventive healthcare or long term condition management role were eligible.

Data collection and analysis

We used standard Cochrane methods to select and extract data and to appraise eligible studies.

Main results

We included 132 trials (N = 4,669,689). Studies spanned across several clinical areas, assessing many comparisons based on evaluation of different ATCS types and variable comparison groups. Forty-one studies evaluated ATCS for delivering preventive healthcare, 84 for managing long-term conditions, and seven studies for appointment reminders. We downgraded our certainty in the evidence primarily because of the risk of bias for many outcomes. We judged the risk of bias arising from allocation processes to be low for just over half the studies and unclear for the remainder. We considered most studies to be at unclear risk of performance or detection bias due to blinding, while only 16% of studies were at low risk. We generally judged the risk of bias due to missing data and selective outcome reporting to be unclear.

For preventive healthcare, ATCS (ATCS Plus, IVR, unidirectional) probably increase immunisation uptake in children (risk ratio (RR) 1.25, 95% confidence interval (CI) 1.18 to 1.32; 5 studies, N = 10,454; moderate certainty) and to a lesser extent in adolescents (RR 1.06, 95% CI 1.02 to 1.11; 2 studies, N = 5725; moderate certainty). The effects of ATCS in adults are unclear (RR 2.18, 95% CI 0.53 to 9.02; 2 studies, N = 1743; very low certainty).

For screening, multimodal ATCS increase uptake of screening for breast cancer (RR 2.17, 95% CI 1.55 to 3.04; 2 studies, N = 462; high certainty) and colorectal cancer (CRC) (RR 2.19, 95% CI 1.88 to 2.55; 3 studies, N = 1013; high certainty) versus usual care. It may also increase osteoporosis screening. ATCS Plus interventions probably slightly increase cervical cancer screening (moderate certainty), but effects on osteoporosis screening are uncertain. IVR systems probably increase CRC screening at 6 months (RR 1.36, 95% CI 1.25 to 1.48; 2 studies, N = 16,915; moderate certainty) but not at 9 to 12 months, with probably little or no effect of IVR (RR 1.05, 95% CI 0.99, 1.11; 2 studies, 2599 participants; moderate certainty) or unidirectional ATCS on breast cancer screening.

Appointment reminders delivered through IVR or unidirectional ATCS may improve attendance rates compared with no calls (low certainty). For long-term management, medication or laboratory test adherence provided the most general evidence across conditions (25 studies, data not combined). Multimodal ATCS versus usual care showed conflicting effects (positive and uncertain) on medication adherence. ATCS Plus probably slightly (versus control; moderate certainty) or probably (versus usual care; moderate certainty) improves medication adherence but may have little effect on adherence to tests (versus control). IVR probably slightly improves medication adherence versus control (moderate certainty). Compared with usual care, IVR probably improves test adherence and slightly increases medication adherence up to six months but has little or no effect at longer time points (moderate certainty). Unidirectional ATCS, compared with control, may have little effect or slightly improve medication adherence (low certainty). The evidence suggested little or no consistent effect of any ATCS type on clinical outcomes (blood pressure control, blood lipids, asthma control, therapeutic coverage) related to adherence, but only a small number of studies contributed clinical outcome data.

The above results focus on areas with the most general findings across conditions. In condition-specific areas, the effects of ATCS varied, including by the type of ATCS intervention in use.

Multimodal ATCS probably decrease both cancer pain and chronic pain as well as depression (moderate certainty), but other ATCS types were less effective. Depending on the type of intervention, ATCS may have small effects on outcomes for physical activity, weight management, alcohol consumption, and diabetes mellitus. ATCS have little or no effect on outcomes related to heart failure, hypertension, mental health or smoking cessation, and there is insufficient evidence to determine their effects for preventing alcohol/substance misuse or managing illicit drug addiction, asthma, chronic obstructive pulmonary disease, HIV/AIDS, hypercholesterolaemia, obstructive sleep apnoea, spinal cord dysfunction or psychological stress in carers.

Only four trials (3%) reported adverse events, and it was unclear whether these were related to the interventions.

Authors' conclusions

ATCS interventions can change patients' health behaviours, improve clinical outcomes and increase healthcare uptake with positive effects in several important areas including immunisation, screening, appointment attendance, and adherence to medications or tests.

The decision to integrate ATCS interventions in routine healthcare delivery should reflect variations in the certainty of the evidence available and the size of effects across different conditions, together with the varied nature of ATCS interventions assessed. Future research should investigate both the content of ATCS interventions and the mode of delivery; users' experiences, particularly with regard to acceptability; and clarify which ATCS types are most effective and cost-effective.

PLAIN LANGUAGE SUMMARY

Automated telephone communication systems for preventing disease and managing long-term conditions

Background

Automated telephone communication systems (ATCS) send voice messages and collect health information from people using their telephone's touch-tone keypad or voice recognition software. This could replace or supplement telephone contact between health professionals and patients. There are several types of ATCS: one-way voice messages to patients (unidirectional), interactive voice response (IVR) systems, those with added functions like referral to advice (ATCS Plus), or those where ATCS are part of a complex intervention (multimodal).

Review question

This review assessed the effectiveness of ATCS for preventing disease and managing long-term conditions.

Results

We found 132 trials with over 4 million participants across preventive healthcare areas and for the management of long-term conditions.

Studies compared ATCS types in many ways.

Some studies reported findings across diseases. For prevention, ATCS probably increase immunisation uptake in children, and slightly in adolescents, but in adults effects are uncertain. Also for prevention, multimodal ATCS increase numbers of people screened for breast or colorectal cancers, and may increase osteoporosis screening. ATCS Plus probably slightly increases attendance for cervical cancer screening, with uncertain effects on osteoporosis screening. IVR probably increases the numbers screened for colorectal cancer up to six months, with little effect on breast cancer screening.

ATCS (unidirectional or IVR) may improve appointment attendance, key to both preventing and managing disease.

For long-term management, multimodal ATCS had inconsistent effects on medication adherence. ATCS Plus probably improves medication adherence versus usual care. Compared with control, ATCS Plus and IVR probably slightly improve adherence, while unidirectional ATCS may have little, or slightly positive, effects. No intervention consistently improved clinical outcomes. IVR probably improves test adherence, but ATCS Plus may have little effect.

ATCS were also used in specific conditions. Effects varied by condition and ATCS type. Multimodal ATCS, but not other ATCS types, probably decrease cancer pain and chronic pain. Outcomes may improve to a small degree when ATCS are applied to physical activity, weight management, alcohol use and diabetes.However, there is little or no effect in heart failure, hypertension, mental health or quitting smoking. In several areas (alcohol/substance misuse, addiction, asthma, chronic obstructive pulmonary disease, HIV/AIDS, high cholesterol, obstructive sleep apnoea, spinal cord dysfunction, carers' psychological stress), there is not enough evidence to tell what effects ATCS have.

Only four trials reported adverse events. Our certainty in the evidence varied (high to very low), and was often lowered because of study limitations, meaning that further research may change some findings.

Conclusion

ATCS may be promising for changing certain health behaviours, improving health outcomes and increasing healthcare uptake.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON   [*Explanation*]

ATCS versus control on immunisation rates

Patient or population: participants at risk of under-immunisation (children, adolescents and adults)
Settings: primary care
Intervention: ATCS (ATCS+, IVR, unidirectional)
Comparison: no intervention, usual care or health information (letter)

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	**Corresponding risk**				
	Control	**ATCS**				
Behavioural outcome: immunisation rate ATCS Plus, IVR, unidirectional versus no calls, letters, usual care at median follow-up of 4 months	**Study population**[a]: children **Comparator**: no intervention		**RR 1.25** (1.18 to 1.32)	10,454 (5 studies)	⊕⊕⊕◯ **Moderate**[c]	Franzini 2000 (N = 1138) reported that compared with controls (no calls), unidirectional ATCS (autodialer) may increase immunisation rates in children (86% versus 64%, low certainty).[d]
	308 per 1000	385 per 1000 (363 to 406)				
	Moderate[b]					
	373 per 1000	466 per 1000 (440 to 492)				
Behavioural outcome: immunisation rate Unidirectional ATCS versus usual care at median follow-up of 15 months	**Study population**[a]: adolescents **Comparator**: usual care		**RR 1.06** (1.02 to 1.11)	5725 (2 studies)	⊕⊕⊕◯ **Moderate**[e]	Szilagyi 2013 (N = 4115) also reported that unidirectional ATCS probably slightly improves the uptake of preventive care visits, compared with usual care

						(63% ATCS versus 59% usual care; moderate certainty evidence[f]).

	543 per 1000	576 per 1000 (554 to 603)				
	Moderate[b]					
	540 per 1000	572 per 1000 (551 to 599)				

Behavioural outcome: immunisation rate Unidirectional ATCS versus no calls or health information at median follow-up of 2.5 months	**Study population**[a]: adults **Comparator**: no calls or health information		RR 2.18 (0.53 to 9.02)	1743 (2 studies)	⊕○○○ **Very low**[g,h]	-
	10 per 1000	21 per 1000 (5 to 88)				
	Moderate[b]					
	66 per 1000	144 per 1000 (35 to 595)				

| **Adverse outcome**: unintended adverse events attributable to the intervention ATCS+, IVR, unidirectional versus various controls | No studies reported adverse events. | | | | | |

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI). **ATCS Plus**: automated telephone communication systems with additional functions; **ATCS**: automated telephone communication systems; **CI**: confidence interval; **IVR**: interactive voice response; **RR**: risk ratio; **unidirectional ATCS** enable non-interactive voice communication and use one-way transmission of information or reminders

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a] The assumed risk represents the mean control group risk across studies (calculated by GRADEPro).
[b] The assumed risk represents the median control group risk across studies (calculated by GRADEPro).
[c] Downgraded as all six studies were rated as at unclear risk of bias on most domains, including all unclear on allocation concealment; and one study at high risk for randomisation, one study at high risk of performance bias (−1).
[d] Downgraded as results are from only one cluster RCT that failed to adequately adjust for clustering in analysis (−1); all risk of bias domains were rated as at unclear risk (−1).
[e] Downgraded as one of two studies was rated as at unclear risk on allocation concealment and attrition bias domains (−1).
[f] Downgraded as study was rated as at unclear risk on allocation concealment and attrition bias domains (−1).
[g] Downgraded as both studies were rated as at unclear on attrition bias, and one study (Hess 2013) was rated as at unclear risk on allocation concealment and at high risk of bias on the 'other' domain (reflecting baseline imbalances between groups and a lack of information to judge whether selective recruitment of participants was adjusted for (−1).
[h] Downgraded as there were wide confidence intervals around the effect estimate (imprecision) (−1); downgraded as substantial level of heterogeneity was detected (inconsistency) (−1).

BACKGROUND

Description of the condition

The demand for information and communication technology applications in healthcare settings is increasing, driven by an interest in facilitating active participation of consumers in managing their own health as well as by the need to develop platforms that have greater reach and are also more cost-effective than traditional approaches. Automated telephone communication systems (ATCS) are applications that have been used to deliver both preventive healthcare programmes as well as services to manage long-term conditions.

The range of ATCS interventions included in this review encompasses the following.

- **Unidirectional ATCS**. This is the non-interactive form, which enables one-way, non-interactive voice communication.
- **Interactive ATCS**. These are systems that enable two-way real-time communication. The most common form of this is the interactive voice response system or **IVR**, which might be used, for example, to provide automated tailored feedback based on the monitoring of an individual's progress.
- **ATCS Plus**. These are also interactive ATCS systems, but they are more complex and include additional functions, such as access to an advisor to ask questions.

Additionally, this review includes several **multimodal/complex ATCS** interventions, defined as any type of ATCS (unidirectional, IVR or ATCS Plus) delivered as part of a complex, multimodal package, such as symptom monitoring by a health professional plus automated monitoring via IVR plus provision of medications.

Primary preventive healthcare

Primary preventive healthcare focuses on keeping people well, preventing disease and injury, and educating people about adopting healthier behaviours (Family Health Teams 2006). There are two types of primary prevention strategies: health promotion and disease prevention (Figure 1).

Figure 1. Primary preventive healthcare
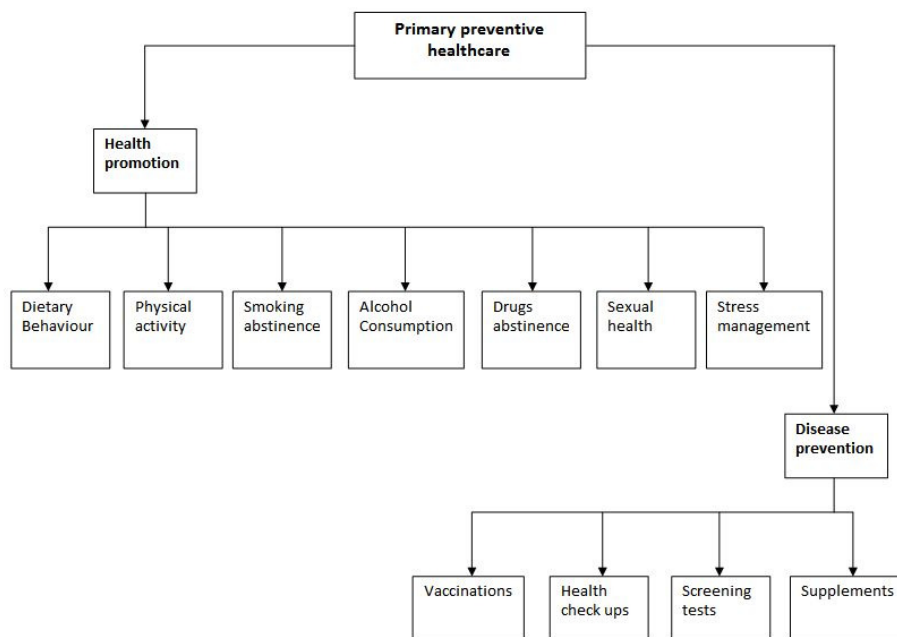
Adapted from Family Health Teams 2006

A major challenge for healthcare systems is to deliver preventive services that systematically target the factors that contribute to ill health (Gullotta 2014). In the prevention of diabetes mellitus, for example, a combination of cognitive, physiological, and behavioural factors (such as lack of knowledge around risk factors, lack of physical activity and unhealthy diet) may contribute to the development of the condition. An effective preventive strategy would therefore need to take an integrative approach and target each of the influencing factors (Figure 2).

Figure 2.   Influencing factors and preventive strategies in type 2 diabetes
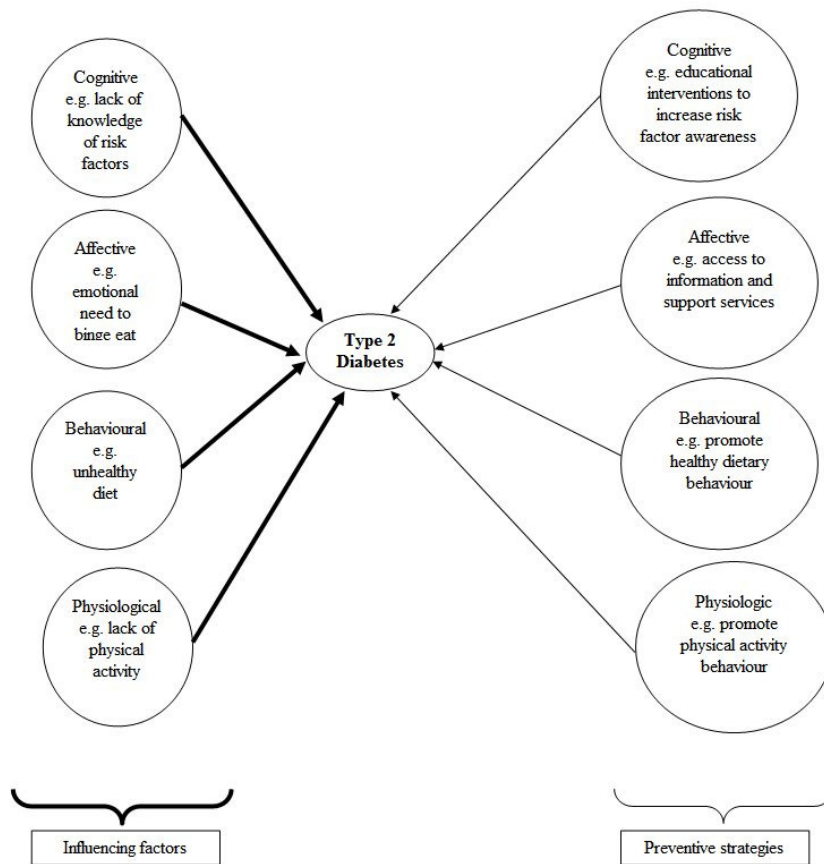
One possible method of communicating preventive activities to the population is via information and communication technology (ICT) (Baranowski 2012; Haluza 2015).

Management of long-term conditions

Long-term conditions such as cardiovascular diseases, cancer, diabetes and chronic lung diseases are the leading causes of death globally (O'Dowd 2014). People with long-term conditions face challenges such as dealing with complex symptoms, medication regimens, disability, and lifestyle adjustments (Carolan 2014; Demain

2015).

Effective chronic disease management programmes bring together relevant information systems with continuous follow-up and targeted management, incorporating ICT to provide accessible and convenient educational information as well as self-management tools for people with long-term conditions (Galdas 2015).

ICT for primary prevention and management of long-term conditions

Consumers increasingly use ICT for health in a myriad of ways, such as accessing medical records through web portals; communicating online with others, one-on-one or in a virtual community (Sawmynaden 2012); surfing the Internet to find information about health and health services; and transmitting health data or communicate messages using the web or the telephone (Pappas 2011).

There is some evidence that tools such as ATCS can successfully deliver health information to consumers, which facilitates health promotion (Cohen-Cline 2014; Oake 2009b), enables active participation of consumers in managing their own care, and facilitates epidemiological and public health research by using collected patient data (Hendren 2014; Maheu 2001).

ICT can also support the delivery and administration of disease management programmes. There is evidence that ATCS can successfully deliver health information to patients for the management of long-term conditions (Derose 2009; Derose 2013).

Description of the intervention

ATCS incorporate a specialised computer technology platform to deliver voice messages and collect information from consumers using either touch-tone telephone keypads or voice recognition software (Piette 2012c). There are three types of ATCS.

1. Unidirectional ATCS enable one-way, non-interactive voice communication. This might include interventions such as automated reminder calls to take medication or perform other actions.

2. Interactive ATCS (e.g. IVR systems) enable two-way real-time communication, for example asking questions and receiving responses and individualised interventions (Reidel 2008; Rose 2015). Different studies have tested interactive ATCS for managing diabetes (Katalenich 2015; Khanna 2014), heart failure (Chaudhry 2010; Krum 2013), coronary heart disease

(Reid 2007), and asthma (Bender 2010). They have also been used in health promotion initiatives, focusing on dietary behaviour (Delichatsios 2001; Wright 2014), physical activity (David 2012; Pinto 2002), and substance use (Aharonovich 2012).

3. ATCS Plus interventions are also interactive systems but include additional functions.

   ○ Advanced communicative functions including access to an advisor to request advice (e.g. 'ask the expert' function), scheduled contact with an advisor (e.g. telephone or face-to-face meetings), and peer-to-peer access (e.g. buddy systems).

   ○ Supplementary functions including automated, non-voice communication (e.g. email or short messaging service (SMS)) (Webb 2010).

In this review, we also include several multimodal/complex ATCS interventions. These are more complex packages of care than ATCS Plus interventions and can include any type of ATCS (unidirectional, IVR or ATCS Plus) delivered as part of a complex, multimodal package, such as symptom monitoring by a health professional plus automated IVR monitoring plus provision of medications.

How the intervention might work

ATCS is a mode of communication that can replace or supplement some of the human-to-human telephone communication with a computer-to-human communication (Lieberman 2012; McCorkle 2011).

There is recognition that ATCS - like all other health interventions - should be underpinned by appropriate theoretical models (Krupinski 2006; Puskin 2010). These include the transtheoretical model (Prochaska 1984); theory of planned behaviour (Ajzen 1985); the health belief model (Rosenstock 1974); social cognitive theory (Bandura 2001); and self-regulation theory (Leventhal 1984). Self-management or preventive skills can be developed using any of these models (Barlow 2002).

There is evidence to suggest that behaviour change interventions underpinned by a theory can significantly enhance health behaviours (Fisher 2007; Gourlan 2015; Michie 2009; Webb 2010). Figure 3 shows a conceptual framework on how theories can influence health behaviour and illustrates how ATCS are used in preventive healthcare.

Figure 3. Conceptual framework of ATCS in preventive healthcare
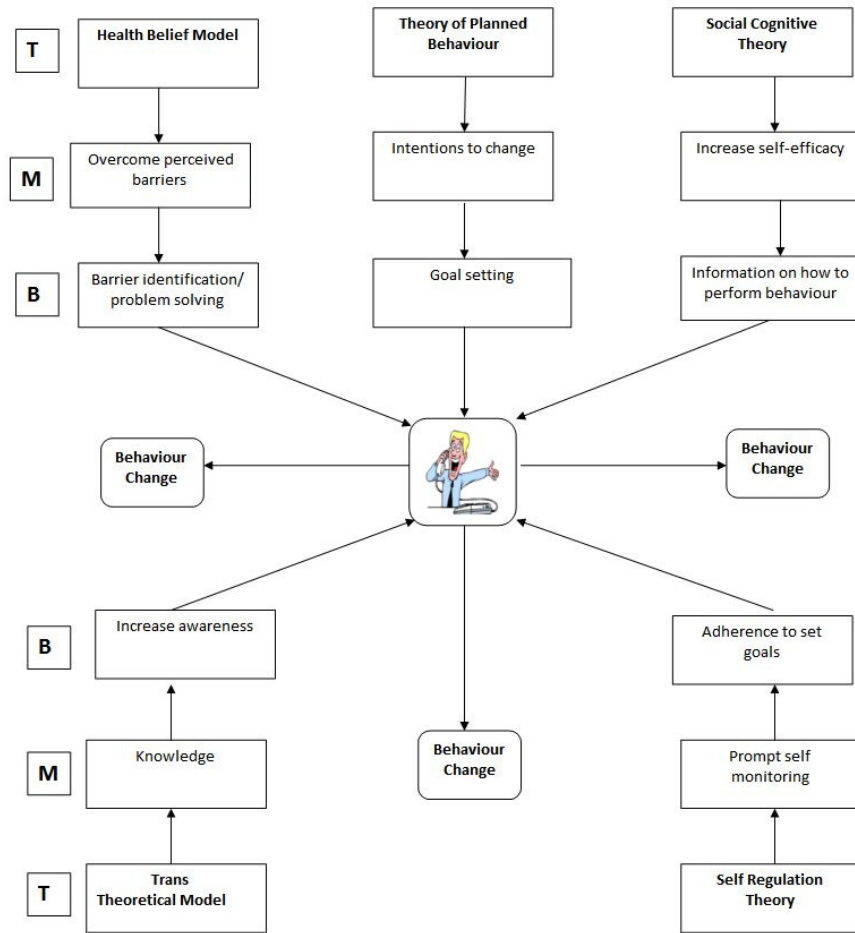
T: Theory; M: Mediator; B: Behaviour change technique

Social cognition models assume that any health outcome is the consequence of the complex interaction between social, environmental, economic, psychological and biomedical factors (Edelman 2000; Jekauc 2015; Kelly 2009). These models focus on key concepts, such as self-efficacy and attitudes to influence behaviour, which in turn can lead to behaviour change (Hardeman 2005; Michie 2010; Vo 2015).

Healthcare interventions delivered through disease management programmes, such as those underpinned by the chronic care model, have produced improved consumer care and health outcomes (Gee 2015; Lee 2011; Piatt 2006; Schillinger 2009). Ac-

cording to the chronic care model, management of long-term conditions requires an interaction between a prepared, proactive team of practitioners and an informed, engaged consumer (Gammon 2015; Wagner 2002). This can be achieved through the interplay between elements such as self-management support, delivery system design, decision support, and clinical information systems (Webb 2006). Figure 4 describes a framework illustrating how ATCS might work in the management of long-term conditions using the chronic care model, by educating, monitoring, and coaching patients.

Figure 4. Conceptual framework of ATCS in the management of long-term conditions
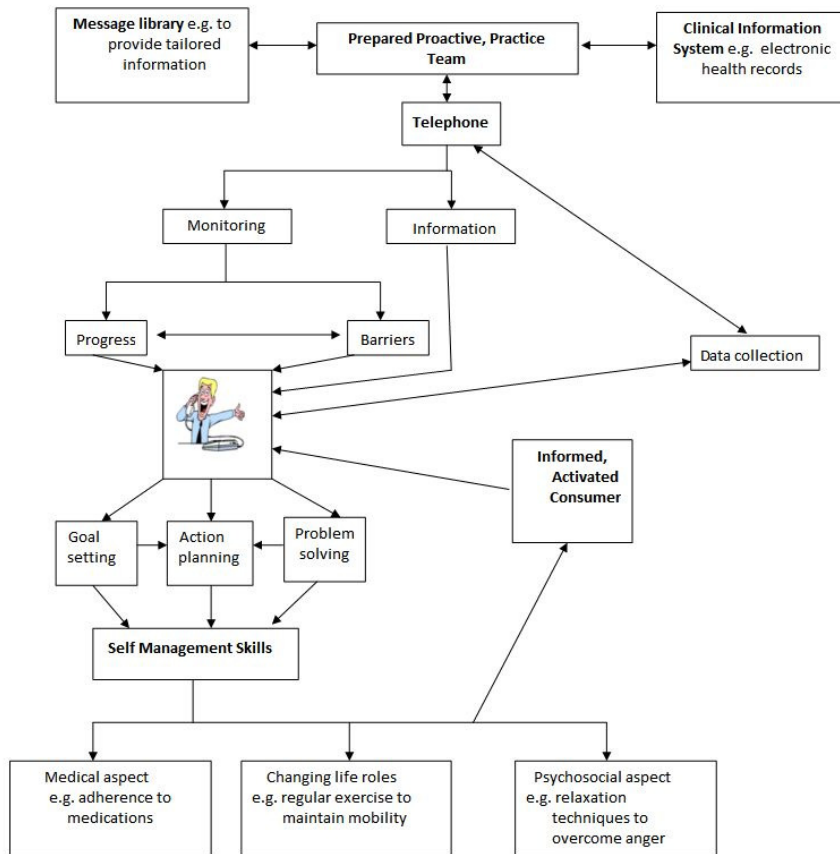
The importance of verbal communication is a complex psycholin-guistic, cognitive-emotional, and educational process that involves the transfer of information between a source (or sender) and a destination (or receiver); it largely depends on the topic/perspective of communication, perceived efficacy of communication, a person's mastery in encoding and understanding the semantic meaning decoded in verbal messages, and communicative intentions. However, other variables such as accent, voice tone, speech rate, and background noise also need to be taken into account when evaluating ATCS (Krauss 2001).

Advantages of automated telephone communication systems

ATCS as a data collection tools have a number of advantages over traditional face-to-face consultation (Rosen 2015). These include convenience, simplicity, anonymity, and low cost (Lee 2003; Piette 2012c). ATCS can provide access to health care 24 hours a day, seven days a week, along with immediate feedback to the consumer (Hall 2000; Schroder 2009). Both patients and healthcare professionals using ATCS have reported a high degree of user satisfaction,

indicating that it is user-friendly and convenient (Abu-Hasaballah 2007).

ATCS technology can facilitate access to difficult-to-reach populations (e.g. people from a lower socioeconomic background) as ATCS require access only to a telephone (private or public) (Schroder 2009). Different authors have found ATCS to be acceptable to low-literacy populations (Glasgow 2004; Piette 2007; Piette 2012c), and others have confirmed these findings in frail elderly patients (Mundt 2001). Unlike face-to-face interaction, which can elicit socially desirable responses, leading to under-reporting of stigmatising behaviours and over-reporting of socially desirable behaviours, ATCS have been found to elicit better self-reporting of sensitive issues (e.g. substance misuse, alcohol use and sexual history) and reduce self-reporting bias (Schroder 2009). They also have the potential to reduce healthcare delivery costs (Phillips 2015; Szilagyi 2013).

Disadvantages of automated telephone

communication systems

Programming of ATCS involves investment in software and hardware, for example to enable multiple simultaneous calls and the development of a voice script appropriate for the target population and the topic of investigation (Piette 2007; Schroder 2009). ATCS may also present difficulties with the provision of immediate participant support. Should questions arise during the interview (Schroder 2009), ATCS cannot capture, interpret, or respond to the users' non-verbal responses (Williams 2001). Individuals with physical disabilities (e.g. severe loss of hearing or speech) may have difficulty with ATCS (Mundt 2001). Others may simply have a strong preference for interactions with humans rather than with automated voice messages (Mahoney 2003). In addition, for individuals targeted by several ATCS-based interventions, ATCS could lead to information overload and outright rejection of the interventions. Finally, protection of individually identifiable health information could be a challenge.

Why it is important to do this review

Existing reviews found evidence of effectiveness of ATCS in preventive healthcare and management of long-term conditions (Krishna 2002; Lieberman 2012; Oake 2009b). However, none of those was conclusive, nor did they explore the theoretical basis or the mechanism of action of the intervention. The present review fills this gap by investigating the effects of interventions based on theoretical constructs and by exploring the behaviour change techniques implemented in the intervention (Abraham 2008; Michie 2011).

In addition, it is not clear which types of ATCS are most effective for prevention or management of long-term conditions, in what setting, or for which conditions. This review aims to explore different interfaces of ATCS programme design and layout that may be used for diverse population groups (considering factors such as age, socioeconomic status, preferred language, and literacy) (Car 2004; Pappas 2011). Numerous randomised controlled trials (RCTs) evaluating the effectiveness of ATCS have recently been published.

A new systematic review is thus needed to critically assess the available evidence and to guide the implementation of ATCS in preventive healthcare and management of long-term conditions.

OBJECTIVES

To assess the effects of ATCS for preventing disease and managing long-term conditions on behavioural change, clinical, process, cognitive, patient-centred and adverse outcomes.

Specific secondary objectives include:

1. determining which type of ATCS is most effective for preventive healthcare and management of long-term conditions;

2. exploring which components of the interventional design contribute to positive consumer behavioural change;

3. exploring the behaviour change techniques and theoretical models underpinning the ATCS interventions.

METHODS

Criteria for considering studies for this review

Types of studies

We included RCTs, cluster RCTs, quasi-RCTs, interrupted time series (ITS) and controlled before-and-after (CBA) studies.
We included CBA and ITS studies because they are often used to draw conclusions about 'promising interventions' ready for trial when RCTs may be too expensive or simply impractical or where there are insufficient RCTs on a particular type of intervention (Centre for Reviews and Dissemination 2008; Higgins 2011; Jackson 2005). Interrupted time series designs can address cyclical trends (i.e. the outcome may be increasing or decreasing over time such as seasonal or other cyclical observations). To be considered for inclusion, these studies must have met the criteria specified by the Cochrane Effective Practice and Organisation of Care Review Group (EPOC) (Ryan 2009). For CBA designs, the timing of data collection for the control and intervention groups had to have been the same, there must have been at least two intervention sites and two control sites, and both groups would have been comparable on key characteristics related to demographics and intervention context. For ITS designs, the studies had to use a clearly defined point in time when the intervention occurred and at least three data points before and three after the intervention.

Types of participants

- We included consumers, including carers, who received ATCS for prevention or management of long-term conditions, regardless of age, sex, education, marital status, employment status, or income.
- For management of long-term conditions, we included consumers who had one or more concurrent long-term conditions (i.e. multimorbidity).
- We included consumers in all settings.

Types of interventions

The ATCS interventions included in this review included the following.

- **Unidirectional ATCS**: non-interactive ATCS enabling one-way voice communication.
- **Interactive ATCS**: systems that enable two-way, real-time communication, such as interactive voice response systems or **IVR.**
- **ATCS Plus**: interactive ATCS systems including additional functions.

The review also included several **multimodal/complex ATCS** interventions, defined as any type of ATCS (unidirectional, IVR or ATCS Plus) delivered as part of a complex, multimodal package. We included studies that evaluated either unidirectional ATCS or interactive ATCS. We also included studies that compared ATCS interventions (e.g. unidirectional ATCS versus interactive ATCS and/or ATCS Plus) to compare the effects of different intervention designs on preventive healthcare or management of long-term conditions.

Interactive ATCS had an automated function such as automated tailored feedback based on individual progress monitoring (e.g. comparison to norms or goals, reinforcing messages, coping messages, and automated follow-up messages). Although our protocol (Cash-Gibson 2012) indicated that we would include ATCS Plus interventions only if the study explicitly reported that the effects of the intervention could be attributed to the ATCS component, in the review we included all types of ATCS Plus interventions as, in a complex intervention such as this, it would be impossible to attribute the intervention effect to one of the intervention components. We also included studies that delivered any type of ATCS (unidirectional, IVR, or ATCS Plus) as part of a complex, multimodal (package) intervention.

The interventions were delivered for one or more types of prevention or one or more types of management for long-term conditions, as illustrated in Figure 1 and Figure 5, respectively.

Figure 5. Management of long-term conditions
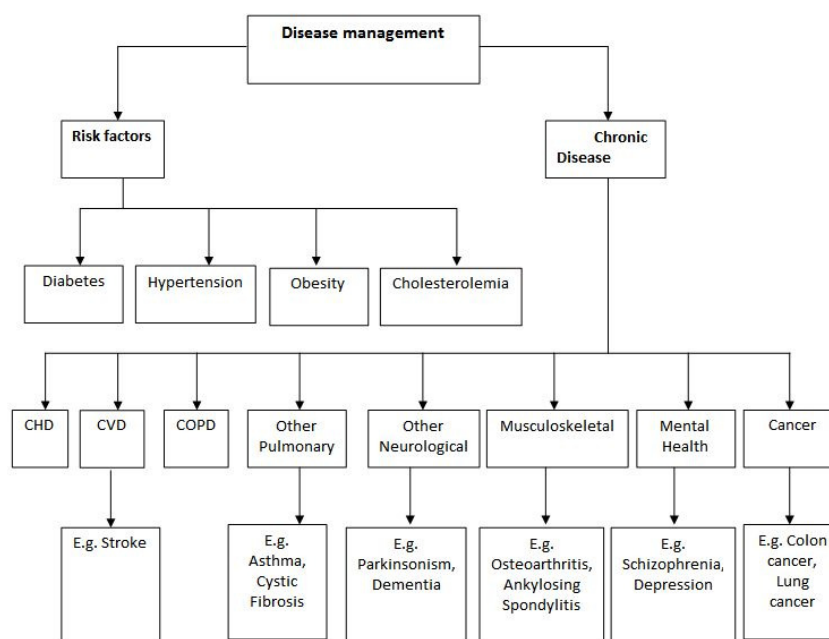
CHD: Coronary Heart Disease; CVD: Cerebro Vascular Disease; COPD: Chronic Obstructive Pulmonary Disease

We excluded studies in which interventions:

- targeted health professionals or teachers for educational purposes;
- were exclusively for the purpose of electronic history-taking or data collection or risk assessment with no health promotion or

interactive elements;

- involved only a non-ATCS component such as face-to-face communication or written communication;
- were web-based interventions that were accessed via a mobile phone.

Comparisons were made against various controls or standard or enhanced forms of usual care (i.e. no ATCS intervention). We also included comparisons of one type of ATCS against another, or the same type of ATCS that was delivered via different delivery modes (e.g. landline telephone versus mobile phone).

As part of this review, we piloted and applied the intervention Complexity Assessment Tool for Systematic Reviews version 1 (iCAT˙SR) for assessing complex, multimodal interventions and reported results narratively/qualitatively (Lewin 2015).

Types of outcome measures

Primary outcomes

Primary outcomes consisted of health behaviour and clinical outcomes (defined below). For each study, we included all relevant primary outcomes, as these are likely to be most meaningful to clinicians, consumers, the general public, administrators and policymakers (Chandler 2013). Given the wide spread of the included studies and the fact that this review represents the first attempt to systematically assess all relevant evidence on broadly defined ATCS interventions, we felt that it was important to capture and report as much relevant information on outcomes and effects of interventions as possible, in order to assist with comprehensively mapping where the evidence lies and how it has been assessed. In future updates to this review, we may consider modifying this approach to focus on a smaller number and range of outcomes if this is likely to improve the clarity and meaningfulness of the collected data.

We reported the following outcomes in 'Summaries of findings' tables.

1. Health behaviour outcomes (category)

- Changes in health-enhancing behaviour (e.g. physical activity, adherence to medications/uptake of recommended laboratory or other testing)
- Risk-taking behaviour (e.g. tobacco consumption)

This outcome was either self-reported or collected using a validated questionnaire that was either self-administered or completed in an interview. In studies that measured the same outcome using both a self-reported measure and an objective measure, we used the objective measure. For example, if a study on physical activity measured Metabolic Equivalent of Task (MET) scores using a self-reported, seven-day physical activity recall as well as a pedometer, we used the score obtained from the (objective) pedometer.

2. Clinical outcomes (category)

- Physiological measures (e.g. blood pressure)
- Blood biochemistry (e.g. glucose levels)

Secondary outcomes

For each study, we selected all relevant secondary outcomes as these were also meaningful for the various stakeholders.

1. Process outcomes (category)

- Change in acceptability of service (e.g. consumer accessibility and usability of the interventions to apply information and support supplied through ATCS)
- Satisfaction (e.g. patient and carer satisfaction with the intervention)
- Cost-effectiveness

2. Cognitive outcomes (category)

- Changes in knowledge (i.e. accurate risk knowledge and perception)
- Attitude and intention to change
- Self-efficacy (i.e. a person's belief in their capacity to carry out a specific action)

3. Patient-centred outcomes (category)

- Quality of life

4. Adverse outcomes

- Unintended adverse events attributable to the intervention

Search methods for identification of studies

Electronic searches

We searched the following electronic databases.

- The Cochrane Central Register of Controlled Trials (CENTRAL; 2015; Issue 5) in the Cochrane Library (searched 12 May 2015);
- MEDLINE OvidSP (1980 to 12 May 2015);
- Embase OvidSP (1980 to 12 May 2015);
- PsycINFO OvidSP (1980 to 12 May 2015);
- CINAHL EBSCOhost (Cumulative Index to Nursing and Allied Health Literature; 1980 to 12 June 2015);
- Web of Science (1980 to 19 May 2015);
- GlobalHealth EBSCOhost (1980 to 16 June 2015);
- WHOLIS (1980 to 17 June 2015);
- LILACS (1982 to 17 June 2015); and

- ASSIA ProQuest (Applied Social Sciences Index and Abstracts; 1987 to 20 May 2015).

We detail the search strategies for each database in respective appendices: CENTRAL (Appendix 1), MEDLINE (Appendix 2), Embase (Appendix 3), PsycINFO (Appendix 4), CINAHL (Appendix 5), Web of Science (Appendix 6), Global Health (Appendix 7), and WHOLIS (Appendix 8). We also present the list of keywords used in trial registers (Appendix 9) and grey literature (Appendix 10).

We searched most databases from 1980 onwards because we expected that any prior evidence would have been incorporated into subsequent research, and because technology has advanced dramatically over the last thirty years, so integration of older research should be interpreted only in light of new findings. We tailored search strategies to each database and reported them in the review. There were no language restrictions.

Searching other resources

We searched grey literature (Dissertation Abstracts, Index to Theses, Australasian Digital Theses). We contacted experts in the field and authors of included studies for advice as to other relevant studies. We searched reference lists of relevant studies, including all included studies and previously published reviews. We also searched online trial registers (e.g. Current Controlled Trials, www.controlled-trials.com; www.clinicaltrials.gov) for ongoing and recently completed studies.

Data collection and analysis

Selection of studies

We merged search results across databases using (EndNote 2015) reference management software and removed duplicate records. Following de-duplication, two authors (PP, NM) independently examined titles and abstracts of records retrieved from the search. We retrieved the full text of the potentially relevant studies and assessed their eligibility according to the inclusion criteria. We linked multiple reports of the same study in order to determine whether the study was eligible for inclusion. Two authors independently performed both the initial screening and the full text screening. Authors corresponded with each other to make final decisions on study inclusion and resolved disagreement about study eligibility through discussion with a third review author (JC). We describe excluded studies, with reasons for exclusion, in Characteristics of excluded studies. We used an adapted PRISMA flow chart to describe the study selection process Figure 6 (Higgins 2011).

Figure 6. Study flow diagram
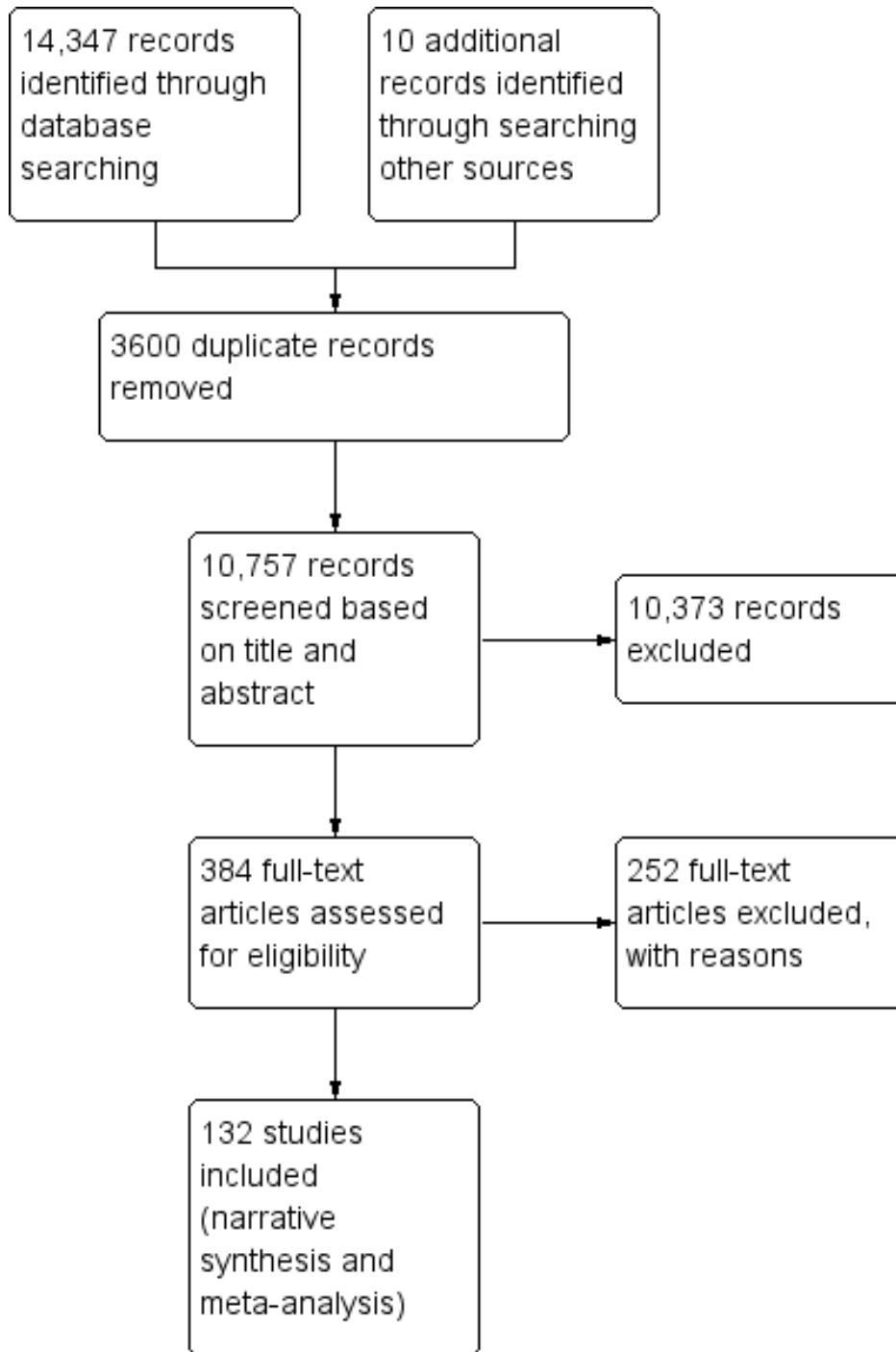
Data extraction and management

Two authors (PP, NM) independently extracted relevant characteristics related to participants, intervention, comparators, outcome measures, and results (effectiveness of the interventions) from all the included studies using a standard data collection form; any disagreements were resolved by discussion. We sought relevant missing information on the trial, particularly information required to judge the risk of bias, from the original author(s) of the article. One author (PP) transferred all the data from the extraction form into the Review Manager (RevMan) software while another author (NM) confirmed the accuracy of the transferred data (RevMan 2014).

Assessment of risk of bias in included studies

We included all studies meeting the inclusion criteria regardless of the outcome of the assessment of risk of bias. We assessed and reported on the methodological risk of bias of included studies in accordance with the *Cochrane Handbook for Systematic Reviews of Interventions* and Cochrane Consumers and Communication guidelines (Higgins 2011; Ryan 2011), which recommend explicitly reporting the following individual elements for RCTs: random sequence generation; allocation concealment; blinding (participants, personnel); blinding (outcome assessment); completeness of outcome data (attrition bias), selective outcome reporting (relevant outcomes reported); other sources of bias (baseline imbalances). For cluster RCTs, we also assessed and reported the risk of bias associated with an additional domain: selective recruitment of cluster participants. We referred to Cochrane Consumers and Communication guidelines to narratively describe the results of risk of bias for each domain for all included studies (Ryan 2011). We reported our assessment of risk of bias for each domain and included study, with a descriptive summary/synthesis of our judgments. In all cases, two authors (PP, NM) independently assessed the risk of bias of included studies, resolving any disagreements by discussion and consensus. We also contacted several study authors for additional information about the included study or for clarification of the study's methods. We incorporated the results of the risk of bias assessment into GRADE assessments and the review itself through standard tables together with systematic and descriptive summary, leading to an overall assessment of the risk of bias of included studies and a judgment about the internal validity of the review's results.

Measures of treatment effect

For dichotomous data, we reported risk ratios (RR), odds ratios (OR), or hazard ratios (HR), as well as their 95% confidence intervals (CI) and P values. For continuous data we reported mean values and standard deviations (SD) of the outcomes in each intervention group along with the number of participants and P values (Table 1).

Unit of analysis issues

When a study had more than one active treatment arm, we labelled the study arms as 'a', 'b' and so on. If more than one intervention arm was relevant for a single comparison, we compared the relevant ATCS arm with the least active control arm to avoid double-counting of data. We listed the arms that were not used for comparison in the 'Notes' section of the Characteristics of included studies tables.

In cluster RCTs, we checked for unit of analysis errors. If we identified any and sufficient information was available, we re-analysed the data using the appropriate unit of analysis, taking account of the intracluster correlation coefficients (ICC). We planned to impute estimates of the ICC using external sources. Where it was not possible to obtain sufficient information to reanalyse the data, we annotated the study 'unit of analysis error' and used this when interpreting the results of that study (where failure to adjust for clustering may lead to overly precise effect estimates) (Higgins 2011; Ukoumunne 1999).

Dealing with missing data

We conducted an intention-to-treat analysis, including all participants who were randomised to either the ATCS group or comparator, regardless of losses to follow-up and withdrawals (Higgins 2011). Wherever possible, we attempted to obtain missing data (e.g. number of participants in each group, outcomes and summary statistics) from the original author(s). For dichotomous outcomes, data imputed case analysis can be used to fill in missing values. This strategy imputes missing data according to reasons for 'missingness' and essentially averages over several of the specific imputation strategies (Higgins 2008). When SDs of continuous outcome data were missing, we calculated them from other statistics, such as 95% CIs, standard errors, or P values. If these were unavailable, we planned to contact the authors or impute the standard deviations from other similar studies (Higgins 2008).

Assessment of heterogeneity

Where we considered studies to be sufficiently similar (based on consideration of populations, interventions, comparators, outcome measures and primary endpoints) to allow pooling of data using meta-analysis, we assessed the degree of heterogeneity by visual inspection of forest plots and by examining the Chi^2 test for heterogeneity. We quantified heterogeneity using the I^2 statistic.

Automated telephone communication systems for preventive healthcare and management of long-term conditions (Review)   17

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We considered an I^2 value of 50% or more to represent substantial levels of heterogeneity, but we also interpreted this value in light of the size and direction of effects and the strength of the evidence for heterogeneity, based on the P value from the Chi^2 test (Higgins 2011). Where substantial heterogeneity was present in pooled effect estimates, we had planned to explore the reasons for variability by conducting subgroup analyses. However, there was not a sufficient number of studies in pooled analyses to enable performance of subgroup analysis. Where we detected substantial clinical, methodological, or statistical heterogeneity across included studies, we did not report pooled results from meta-analysis but instead used a narrative approach to data synthesis. In this event we attempted to explore possible clinical or methodological reasons for this lack of homogeneity by grouping studies that were similar in terms of populations, interventions, comparators, outcome measures and primary endpoints to explore differences in intervention effects.

Assessment of reporting biases

We assessed reporting bias qualitatively based on the characteristics of the included studies (e.g. if only small studies that indicate positive findings were identified for inclusion). Where quantitative meta-analysis included at least 10 studies, we had planned to construct a funnel plot to investigate small study effects, as this may indicate the presence of publication bias. We also planned to formally test for funnel plot asymmetry, with the choice of test made based on advice in Higgins 2011, and bearing in mind that there may be several reasons for funnel plot asymmetry when interpreting the results (Egger 1997). However, there were not enough studies in any of the pooled analyses to allow formal assessment of reporting biases.

Data synthesis

Our decisions on whether to perform meta-analysis were based on an assessment of whether participants, interventions, comparisons, and outcomes were sufficiently similar to ensure a clinically meaningful result. For studies that were included in meta-analysis, we used a random-effects model. For studies that assessed the same continuous outcome measures, we estimated mean differences (for studies using the same scale) and standardised mean differences (for differences in scale) between groups, along with 95% CIs. We displayed the results of the meta-analysis in a forest plot that provided effect estimates and 95% CIs for each individual study as well as a pooled effect estimate and 95% CI. We performed meta-analysis using RevMan 2014. We adhered to the statistical guidelines described in Higgins 2011.

We used a systematic approach to the description of results from pooled data and to narratively describe results. This approach was based on the following process.

- Two authors (PP, RR) assessed the size of the effect and jointly rated it as an important, less important, or not important.
- Two authors (PP, RR) assessed the quality of the evidence using GRADE criteria (Schünemann 2011). According to these guidelines, we assessed all primary and secondary outcomes reported in the review and assigned a rating of high, moderate, low, or very low certainty.

We reported results and then adopted the standardised wording developed for writing Plain Language Summaries in Cochrane reviews (Glenton 2010); see Appendix 12. We used this wording to synthesise all of the results of the review, irrespective of whether we meta-analysed or narratively reported the data.

For all the included studies we used the following steps to describe the studies as described by Rodgers 2009.

- Developed a preliminary synthesis by grouping the included studies by the type of prevention or long-term condition and intervention.
- Described the inclusion criteria (especially participants, interventions, comparators, and outcome elements) along with the reported findings for each of the included studies.
- Included an additional table to describe the intervention components including: the type of ATCS; content delivery; intervention content; behaviour change theories; behaviour change techniques (Michie 2011); instructions on how to use the system (yes/no); call initiation (participants/interventionist/ either); telephone keypad for response (yes/no); toll free number (yes/no); duration of intervention; duration of call; frequency, intensity; speakers features; and security arrangement.
- Used the summary of quality of the evidence, assessed using the GRADE tool, to judge the robustness of the evidence; and adapted standardised wording based on the size of effects and the strength (quality) of the evidence to consistently describe results.

Subgroup analysis and investigation of heterogeneity

We considered performing subgroup analyses depending on the types of preventive intervention (Figure 1), long-term condition being managed (Figure 5), and other relevant factors that may have influenced the results.

- Type of ATCS (unidirectional, IVR or ATCS Plus, multimodal).
- Type of preventive intervention;
- Type of long-term condition.
- Language (for studies in languages other than English).
- Country's income level (for studies undertaken in 'high-income countries', 'middle-income countries', or 'low-income countries' as defined by the World Bank's income level data (World Bank 2012)).
- Source of funding (industry versus other).
- Theoretical models (where applicable, we separated included studies depending on the type of theoretical model used to inform the design of the intervention).

If at least 10 studies had been available for a particular outcome and if feasible, we would have performed a meta-regression. This was to be undertaken using Stata Software with the metareg command, including trial characteristics as covariates. However, we did not identify a sufficient number of studies within review comparisons to allow performance of subgroup analyses.

Sensitivity analysis

We planned to perform sensitivity analyses to investigate the robustness of the results, including assessing the effects of:

- including only studies with low risk of bias in the selection bias domain in analysis (i.e. sequence generation and allocation concealment);
- including only studies with low risk of bias in the attrition bias domain in analysis (i.e. incomplete outcome data);
- using a fixed-effect model of analysis for all the studies;
- using a fixed-effect model for analysis of studies with low risk of bias in the selection bias domain; and
- using a fixed-effect model for analysis of studies with low risk of bias in the attrition bias domain.

Again, we did not identify a sufficient number of studies within review comparisons to enable performance of sensitivity analyses.

Summary of findings tables

We prepared 'Summary of findings' tables to present the results for each of the major primary outcomes, based on meta-analysis or narrative synthesis. We converted results into absolute effects when possible and provided a source and rationale for each assumed risk cited in the table(s) when presented. Two authors independently (PP, RR) assessed the overall quality of the evidence as implemented and described in the GRADEprofiler (GRADEpro 2016) software and chapter 11 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Schünemann 2011). We considered the following criteria to assess the quality of the evidence: limitations of studies (risk of bias), inconsistency of results, indirectness of the evidence, imprecision and publication bias, downgrading the quality where appropriate. We did this for all primary and secondary outcomes reported in the review.

As there were many prevention and long-term management areas and comparisons included in this review, two authors (PP, RR) made the decision to limit the number of 'Summary of findings' tables presented. We examined the prevention and long-term management areas covered by the review, assessed the numbers of studies contributing data to each of these areas, and determined the direction of results for each area (positive, negative or inconclusive). We then made the decision to report in 'Summary of findings' tables only those areas of prevention and/or long-term management where four or more studies contributed data.

We also determined that in the review, we would represent both comparisons presented and those not presented in 'Summary of findings' tables, describing results that were positive, negative, or inconclusive.

We took this approach in order to be confident that we were not selectively reporting and presenting positive results (those in favour of the intervention) over negative or inconclusive results.

As the included studies covered a very large range of preventive care and long-term management decisions, we also made the pragmatic decision not to report only a single comparison in each 'Summary of findings' table. Instead we chose to present all the main results for primary outcomes within a given preventive healthcare/long-term management area, irrespective of the comparisons being made. We clearly identified the different comparisons in each case within each 'Summary of findings' table. The reasons for doing so were as follows.

- Reporting by different disease/prevention areas together (i.e. by comparison) would have resulted in significant clinical heterogeneity, as the populations and the likely effects of interventions on targeted behaviours and clinical outcomes varied considerably.

- Given the above point, if we had further split tables by comparisons, it would have most likely meant creation and reporting of more than 30 tables, many with sparse data that would not be informative to most users or readers of this review.

We have otherwise not deviated from the advice on preparing 'Summary of findings' tables outlined in Schünemann 2011. Involvement of non-governmental organisations (NGOs) that represent a range of potential user groups was an important part of the project development. We contacted NGOs such as the Diabetes Research Network and requested one of the members (AM) to guide us in the review process, particularly in considering outcomes of interest to users and methods of disseminating results to user communities. The protocol was peer reviewed by at least one consumer, as part of the Cochrane Consumers and Communication Group's standard editorial process.

RESULTS

Description of studies

See Characteristics of included studies and Characteristics of excluded studies for more details about individual studies.

Additional tables also contain supplementary information: Table 2 presents further information on participants of included studies, Table 3 reports details of the interventions assessed, and Table 4 presents an assessment of intervention complexity for studies evaluating the effects of highly complex (i.e. multimodal) ATCS interventions.

Results of the search

The database searches yielded 14,347 records (CENTRAL: N = 1150; MEDLINE: N = 3768; Embase: N = 4714; PsycINFO: N = 2070; CINAHL: N = 435; Web of Science: N = 585; Global-Health: N = 679; WHOLIS: N = 291; LILACS: N = 108; AS-SIA: N = 547). We identified a further 10 studies through Google searching. All records were imported into Endnote, and after de-duplication (N = 3600), a total of 10,757 records remained for the first phase of the screening process. Based on title and abstract, we judged 384 records to be potentially eligible and retrieved the full text copies for detailed assessment. Screening the full text of 384 records resulted in inclusion of 132 trials that met our review inclusion criteria (Figure 6).

Included studies

Full details of each trial are presented in Characteristics of included studies; a summary is given below. We included a total of 132 studies in the review. Full data were not available for 64 others, which we present in Ongoing studies.

The included trials were published between 1991 and 2015: 5 had cluster designs (Feldstein 2006; Hess 2013; Franzini 2000; Krum 2013; Stuart 2003), 6 were quasi-randomised (Dini 1995; Heyworth 2014; Kurtz 2011; Linkins 1994; Siegel 1992; Tanke 1994), and 121 had a parallel-group design. No CBA or ITS stud-

ies met our inclusion criteria. Trial duration ranged from 25 days to 46 months, and study sample sizes varied from 16 to 4,237,821. Most studies took place in the USA (n = 114).

Eighty-four studies focused on management of long-term conditions, 41 were preventive healthcare studies, and 7 were specific to neither (appointment reminders/non-attendance rates) (Figure 7). Table 2 presents further information about participant characteristics. Twenty-two trials used unidirectional ATCS (102,240 participants), 50 used IVR (4,402,631 participants), 60 used ATCS Plus (154,932 participants). Seventeen studies used ATCS as part of complex/multimodal interventions (9886 participants). The two most common theories underpinning ATCS interventions among the included studies were the transtheoretical model (n = 16) and Bandura's social cognitive theory (n = 21) (Bandura 2001). The most common behaviour change technique was the use of follow-up prompts (n = 57), followed by self-monitoring of behaviour (n = 53). Table 3 presents details of other theories or behaviour change techniques used or intervention characteristics, and Table 5 presents information about primary measures and effectiveness of ATCS. Table 1 summarises continuous and dichotomous data related to primary outcomes (from at least two studies in the same category). A description of all 17 studies using complex/multi-modal interventions, which by definition had two or more active components and in five studies were delivered as a bundle, appear with ratings of intervention complexity in Table 4.

Figure 7. Subgroups for preventive health and/or management of long term conditions in this review
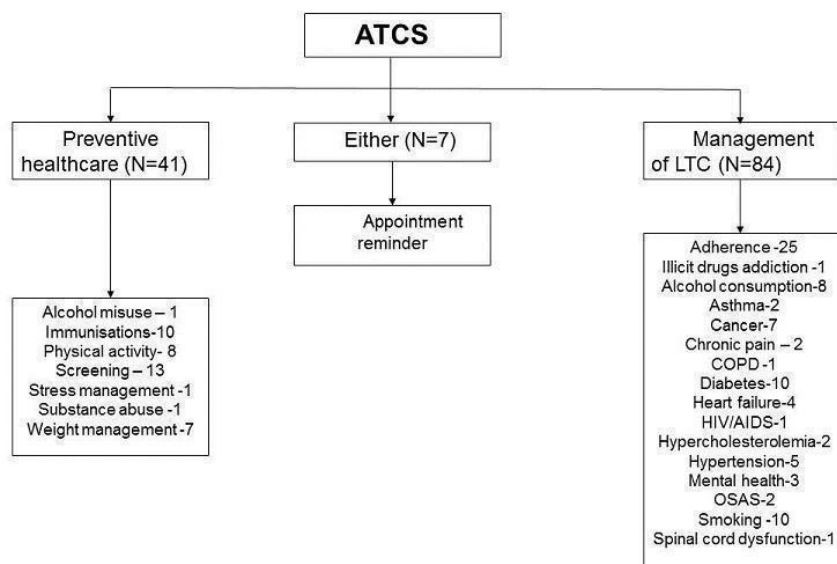
In this section, we generally report the relevant outcomes from individual studies according to the priority (primary, secondary) assigned by the trial authors. However, we reorganise this information in Effects of interventions according to the primary and secondary outcomes identified for this review.

ATCS for preventive healthcare

Forty-one studies evaluated the effectiveness of ATCS in preventive healthcare; study subtypes included alcohol misuse, immunisations, physical activity, screening, stress management among caregivers, substance abuse, and weight management.

Alcohol misuse

Tucker 2012 evaluated the effectiveness of IVR versus assessment-only control for supporting natural resolutions in community-dwelling problem drinkers in the USA (N = 187 participants). The participants' mean age was 45 years, and 63% were male. Participants in the intervention group received verbal feedback about their previous week's goals and set new goals for the following week. They listened to daily educational modules (up to five minutes for 24 weeks) on goal setting, relapse prevention, and support for stable resolution such as social networking, and they received monthly feedback letters summarising calling and drinking patterns. Outcomes were drinking practices and spending on alcohol.

Immunisation

Ten studies, all in the USA, evaluated ATCS for promoting immunisation uptake (Dini 2000; Franzini 2000; Hess 2013; LeBaron 2004; Lieu 1998; Linkins 1994; Nassar 2014; Stehr-Green 1993; Szilagyi 2006; Szilagyi 2013). Sample sizes ranged from 50 participants in Nassar 2014 to 11,982 participants in Hess 2013. Six studies included more than 1000 participants (Dini 2000; Franzini 2000; LeBaron 2004; Linkins 1994; Szilagyi 2006; Szilagyi 2013). Interventions generally focused on vaccinations for children (participants were parents), with some studies also focusing on adult immunisation (Hess 2013; Nassar 2014).

Eight studies used unidirectional ATCS (Dini 2000; Franzini 2000; Hess 2013; Linkins 1994; Nassar 2014; Stehr-Green 1993; Szilagyi 2006; Szilagyi 2013), while LeBaron 2004 used ATCS Plus and Lieu 1998, IVR. Only LeBaron 2004 used communicative functions in addition to automated functions. Healthcare professionals initiated short calls (under two minutes) at a frequency ranging from twice per day in Linkins 1994 to once per month in Hess 2013. Typically, interventions aimed at providing follow-up prompts.

Several studies had additional intervention arms including elements such as letter reminders or other forms of outreach (Dini 2000; Franzini 2000; LeBaron 2004; Lieu 1998; Szilagyi 2013). Controls included no calls (Dini 2000; Franzini 2000; Hess 2013; Linkins 1994; Stehr-Green 1993), usual care (LeBaron 2004; Szilagyi 2006; Szilagyi 2013), letter only (Lieu 1998), or health information (Nassar 2014).

The primary outcome for all studies was immunisation status. Other primary outcomes included cost-effectiveness (Franzini 2000) and preventive visit rate (Szilagyi 2013), while secondary outcomes were satisfaction (Nassar 2014), acceptability and costs (Dini 2000; Lieu 1998), and costs and process evaluation (Szilagyi 2013).

Physical activity

Eight studies, all in the USA, evaluated the effectiveness of ATCS for improving physical activity levels (David 2012; Dubbert 2002; Jarvis 1997; King 2007; Morey 2009; Morey 2012; Pinto 2002; Sparrow 2011). Sample sizes ranged from 71 in David 2012 to 398 in Morey 2009, and mean participant age ranged from 57 years in David 2012 to 71 years in Sparrow 2011.

David 2012 and Pinto 2002 used ATCS Plus; Jarvis 1997, King 2007, and Sparrow 2011, IVR; and Dubbert 2002, Morey 2009, and Morey 2012, unidirectional ATCS. In addition to the customary automated functions, David 2012 used communicative functions and Pinto 2002, supplementary functions. In David 2012, Dubbert 2002, Jarvis 1997, King 2007, Morey 2009, Morey 2012, and Pinto 2002, interventions were underpinned by the transtheoretical model, and in David 2012, King 2007, Morey 2009, Morey 2012, Pinto 2002, and Sparrow 2011, also by social cognitive theory. Participants in four studies could use touch-tone telephone keypads to communicate with the system (Jarvis 1997; King 2007; Pinto 2002; Sparrow 2011). Call duration ranged from 10 to 30 seconds twice per day in David 2012 to 10 to 15 minutes (weekly) in King 2007.

Two studies had more than one intervention arm: King 2007 included automated advice (IVR) versus human advice arms, whereas Dubbert 2002 assessed 20 nurse-delivered phone calls versus 10 nurse-delivered plus 10 automated phone calls. Three studies used multimodal/complex interventions (see Table 4), including elements such as nurse-delivered phone calls plus clinic-based counselling (Dubbert 2002); biweekly and then monthly telephone counselling, clinical endorsement of physical activity, and quarterly tailored mailings of progress (Morey 2009); and in-person baseline counselling, regular telephone counselling, physician endorsement in clinic, tailored mailings, and a consult to a Veterans Affairs (VA) weight management programme (Morey 2012).

In studies with one intervention arm, comparators included no-coach IVR (David 2012), usual care (Jarvis 1997; Morey 2009), usual care + MOVE programme (Morey 2012), ATCS Plus call promoting healthy eating (Pinto 2002), and attention-control via IVR (Sparrow 2011). Controls in other trials included attention-control in King 2007 and no calls in Dubbert 2002.

Six studies measured adherence to physical activity (e.g. minutes or distance walking), usually as a primary outcome (Dubbert 2002; Jarvis 1997; King 2007; Morey 2009; Morey 2012; Pinto 2002; Sparrow 2011). Studies also assessed other outcomes: physical functioning and well-being (King 2007); quality of life (Dubbert

2002); satisfaction (Jarvis 1997); energy expenditure and motivational readiness for physical activity (Pinto 2002); muscle strength, balance, and mood (Sparrow 2011); ability to complete a one-mile walk after the intervention, body weight, BMI, waist and hip circumference, and self-efficacy (David 2012); gait speed (usual and rapid), function and disability, and change in minutes of moderate/vigorous physical activity per week (Morey 2009); and fasting insulin and glucose levels using homeostasis model assessment of insulin resistance (HOMA-IR), HbA1C, anthropometric measures, health-related quality of life, and physical function (Morey 2012).

Screening

Thirteen studies evaluated ATCS for improving screening rates in Australia (Corkrey 2005) and the USA (Baker 2014; Cohen-Cline 2014; DeFrank 2009; Durant 2014; Fiscella 2011; Fortuna 2014; Hendren 2014; Heyworth 2014; Mosen 2010; Phillips 2015; Simon 2010a; Solomon 2007). Sample sizes ranged from 366 in Hendren 2014 to 75,532 in Corkrey 2005, and mean participant age ranged from 40 years in DeFrank 2009 to 69 years in Solomon 2007. In Solomon 2007, 22% of patients were on oral glucocorticoids, while in Baker 2014, 68% had one or more long-term conditions (LTC).
Five studies used ATCS Plus (Corkrey 2005; Fiscella 2011; Hendren 2014; Heyworth 2014; Solomon 2007); six, IVR (Cohen-Cline 2014; DeFrank 2009; Durant 2014; Mosen 2010; Phillips 2015; Simon 2010a); and two, unidirectional ATCS (Baker 2014; Fortuna 2014). Corkrey 2005, Fiscella 2011, Hendren 2014, Heyworth 2014, and Solomon 2007 used communicative functions in addition to automated functions. A few studies specified the theoretical model underpinning the intervention: the health belief model (DeFrank 2009), the general model of the determinants of behavioural change (Simon 2010a), or theory of cognitive dissonance (Baker 2014). Typically, short calls (25 seconds to five minutes) provided information on consequences of behaviour in general, planning action, identifying barriers and solving problems as well as providing follow-up prompts. Several studies had more than one intervention arm: DeFrank 2009 compared telephone calls (IVR) versus enhanced letter reminders; Fortuna 2014 assessed a letter plus unidirectional ATCS versus letter plus unidirectional ATCS Plus prompt versus letter plus personal call; Heyworth 2014 compared usual care plus IVR versus mailing plus usual care; and Phillips 2015 assessed IVR calls versus personalised letter versus IVR plus personalised letter. Several of the studies used multimodal/complex interventions with elements such as mailings, test kits, and personal counselling (see Table 4 for more information). In studies with more than one intervention arm, comparators (the least active arms) included enhanced usual care reminders (DeFrank 2009); reminder letter only (Fortuna 2014; Phillips 2015); or usual care alone (Heyworth 2014). Other controls consisted of usual care or no intervention (calls).
The primary outcome of most trials was documentation of one or more types of screening attendance at 3 to 12 months of the intervention (Baker 2014; Cohen-Cline 2014; Corkrey 2005; Durant 2014; Fortuna 2014; Fiscella 2011; Hendren 2014; Heyworth 2014; Mosen 2010; Phillips 2015; Simon 2010a). DeFrank 2009 measured repeat adherence to screening, while Solomon 2007 assessed performance of bone mineral density testing or filling a prescription for a bone active medication. Four trials evaluated cost (Baker 2014; Corkrey 2005; Durant 2014; Phillips 2015).

Stress management among caregivers

One study in the USA (N = 100 dyads) evaluated the effectiveness of IVR for stress management in caregivers of people with disruptive behaviours associated with Alzheimer's disease (AD) (Mahoney 2003). The mean age of the caregivers was 63 years. and over 78% of them were women.
The trial compared usual care versus an ATCS Plus intervention with both automated and communicative functions, underpinned by process theory and Pearlin's model of caregiver stress. The intervention aimed to identify barriers/solve problems, plan social support/social change, provide feedback on performance, and tailor and provide follow-up prompts. The IVR calls (lasting 18 min on average) provided advice on managing stress and their charges' behavioural problems, opportunities to communicate confidentially with nurse specialists or peers (through an online forum), and social conversation based on participants' interests.
The primary outcomes reported were the caregivers' experience of caregiving, anxiety, and depression.

Substance abuse

Aharonovich 2012 (N = 33) compared an ATCS Plus intervention versus motivational interviewing alone for reducing non-injection drug use in participants (mean age 46, 76% men) with HIV in the USA. Participants were substance users attending HIV clinics. The intervention consisted of brief counselling based on motivational interviewing aimed at goal setting, providing feedback on performance and teaching to use prompts/cues. Short (one to three min) daily calls used automated and supplementary functions and included personalised questions about the previous day's use of primary drug, amount in dollars spent on that drug, use of other drugs, HIV medication adherence, and feelings of wellness, stress, and overall quality of that day. Participants received immediate feedback and personal calls from a counsellor when they failed to call for 48 hours.
The main outcome was the number of days using the primary drug in the past 30 days.

Weight management

Seven studies based in Greece and the USA evaluated the effectiveness of ATCS in facilitating weight management in adults and/or children (Bennett 2012; Bennett 2013; Estabrooks 2008; Estabrooks 2009; Goulis 2004; Vance 2011; Wright 2013). Sample sizes ranged from 50 (dyads) in Wright 2013 to 365 participants in Bennett 2012, while mean age ranged from 10 years in

Wright 2013 to 59 years in Estabrooks 2008. Many participants had co-morbidities such as diabetes mellitus, metabolic syndrome, hypertension, and depression.

Three studies used ATCS Plus (Bennett 2012; Estabrooks 2009; Vance 2011); and four, an IVR system (Bennett 2013, Estabrooks 2008, Goulis 2004, and Wright 2013). The automated systems in Bennett 2012, Bennett 2013, and Estabrooks 2009 also had communicative functions, and in Vance 2011, they had supplementary functions. In three studies, interventions were underpinned by social cognitive theory (Bennett 2012; Bennett 2013; Wright 2013), and in one the intervention was embedded in Golan's model based on social ecologic theory (Estabrooks 2009). Typically, interventions aimed at planning action, identifying barriers, solving problems, setting goals, planning social support or social change, self-monitoring of behaviour or behavioural outcome, providing feedback on performance, or providing rewards contingent on successful behaviour. Calls lasted from 1 to 10 min weekly in Estabrooks 2008 to 15 minutes weekly in Goulis 2004.

One study (Bennett 2013) used multimodal/complex interventions. For instance, in addition to IVR calls, the participants also received behaviour change goals, tailored skills training materials, monthly interpersonal counselling calls, and a 12-month gym membership. Two studies had more than one intervention arm: Estabrooks 2009 included the Family Connections (FC) IVR versus FC - workbook; and Vance 2011 used interactive telephone counselling (ITC) plus control intervention versus online behaviour-based incentives (BI) plus control intervention versus control intervention plus ITC and BI. In these studies, comparators included FC group in Estabrooks 2009; and written materials and group meetings monthly in Vance 2011. Controls in other trials included usual care in Bennett 2012; Bennett 2013; Goulis 2004; or no intervention in Estabrooks 2008; Wright 2013.

In terms of outcomes, all studies assessed BMI or BMI z-scores, usually as primary outcomes. Other outcomes were related to weight loss and other anthropometric measures (Bennett 2012; Bennett 2013; Estabrooks 2008; Estabrooks 2009; Goulis 2004; Vance 2011), dietary intake (Estabrooks 2008; Estabrooks 2009; Wright 2013), physical activity (Estabrooks 2008; Estabrooks 2009), television-viewing time (Wright 2013), blood pressure (Bennett 2012; Goulis 2004; Vance 2011), lipid and glucose biomarkers (Goulis 2004; Vance 2011), health-related quality of life (Goulis 2004), user satisfaction (Estabrooks 2008), adherence to medication or behavioural change (Bennett 2012; Bennett 2013), and adverse events (Bennett 2012; Bennett 2013).

ATCS for reducing non-attendance rate (preventive healthcare or management of long-term conditions)

All seven studies in this category evaluated the effectiveness of ATCS in providing appointment reminders or reducing non-attendance rates (Dini 1995; Griffin 2011; Maxwell 2001; Parikh 2010; Reekie 1998; Tanke 1994; Tanke 1997). Reekie 1998 took place in the UK, while the rest were in the USA. Sample size ranged from 701 in Tanke 1997 to 12,092 in Parikh 2010, and the mean reported age of participants ranged from 19 years in Tanke 1994 to 63 years in Griffin 2011.

Parikh 2010 compared IVR versus staff reminder or no reminder. Griffin 2011 compared ATCS Plus three or seven days prior to appointment versus nurse-delivered reminder, and the remaining studies assessed unidirectional ATCS versus no reminder (Dini 1995; Maxwell 2001; Tanke 1997), postal reminder (Maxwell 2001; Reekie 1998), staff reminder (Reekie 1998), automated reminders plus staff and postal reminder (Reekie 1998), and automated reminders plus importance statement, authority statement, and both (Tanke 1994). Only Griffin 2011 used communicative functions in addition to automated functions. Typically, participants received a single, completed (i.e. answered) reminder call before an appointment; these included instructions, opportunities to cancel or confirm appointment, information on consequences of non-adherence, and prompts for follow-up. Tanke 1994 and Tanke 1997 drew solely from the health belief model, while Griffin 2011 also consulted the model of social marketing principles.

The primary outcome in all studies was appointment adherence. Griffin 2011 also reported outcomes on appointment non-attendance and preparation non-adherence. Secondary outcomes included perceptions about the calls (Griffin 2011), satisfaction (Parikh 2010), attitudes (Tanke 1994), and perceptions of reminders (Tanke 1997).

ATCS for managing long-term conditions

Eighty-four studies evaluated the effectiveness of ATCS for managing long-term conditions, focusing on adherence to medications/laboratory tests (the comparison that provides the most generally applicable evidence across conditions), addiction, alcohol consumption, asthma, cancer, chronic pain, chronic obstructive pulmonary disease, diabetes mellitus, heart failure, HIV, hypercholesterolaemia, hypertension, mental health, obstructive sleep apnoea syndrome, smoking, and spinal cord injury.

Adherence to medications/laboratory tests

Twenty-five studies, all in North America, evaluated the effectiveness of ATCS in facilitating adherence to medications or laboratory tests (Adams 2014; Bender 2010; Bender 2014; Boland 2014; Cvietusa 2012; Derose 2009; Derose 2013; Feldstein 2006; Friedman 1996; Glanz 2012; Green 2011; Ho 2014; Leirer 1991; Lim 2013; Migneault 2012; Mu 2013; Ownby 2012; Patel 2007; Reynolds 2011; Sherrard 2009; Simon 2010b; Stacy 2009; Stuart 2003; Vollmer 2011; Vollmer 2014). Sample size ranged from 16 in Leirer 1991 to 4,237,821 in Mu 2013, with 10 studies' samples exceeding 1000 (Bender 2014; Cvietusa 2012; Derose 2009; Derose 2013; Green 2011; Patel 2007; Reynolds 2011; Simon 2010b; Vollmer 2011; Vollmer 2014). Mean age ranged from 5 years in Adams 2014 to 80 years in Ownby 2012. Participants

were recruited from primary care (Feldstein 2006), or they had a variety of chronic conditions: diabetes mellitus (Derose 2009; Friedman 1996; Ho 2014; Simon 2010b; Vollmer 2014); coronary heart disease and/or cerebrovascular disease (Friedman 1996; Ho 2014; Vollmer 2014); hypertension, hyperlipidaemia, chronic kidney disease, chronic lung disease, peripheral arterial disease (Ho 2014; Vollmer 2014); or cognitive (memory) impairment (Ownby 2012).

Nine studies assessed an ATCS Plus system: in Cvietusa 2012, versus an unspecified control; in Derose 2009, versus no intervention, letter, letter plus call, letter plus call plus letter, or call plus letter; in Derose 2013, Sherrard 2009, Simon 2010b, and Vollmer 2011, versus usual care; in Stacy 2009, versus a generic enhanced care package (single IVR call plus self-help booklet); and in Vollmer 2014, versus a less intensive IVR intervention. Participants in Ho 2014 received usual care or a complex/multimodal intervention including medication reconciliation and tailoring, patient education (through pharmacist telephone calls when requested by the patient), and collaborative care between pharmacists and providers (primary care providers or cardiologists).

Fifteen studies compared an IVR system: in Adams 2014, versus a less intensive IVR intervention (single automated call); in Bender 2010, Leirer 1991, and Mu 2013, versus no intervention; in Bender 2014, Boland 2014, Friedman 1996, Glanz 2012, Green 2011, Migneault 2012, Patel 2007, and Reynolds 2011, versus usual care; and in Feldstein 2006, versus electronic medical records or pharmacy team outreach. Stuart 2003 compared a multimodal/complex intervention versus education or education plus nurse calls, and Vollmer 2014 compared IVR to IVR Plus.

Two studies assessed unidirectional ATCS: Lim 2013 compared it to no intervention and Ownby 2012 compared automated reminding versus tailored information or no intervention.

Only four studies used supplementary functions in addition to automated functions (Derose 2009; Derose 2013; Stacy 2009; Vollmer 2014), while six studies also used communicative functions (Cvietusa 2012; Ho 2014; Sherrard 2009; Simon 2010b; Vollmer 2011; Vollmer 2014). Interventions were based on the health belief model (Bender 2010; Stacy 2009), the chronic care model (Stacy 2009), social cognitive theory (Friedman 1996; Migneault 2012), transtheoretical model (Migneault 2012); motivational interviewing (Migneault 2012); self-regulation theory, and reflective listening (Stacy 2009).

Typically, interventions were aimed at providing information on consequences of behaviour in general, planning action, identifying barriers and solving problems as well as providing follow-up prompts, tailoring, prompting self-monitoring of behaviour, providing rewards contingent on effort or progress towards behaviour or providing information on consequences of behaviour. Call duration ranged from single, 40-second calls in Derose 2009 and Derose 2013 to 29.3 minutes in Adams 2014.

Studies measured medication adherence in a variety of ways: medication possession ratio (MPR) (Bender 2014; Patel 2007), refill rates (Bender 2010; Boland 2014; Cvietusa 2012; Derose 2013; Friedman 1996; Glanz 2012; Green 2011; Ho 2014; Lim 2013; Migneault 2012; Mu 2013; Ownby 2012; Reynolds 2011; Stuart 2003; Vollmer 2011; Vollmer 2014), or other methods (Adams 2014; Sherrard 2009). In contrast, Leirer 1991 measured non-adherence by calculating the time difference between the participant's self-specified time for taking the medication and the actual time they took to scan the appropriate bar code label; investigators also measured cognitive assessment using the Schaie-Thurstone adult mental abilities test. Eight studies measured other indicators related to healthcare usage (e.g. completion of recommended tests, visits to the emergency room) or coverage (Adams 2014; Bender 2014; Derose 2009; Feldstein 2006; Lim 2013; Simon 2010b; Sherrard 2009; Vollmer 2011). Five studies assessed participant and/or physician satisfaction (Adams 2014; Cvietusa 2012; Friedman 1996; Sherrard 2009; Stuart 2003). Four studies measured achievement of behavioural or clinical targets such as blood pressure, as both primary and secondary outcomes (Friedman 1996; Ho 2014; Migneault 2012; Vollmer 2014). Finally, Bender 2010 used the asthma control test, asthma quality of life questionnaire, and beliefs about medications questionnaire; Sherrard 2009 measured a composite outcome of adherence and adverse events, and Stacy 2009 reported outcome on point prevalence persistency.

Illicit drugs addiction

Moore 2013 (N = 36) evaluated ATCS Plus versus usual care for opioid dependency in participants (mean age 41, 58% men) receiving methadone maintenance and continuing to use illicit drugs. The study took place in the USA and aimed to prompt review of behavioural goals, prevent relapses, plan coping, or manage stress. Underpinned by social cognitive theory, the intervention used automated and communicative functions to provide patients with immediate assistance, training, and support and self-monitoring in their own environment. Calls lasted an average of nine minutes daily for 28 days. Outcomes included patient interest, perceived efficacy, treatment satisfaction, retention rate, self-reported drug use, methadone counselling, ease of use and coping skills.

Alcohol consumption

Eight studies evaluated the effectiveness of ATCS for managing alcohol intake: seven in the USA (Hasin 2013; Helzer 2008; Litt 2009; Mundt 2006; Rose 2015; Rubin 2012; Simpson 2005) and one in Sweden (Andersson 2012). Sample sizes ranged from 47 participants in Rubin 2012 to 1423 participants in Andersson 2012, and mean participant age ranged from 46 years in Hasin 2013 and Simpson 2005 to 57 years in Rubin 2012. The mean duration of alcoholism was over 10 years in all studies, and participants in Hasin 2013 were HIV positive.

Three studies were primarily interested in IVR: Andersson 2012 was a four-arm trial comparing a single IVR call, a single online intervention, repeated IVR calls, and repeated online interven-

tions; Rubin 2012 compared IVR versus an information pamphlet; and Simpson 2005 compared daily or weekly calls with a no-intervention control. The remaining five compared ATCS Plus: to advice/education (Hasin 2013), usual care (Rose 2015), or other interventions or control (Helzer 2008; Litt 2009; Mundt 2006). Litt 2009 compared ATCS Plus versus a packaged cognitive behavioural therapy (CBT) intervention via IVR. Mundt 2006 had three arms: daily IVR with personal follow-up on noncompliant callers (i.e. ATCS Plus), daily IVR without follow-up, and usual care. Helzer 2008 had four arms: ATCS Plus with feedback, ATCS Plus with feedback and financial compensation; automated daily phone calls (ATCS only); and no calls, with a brief intervention and standard care. Systems in Litt 2009 and Helzer 2008 had supplementary functions, and those in Hasin 2013, Mundt 2006, and Rose 2015 had both communicative and supplementary functions in addition to the automated ones. The intervention was underpinned by CBT in three studies (Litt 2009; Mundt 2006; Rose 2015) and by motivational interviewing (MI) in two (Hasin 2013; Rubin 2012). The interventions were aimed at goal setting and motivational interviewing (Hasin 2013; Rubin 2012); providing feedback on performance (Andersson 2012); training of emotional control, prompting self-monitoring of behaviour, preventing relapses/coping planning, and/or managing stress (Litt 2009; Mundt 2006; Rose 2015); prompting self-monitoring of behaviour (Helzer 2008; Simpson 2005). The duration of intervention ranged from one month in Simpson 2005 to six months in Helzer 2008, Mundt 2006, and Rubin 2012, and it was delivered daily in Hasin 2013, Helzer 2008, Mundt 2006, Rose 2015, and Simpson 2005.

Primary outcomes included the alcohol use disorders identification test (AUDIT) score (Andersson 2012); proportion of days abstinent, proportion of heavy drinking days, continuous abstinence, drinking problems, and coping problems (Litt 2009); drinking days, heavy drinking days, and total drinks consumed (Mundt 2006); drinking habits, alcohol craving, and post-traumatic stress disorder symptoms (Simpson 2005); number of drinks per drinking day in the last 30 days (Hasin 2013); weekly alcohol consumption (Helzer 2008); alcohol consumption (Rose 2015); and number of heavy drinking days per month, percent days abstinent per month, drinks per drinking day (Rubin 2012). Secondary outcomes included participant perceptions of the system (Rose 2015).

Asthma

Two studies evaluated ATCS for managing asthma (Vollmer 2006; Xu 2010).

Vollmer 2006 (N = 6948) compared ATCS Plus with automated and communicative functions versus staff calls or usual care in adults (mean age 52 years) in the USA, Healthcare professionals initiated three IVR calls lasting under 10 minutes, five months apart. The system asked questions related to healthcare utilisation, and participants received tailored feedback. Participants at high risk of exacerbations were flagged up and their primary care

provider was alerted, triggering a follow-up contact. In addition, the IVR system assigned a primary care provider to participants who did not regularly visit a consistent provider for asthma care. Outcomes included healthcare utilisation, asthma control, medication use, quality of life, and acceptability.

Xu 2010 (N = 121) studied children (mean age 7 years) in Australia, comparing a nurse support group versus an IVR system where participants received calls twice a week that asked questions about asthma symptoms and medication use. Based on touch-tone responses, they received educational messages, appropriate messages from the asthma management plan, and medication reminders. Primary care physician had access to the reports generated by the IVR system. Outcomes included healthcare utilisation, medication use, health-related quality of life, and cost.

Cancer

Seven studies, all in the USA, evaluated ATCS for helping cancer patients (Cleeland 2011; Kroenke 2010; Mooney 2014; Sikorskii 2007; Siegel 1992; Spoelstra 2013; Yount 2014). Sample sizes ranged from 79 participants in Cleeland 2011 to 437 participants in Sikorskii 2007, and mean age from 57 years in Sikorskii 2007 to 61 years in Yount 2014. Participants in Kroenke 2010 and Mooney 2014 had a variety of other co-morbidities, and participants in Spoelstra 2013 were taking antineoplastic medications.

Five studies assessed an ATCS Plus system, comparing it to to a less intensive (IVR monitoring) intervention (Cleeland 2011), usual care (Kroenke 2010; Yount 2014), attention only via IVR (Mooney 2014), and a less intensive (adherence only) IVR intervention (Spoelstra 2013), By contrast, Siegel 1992 compared IVR versus a research interview by an experienced clinician, and Sikorskii 2007 compared it to telephone calls by specially trained nurses. In addition to automated functions, Kroenke 2010 and Spoelstra 2013 used communicative functions; Cleeland 2011 and Yount 2014, supplementary functions; and Mooney 2014, both. Kroenke 2010 used a multimodal/complex intervention (symptom monitoring by a nurse and medications) and was underpinned by the three-component model, whereas Spoelstra 2013 had a CBT basis.

Typically, interventions were aimed at prompting self-monitoring of behaviour and behavioural outcome, prompting review of behavioural goals, providing instructions on how to perform the behaviour, tailoring and teaching to use prompts/cues. The frequency of calls ranged from daily in Mooney 2014 to twice a week and then twice a month in Kroenke 2010.

Primary outcomes were symptom threshold events, cumulative distribution of symptom threshold events, differences in mean symptom severity between discharge and follow-up (Cleeland 2011); depression and pain severity (Kroenke 2010); symptom severity, distress, and burden (if a symptom was present) (Mooney 2014; Sikorskii 2007; Spoelstra 2013; Yount 2014); the prevalence of unmet needs (Siegel 1992); and adherence to medications (Spoelstra 2013). Secondary outcomes included health-re-

lated quality of life, disability, healthcare use (outpatient physician visits), and co-interventions (depression treatments) in Kroenke 2010; system usability and acceptability in Mooney 2014; and health-related quality of life, treatment satisfaction, symptom management barriers, and self-efficacy in Yount 2014.

Chronic pain

Kroenke 2014 (N = 250) and Naylor 2008 (N = 55) evaluated ATCS versus usual care for managing chronic pain in adults (mean age 55 years and 46 years, respectively) in the USA.

Naylor 2008 used an IVR intervention underpinned by CBT, aiming to identify barriers; solve problems; prompt practice, self-monitoring of behaviour, or imagery; and provide feedback on performance and follow-up prompts. The calls lasted 3 to 16 minutes and consisted of daily self-monitoring questionnaire that assessed coping, perceived pain control, mood, medication use, and stress. Participants were able to access a verbal review of eight different pain management skills they learned during the 11 weeks of CBT (relaxation response, diaphragmatic breathing, positive self-talk, cognitive restructuring, activity-rest pacing, distraction techniques, reappraisal of pain, and defusing catastrophising). Once a month the group therapist analysed computer-collated patient-specific data and called the IVR to record a personalised message with advice and encouragement for each participant. Outcomes were pain (total pain experience, pain intensity), function/disability, and coping.

Kroenke 2014 used an ATCS Plus system and multimodal/complex intervention (with nursing care and analgesics) with automated and communicative functions, aiming at tailoring and self-monitoring of behavioural outcome. The calls were scheduled weekly for the first month, every other week for months 2 and 3, and monthly for months 4 through 12. Investigators assessed pain, anxiety, depression, the degree of improvement; analgesic adverse effects, adherence, and whether a medication change was desired. Primary outcomes included pain intensity, while secondary outcomes included difference in response rates, and mean brief pain inventory interference and pain severity scale scores, at 12 months.

Chronic obstructive pulmonary disease (COPD)

Halpin 2009 (N = 79) compared ATCS versus no intervention for managing COPD. The trial took place in the UK. Participants had a mean age of 69, were mostly men (74%), and were taking long and short-acting muscarinic antagonists as well as short-acting β 2-agonists. Investigators tested an ATCS Plus system with automated, communicative, and supplementary functions, aiming at prompting self-monitoring of behavioural outcomes, teaching to use prompts/cues; and using follow-up prompts. Participants received weekly automated alert calls with tailored advice, an information pack with important information about their condition, thermometers to monitor the temperature in the bedroom and living room, and advice on recognising early symptoms of an exacerbation. Participants also completed a daily diary comprising the EXACT questionnaire plus additional questions such as the

colour of their phlegm, presence of symptoms of a cold or flu, visit to a doctor or nurse on that day for breathing problems or a cold, and need for the study team to contact them. The responses to these questions were used as a trigger to contact the participant to determine if an exacerbation was starting.

The primary outcomes were frequency of exacerbations and proportion of patients experiencing one or more exacerbations. Secondary outcomes included changes in health status.

Diabetes mellitus

Ten studies evaluated ATCS for managing diabetes mellitus (Graziano 2009; Homko 2012; Katalenich 2015; Khanna 2014; Kim 2014; Lorig 2008; Piette 2000; Piette 2001; Schillinger 2009; Williams 2012). With the exception of Williams 2012, which took place in Australia, all the studies were in the USA. Sample sizes ranged from 75 participants in Khanna 2014 to 417 participants in Lorig 2008, and mean age ranged from 30 years in Homko 2012 to 62 years in Graziano 2009.

Participants in five studies had a BMI above 30 kg/m^2 (Homko 2012; Piette 2000; Piette 2001; Schillinger 2009; Williams 2012); they were pregnant in Homko 2012 (33 weeks or less) and had elevated blood pressure and cholesterol levels in Khanna 2014. In Kim 2014, 46% of participants were diagnosed with psychiatric illnesses; and 28% had been hospitalised in the past year.

Seven studies compared an ATCS Plus system versus usual care (Katalenich 2015; Khanna 2014; Kim 2014; Lorig 2008; Piette 2000; Piette 2001; Schillinger 2009), and in the case of Schillinger 2009, also versus support, education, and patient activation. The remaining studies compared an IVR system with usual care (Homko 2012; Graziano 2009; Williams 2012). In addition to automated functions, five studies used communicative functions (Kim 2014; Lorig 2008; Piette 2000; Piette 2001; Schillinger 2009), one study used supplementary functions (Khanna 2014), and one study used both communicative and supplementary functions (Katalenich 2015). Three studies were underpinned by social cognitive theory (Piette 2000; Piette 2001; Schillinger 2009) and one was based on the chronic care model (Schillinger 2009). Typically, interventions were aimed at planning action, setting goals, identifying barriers and solving problems, prompting self-monitoring of behaviour and/or behavioural outcomes, providing feedback on performance, tailoring and providing follow-up prompts. Call duration and frequency ranged from 90 seconds monthly in Lorig 2008 to 5 to 20 minutes weekly in Williams 2012.

Primary outcomes included glycated haemoglobin (Graziano 2009; Katalenich 2015; Khanna 2014; Kim 2014; Lorig 2008; Piette 2001; Williams 2012); blood glucose level and infant birth weight (Homko 2012); health- or diabetes-related quality of life (Katalenich 2015; Piette 2000; Williams 2012); self-efficacy (Lorig 2008; Piette 2000); medication adherence and cost-effectiveness (Katalenich 2015); health distress, global health, hypoglycaemia, hyperglycaemia, activity limitation, fatigue, glucose monitoring, and healthcare utilisation (Lorig 2008); depression, anxiety, days

in bed because of illness, days cut down on activities because of illness (Piette 2000); glucose monitoring, foot inspection, weight monitoring, medication use, diabetic symptoms (all), and satisfaction with care (Piette 2001); and change in self-management behaviours (consisting of the four domains/sub-scales: self-monitoring of blood glucose and self-monitoring of diabetic foot, diet and exercise) (Schillinger 2009).

Secondary outcomes included self-monitoring of blood glucose frequency (Graziano 2009); systolic blood pressure, diastolic blood pressure, BMI, waist circumference, total cholesterol, triglycerides, high-density lipoproteins, and low-density lipoproteins (Khanna 2014); outpatient speciality services utilisation (Piette 2001); and behavioral, functional, and metabolic outcomes (Schillinger 2009).

Heart failure

Four studies evaluated ATCS versus usual care for reducing healthcare utilisation in people with heart failure (Capomolla 2004; Chaudhry 2010; Krum 2013; Kurtz 2011); Kurtz 2011 had a third arm implementing a multidisciplinary team approach during visits to the heart failure clinic. Trials took place in the USA (Chaudhry 2010), Australia (Krum 2013), France (Kurtz 2011), and Italy (Capomolla 2004). Sample sizes ranged from 138 participants in Kurtz 2011 to 1653 participants in Chaudhry 2010, while mean age ranged from 57 years in Capomolla 2004 to 73 years in Krum 2013. Participants in Chaudhry 2010 and Krum 2013 had several co-morbidities such as coronary artery disease, chronic kidney disease, chronic obstructive pulmonary disease, diabetes mellitus, and hypertension.

Three studies used an ATCS Plus system (Chaudhry 2010; Capomolla 2004; Krum 2013), while Kurtz 2011 used an IVR system. Chaudhry 2010 and Capomolla 2004 used communicative functions in addition to automated ones, and Krum 2013 used supplementary functions as well. Typically, interventions were aimed at prompting self-monitoring of behaviour and/or behavioural outcome as well as tailoring and providing follow-up prompts. The mean call duration, reported in one study (Kurtz 2011) was 48 seconds (weekly). In Chaudhry 2010 and Capomolla 2004, participants placed calls once a day; and in Krum 2013, participants or staff called once a month. The duration of intervention ranged from six months in Chaudhry 2010 to 24 months in Kurtz 2011.

Capomolla 2004 reported a composite primary outcome considering rehospitalisation, cardiac mortality and emergency room use; outcomes in isolation included hospitalisation for heart failure, cardiac mortality, all-cause mortality, all-cause hospitalisation (chronic heart failure, cardiac cause and other cause) and emergency room use. Chaudhry 2010 measured readmission for any reason or death from any cause, and Kurtz 2011 reported cardiovascular deaths and hospitalisation for heart failure, both in isolation and as a composite or adverse events. Finally, Krum 2013 reported the Packer clinical composite score (death, hospital ad-

mission for heart failure, withdrawal from study due to worsening heart failure, seven-point global health assessment questionnaire) as its primary outcome. For the purposes of this review, we separated these component outcomes and reported data for each of the following individually: all-cause mortality, hospitalisation for heart failure, all-cause hospitalisation and global health (hospitalisation for heart failure or for any cause were identified as secondary outcomes by this study). Secondary outcomes also included intervention adherence in Capomolla 2004; and hospitalisation for heart failure, number of days in the hospital, number of hospitalisations, and adverse events in Chaudhry 2010.

HIV/AIDS

Shet 2014 (N = 631) evaluated ATCS versus usual care for managing HIV in India. The trial used an IVR intervention underpinned by the theory of planned behaviour, which aimed at goal setting, prompting self-monitoring of behaviour, providing feedback on performance and relapse prevention/coping planning. Intensity and duration of calls was weekly for 24 months. In addition to IVR calls, the multimodal/complex intervention included a weekly non-interactive neutral pictorial message sent out as a reminder four days after the IVR call plus usual care that consisted of to three counselling sessions and antiretroviral treatment. Primary outcomes were time to virological failure (viral load > 400 copies/mL on two consecutive measurements), and secondary outcomes were medication adherence (pill count), death rate, and attrition rate.

Hypercholesterolaemia

Two studies(total N = 238) evaluated ATCS versus usual care for managing hypercholesterolaemia in the USA (Hyman 1996; Hyman 1998). Mean participant age was 48 years in Hyman 1996 and 57 years in Hyman 1998. Participants in Hyman 1998 had a mean BMI greater than 30 kg/m^2; and 58% of them had had history of smoking.

Hyman 1996 used an IVR system with daily interaction, and Hyman 1998 used an ATCS Plus intervention, underpinned by social cognitive theory, with two to three minute calls twice weekly. Interventions aimed at prompting self-monitoring of behaviour, tailoring, and providing follow-up prompts. The primary outcome reported in both studies was total cholesterol reduction. Secondary outcomes included acceptability of the IVR system (Hyman 1996), self-efficacy, dietary knowledge, and fat intake scale (Hyman 1998).

Hypertension

Five studies evaluated ATCS for managing hypertension; one took place in Honduras/Mexico (Piette 2012), and four were in the USA (Bove 2013; Dedier 2014; Harrison 2013; Magid 2011). Sample size ranged from 166 participants in Bove 2013 to 64,773 participants in Harrison 2013, while mean age ranged from 58 years in Dedier 2014 and Piette 2012 to 66 years in Magid 2011.

Participants in Bove 2013, Magid 2011, and Harrison 2013 were diagnosed with diabetes mellitus.

Bove 2013 and Magid 2011 compared multimodal/complex interventions including an ATCS Plus system with additional communicative (and in the case of Bove 2013, also supplementary) functions versus usual care. In addition to ATCS, participants in Bove 2013 received a sphygmomanometer, a weighting scale if needed, and a pedometer, whereas in Magid 2011 they also received patient education, home blood pressure monitoring, and clinical pharmacist management of hypertension with physician oversight in addition to usual (standard) care. Piette 2012 compared an ATCS system with communicative functions to primary care and education. Dedier 2014 assessed an IVR system underpinned by social cognitive theory versus primary care and education, while Harrison 2013 evaluated a unidirectional ATCS versus usual care. Interventions were typically aimed at planning action and setting goals, prompting self-monitoring of behavioural outcome, providing rewards contingent on effort or progress towards behaviour, setting graded tasks and tailoring, prompting self-monitoring of behaviour and providing follow-up prompts or providing feedback on performance. Call duration was typically up to 10 min (weekly) in Magid 2011 and Dedier 2014. Call frequency was biweekly in Bove 2013.

All studies monitored blood pressure as a primary outcome, while Dedier 2014 also assessed change in minutes of moderate or intensive physical activity. Secondary outcomes included health status, depression, satisfaction, and medication-related problems in Piette 2012 and medication adherence in Magid 2011.

Mental health

Three studies in the USA evaluated ATCS for managing mental health problems (Farzanfar 2011; Greist 2002; Zautra 2012). Sample sizes ranged from 73 in Zautra 2012 to 218 in Greist 2002, while mean participant age was 39 years in Farzanfar 2011 and Greist 2002 and 54 years in Zautra 2012. Mental problems included mild to moderate depression (Zautra 2012), social phobia and generalised anxiety disorder (9% each in Greist 2002).

Farzanfar 2011 compared an IVR counselling intervention versus advice only for facilitating social comparison, prompting self-monitoring of behaviour, providing instruction on how to perform the behaviour, tailoring, and providing follow-up prompts. The included TLC-Detect system aimed at identifying undiagnosed and untreated mental health problems, with an initial 30 to 90 minute screening call and monthly follow-up calls. Greist 2002 assessed a computer-driven ATCS Plus system (via IVR) with supplementary functions, underpinned by the theory of behavioural change, versus clinician-guided behaviour therapy or relaxation-only therapy. The trial's focus was relapse prevention/coping planning; participants called 12 or more times to record a message for a behavioural therapist, who responded within 72 hours. Final steps also included barrier identification, problem solving, and relapse prevention techniques. In addition, participants also received a programmed workbook. The last study, Zautra 2012, compared two unidirectional ATCS interventions (one for personal control/mastery and the other for mindful awareness/acceptance), underpinned by social cognitive theory, versus a healthy lifestyle control. The focus of the study was emotional control training and planning of social support/social change.

The primary outcomes included quality of life (physical health scale and mental health scale), total depression, perceived stress levels/score, and total well-being (WHO-5) in Farzanfar 2011; Yale-Brown obsessive compulsive scale in Greist 2002; and depression and stress in Zautra 2012. Secondary outcomes included clinical and patient global impressions and depression (Hamilton rating scale for depression) in Greist 2002 and satisfaction in Greist 2002 and Farzanfar 2011.

Obstructive sleep apnoea syndrome (OSAS)

Two studies in the USA evaluated ATCS for managing OSAS (DeMolles 2004; Sparrow 2010). Sample sizes were 30 and 250 participants, respectively, with mean ages of 46 years and 55 years. Both studies included participants who were obese (BMI greater than 35 kg/m^2), and 82% of participants in Sparrow 2010 were men.

Both studies assessed an IVR system with automated functions. DeMolles 2004 compared once weekly calls (for two months) to usual care for barrier identification/problem solving, prompting review of outcome goals or self-monitoring of behaviour, teaching to use prompts/cues and using of follow-up prompts. Sparrow 2010 compared an IVR intervention underpinned by social cognitive theory and motivational interviewing consisting of once weekly (for the first month) then once monthly (up to one year) calls versus attention placebo control. The intervention aimed at barrier identification/problem solving, motivational interviewing, prompting review of behavioural goals, self-monitoring of behaviour, providing feedback on performance, tailoring, teaching to use prompts/cues and using follow-up prompts.

The primary outcome in both studies was continuous positive airway pressure (CPAP) use. Secondary outcomes included the sleep symptoms checklist, functional outcomes of sleep questionnaire (DeMolles 2004; Sparrow 2010), and depression (Sparrow 2010).

Smoking

Ten studies evaluated ATCS for managing tobacco dependence: five studies were conducted in the USA (Carlini 2012; Ershoff 1999; Regan 2011; Rigotti 2014; Velicer 2006), three in Canada (McNaughton 2013; Reid 2007; Reid 2011), one in Norway (Brendryen 2008), and one in Taiwan (Peng 2013). Sample sizes ranged from 44 in McNaughton 2013 to 2054 in Velicer 2006, and mean participant age ranged from 20 years in Peng 2013 to 54 years in Reid 2007. In Carlini 2012, 43% of participants had one or more chronic conditions. Participants in Reid 2007 were diagnosed with acute coronary syndrome and were hospitalised prior to the smoking cessation intervention.

Seven studies used an ATCS Plus system (Brendryen 2008; Carlini 2012; Peng 2013; Reid 2007; Reid 2011; Regan 2011; Rigotti 2014), one of which was a multimodal/complex intervention where participants received emails, web pages, SMS and an access to craving helpline (Brendryen 2008). Three studies used an IVR system (Ershoff 1999; McNaughton 2013; Velicer 2006), two of which had three arms: Ershoff 1999 compared the IVR intervention versus motivational interviewing or booklet only control, whereas Velicer 2006 compared three multimodal/complex interventions: nicotine replacement therapy (NRT) plus manual, NRT plus manual plus expert system, and NRT plus manual plus expert system plus IVR. Comparators in other studies included self-help intervention (booklet) (Brendryen 2008), inactive IVR call (Carlini 2012; Peng 2013; Regan 2011), usual care (Reid 2007; Reid 2011; Rigotti 2014), and no calls (McNaughton 2013).

In addition to automated functions, four studies used communicative functions (Carlini 2012; Reid 2007; Reid 2011; Regan 2011), two used supplementary functions (Brendryen 2008; Peng 2013), and one used both (Rigotti 2014). Theoretical underpinnings included cognitive behavioural theory (Brendryen 2008; Peng 2013), motivational interviewing (Brendryen 2008; Peng 2013), relapse prevention and self-regulation theory (Brendryen 2008), social cognitive theory (Brendryen 2008), and transtheoretical model of change (Peng 2013; Ershoff 1999; Velicer 2006). Interventions were typically aimed at planning action and setting goals, prompting self-monitoring of behavioural outcome, providing rewards contingent on effort or progress towards behaviour, providing information on consequences of behaviour in general, setting graded tasks, tailoring, prompting self-monitoring of behaviour and providing follow-up prompts, providing feedback on performance, identifying barrier/solving problems, motivating individuals, planning social support/social change or preventing relapses/planning coping. The duration of intervention ranged from three calls only in Reid 2007 to biweekly IVR calls for two years in McNaughton 2013. The call duration ranged from 3 to 5 minutes in McNaughton 2013 to 18.9 minutes in Peng 2013.

Primary outcome measures included smoking abstinence rates (McNaughton 2013; Regan 2011; Reid 2007; Reid 2011; Velicer 2006), repeated point abstinence (Brendryen 2008); re-enrolment into quit line support (Carlini 2012); biochemically confirmed smoking abstinence (Ershoff 1999; McNaughton 2013; Rigotti 2014); stage of change, self-efficacy, and decisional balance (Peng 2013). Secondary outcome measures included nicotine replacement therapy adherence, self-efficacy and nicotine dependence (averaged score) in Brendryen 2008; satisfaction with the intervention in Ershoff 1999; medication use in Regan 2011; and self-reported tobacco abstinence and costs in Rigotti 2014.

Spinal cord dysfunction

One study (N = 142) compared an IVR system versus usual care for managing spinal cord injury or multiple sclerosis in the USA (Houlihan 2013). Participants' mean age was 48 years; they were predominantly men (61%) who had had their condition for an average of 11.7 years. At baseline, they were also diagnosed with pressure ulcers or depression. The intervention consisted of weekly calls lasting an average of 4.12 minutes, and it was underpinned by the transtheoretical model of change and social cognitive theory. The intervention was aimed at emotional control training, prompting self-monitoring of behaviour and self-monitoring of behavioural outcome. Authors reported prevalence of pressure ulcers, depression severity, and healthcare utilisation.

Excluded studies

We excluded 252 studies at the full-text screening stage. Studies with reasons for exclusion are presented in Characteristics of excluded studies. These reasons pertained to a wrong type of intervention in 165 (65%) studies; inappropriate design in 65 studies (26%); no preventive healthcare/management of long-term conditions in 21 (8%); or others (1%).

Risk of bias in included studies

We present our judgements about each risk of bias item across all included studies as (summary) percentages in Figure 8. Figure 9 shows judgements about each risk of bias item for each included study separately.

Figure 8.   Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.
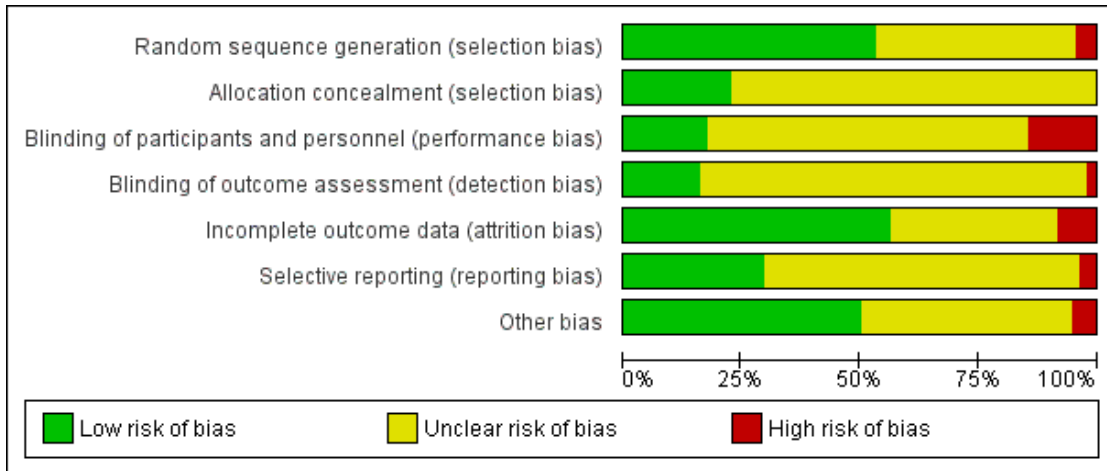
Figure 9. **Risk of bias summary: review authors' judgements about each risk of bias item for each included study.**
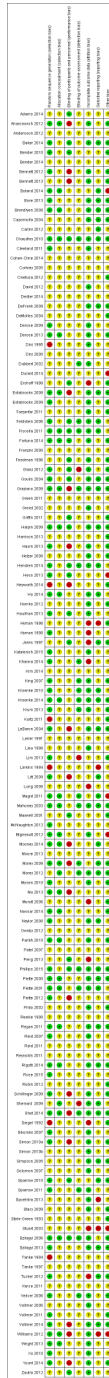
Allocation

Among 132 included trials, 70 (53%) precisely explained an adequate randomisation process, so we rated them as being at low risk of bias. Fifty-six studies (42%) had an unclear method of sequence generation, meaning there was insufficient information to assign a high or low risk rating. We considered six studies (5%) to be at high risk of bias for random sequence generation (Dini 1995; Heyworth 2014; Kurtz 2011; Linkins 1994; Siegel 1992; Tanke 1994). Heyworth 2014 used pseudo-random number generator, and Dini 1995 assigned clients with last names beginning with the letters A through L to receive the intervention. Kurtz 2011 allocated participants without medical practitioner or telephone to the intervention group, and Linkins 1994 allocated children to an intervention group if their telephone numbers ended in an odd number. Siegel 1992 assigned participants to the experimental or control group based on the block of time during which investigators identified them, and Tanke 1994 used a quasi-experimental design because of economic limitations/lack of resources.

Among the included trials, 30 (23%) explained how they performed allocation concealment, meriting their rating as being at low risk of bias. We assessed the other 102 (77%) studies as being at unclear risk of bias for allocation concealment (selection bias), meaning there was insufficient information to allow judgement of high or low risk. We did not consider any of the included studies to be at high risk of bias in this domain.

Blinding

Among the included trials, 23 (17.4%) precisely described an adequate procedure for blinding of participants and personnel, and we rated them as being at low risk of bias. Ninety studies (68.1%) had an unclear method of blinding, meaning there was insufficient information to allow judgement of high or low risk. We considered 19 studies (14.3%) to be at high risk of performance bias (Aharonovich 2012; Bennett 2012; Bennett 2013; Estabrooks 2008; Graziano 2009; Hasin 2013; Heyworth 2014; LeBaron 2004; Mu 2013; Litt 2009; Mooney 2014; Morey 2009; Piette 2012; Schillinger 2009; Shet 2014; Simon 2010a; Vollmer 2014; Williams 2012; Yount 2014). In these studies, the authors of primary studies clearly mentioned the reasons for lack of blinding.

Among the included trials, 21 (15.9%) described an adequate procedure for blinding of outcome assessors. We rated these studies as being at low risk of bias for this item. One hundred and eight studies (81.8%) had an unclear method of blinding of outcome assessors, meaning there was insufficient information to allow judgement of high or low risk. We considered three studies (2.2%) to be at high risk of detection bias (Glanz 2012; Sherrard 2009; Lim 2013); similarly, the reasons for non-blinding of outcome assessors were clearly mentioned.

Incomplete outcome data

In 74 trials (56%), there was no substantial loss of data, or we considered that authors imputed them using appropriate methods. We rated these studies as being at low risk of bias for this domain. Forty-eight studies (36%) had an unclear method of addressing of incomplete data, meaning there was insufficient information about reporting of attrition/exclusions to permit judgement of low or high risk of bias. We considered 11 studies (8%) to be at high risk of attrition bias (Ershoff 1999; Hyman 1996; Hyman 1998; Jarvis 1997; Khanna 2014; Lorig 2008; Mundt 2006; Peng 2013; Siegel 1992; Stuart 2003; Tucker 2012). Four trials included only the completers in the final analyses (Ershoff 1999; Hyman 1996; Jarvis 1997; Lorig 2008). Peng 2013 and Tucker 2012 potentially applied simple imputations inappropriately, and there was an imbalance in numbers and no reasons for missing data. Four studies all had a high attrition rate, potentially introducing bias (Hyman 1998; Khanna 2014; Siegel 1992 and Stuart 2003).

Selective reporting

Among the included trials, we considered 39 (29.5%) to be at low risk of reporting bias, meaning that authors reported all relevant outcomes of interest or that study protocols were available. We assigned an unclear rating to 88 studies (66.6%), meaning there was insufficient information to permit judgement of whether any risk of this bias was present. We considered five studies (4%) to be at high risk of reporting bias (Hyman 1996; Linkins 1994; Spoelstra 2013; Stuart 2003; Williams 2012). Hyman 1996 used a complete case analysis. Linkins 1994 did not report data on the differences between the groups by county, type of residence, ethnicity, sex, or age, and Spoelstra 2013 did not report outcomes on depression scores at the study's completion. Although the authors of Stuart 2003 mentioned that there were no significant differences in medication adherence among the three groups, the analyses were restricted to one subgroup of patients who completed the IVR calls. Williams 2012 did not report six-month secondary outcomes.

Other potential sources of bias

In 66 trials (50%), there were no baseline imbalances, indicating low risk of other bias. Fifty-nine studies (44.6%) had an unclear risk for this item, meaning there was insufficient information about baseline imbalances to permit judgement of low or high risk. We considered seven studies (5%) to have a potentially high risk of other bias because of significant baseline imbalances (Boland 2014; Durant 2014; Hess 2013; Magid 2011; Migneault 2012; Williams 2012), or in the case of Stuart 2003, because authors failed to report baseline characteristics.

We included five cluster RCTs in the review (Feldstein 2006; Franzini 2000; Hess 2013; Krum 2013; Stuart 2003). Only Krum 2013 appropriately adjusted for clustering in the analysis. For the remaining four studies, it was not possible to determine whether selective recruitment of cluster participants was likely to introduce bias, as they did not report sufficient details. Several indicated baseline differences between groups (Franzini 2000; Hess 2013), and one did not report any information about this (Stuart 2003). We calculated an approximate sample size for Hess 2013, while the other three studies have unit of analysis errors that may lead to overly precise effect estimates being reported for these studies (Feldstein 2006; Franzini 2000; Stuart 2003).

Overall quality of the evidence

We also assessed and reported on the quality of the evidence, using the GRADE criteria. Appendix 13 presents results of this assessment for each study, and we report them alongside the main results for the review in each 'Summary of findings' table.

Effects of interventions

See: **Summary of findings for the main comparison** Preventive healthcare: effects of ATCS on health services uptake (immunisations); **Summary of findings 2** Preventive healthcare: effects of ATCS on physical activity levels; **Summary of findings 3** Preventive healthcare: effects of ATCS on health services uptake (screening); **Summary of findings 4** Preventive healthcare: effects of ATCS on weight management; **Summary of findings 5** Preventive healthcare or management of long-term conditions: effects of ATCS as appointment reminders/reducing non-attendance rates; **Summary of findings 6** Long-term management: effects of ATCS on adherence to medication or laboratory tests; **Summary of findings 7** Long-term management: effects of ATCS on alcohol consumption; **Summary of findings 8** Long-term management: effects of ATCS on severity of cancer symptoms; **Summary of findings 9** Long-term management: effects of ATCS in the management of diabetes mellitus; **Summary of findings 10** Long-term management: effects of ATCS in patients with heart failure; **Summary of findings 11** Long-term management: effects of ATCS in the management of hypertension; **Summary of findings 12** Long-term management: effects of ATCS on smoking cessation

Table 1 presents additional information about the effects of ATCS interventions for both continuous and dichotomous outcomes for each study. Table 5 summarises the effectiveness of ATCS by specific categories and subcategories used to organise the review along with the effect estimates and selected median effect estimates.

ATCS for preventive healthcare

Alcohol misuse

Tucker 2012 evaluated an ATCS intervention versus control for preventing alcohol misuse.

Primary outcomes: *behavioural outcomes*

The IVR intervention may have little or no effect on drinking practices or spending on alcohol compared with control (assessment-only) group (P > 0.20; low certainty evidence).

Immunisations

Ten studies evaluated ATCS compared with no calls, letters, usual care or health information for promoting immunisations (Dini 2000; Franzini 2000; Hess 2013; LeBaron 2004; Lieu 1998; Linkins 1994; Nassar 2014; Stehr-Green 1993; Szilagyi 2006; Szilagyi 2013). For a summary of the effects of these comparisons on immunisation uptake, see Summary of findings for the main comparison. We considered studies by separate population groups (children, adolescents, adults) as there was otherwise a high degree of heterogeneity in a pooled effect estimate.

Primary outcomes: *behavioural outcomes*

Immunisation rate

- Children: ATCS versus control

Meta-analysis of five studies considered to be sufficiently homogeneous found that ATCS (ATCS Plus, IVR, unidirectional) probably increased the uptake of immunisations in children compared with controls (no calls, letter, or usual care) (RR 1.25, 95% CI 1.18 to 1.32; moderate certainty evidence; Analysis 1.1; Dini 2000; LeBaron 2004; Lieu 1998; Linkins 1994; Stehr-Green 1993). There was no evidence of heterogeneity among the studies (Tau^2 = 0.00; Chi^2 = 1.99, df = 4 (P = 0.74); I^2 = 0%).
We could not include Franzini 2000 in the meta-analysis, as it used a cluster RCT design and did not report sufficient information to allow for statistical pooling (i.e. regarding cluster size and within-cluster or between-cluster variance). Franzini 2000 reported that compared with controls (no calls), unidirectional ATCS (Autodialer) may increase immunisation rates in children (270/314 (86%) intervention group versus 273/429 (64%) control group, low certainty evidence).

- Adolescents: unidirectional ATCS versus usual care

Meta-analysis of two studies considered to be sufficiently homogeneous found that unidirectional ATCS, compared with usual care, probably slightly increased immunisation status of adolescents (RR 1.06, 95% CI 1.02 to 1.11; moderate certainty evidence; Analysis 1.2; Szilagyi 2006; Szilagyi 2013). There was no evidence of heterogeneity among the studies (Tau^2 = 0.00; Chi^2

= 0.28, df = 1 (P = 0.60); I² = 0%). Szilagyi 2013 also reported that compared with usual care, unidirectional ATCS probably improved slightly the uptake of preventive care visits (63% ATCS versus 59% usual care; HR = 1.1, 95% CI 1.0 to 1.2; P < 0.05; moderate certainty evidence).

- Adults: unidirectional ATCS versus no calls or health information

Two studies contributed data to this comparison and were considered sufficiently homogeneous to warrant meta-analysis (Hess 2013; Nassar 2014). Hess 2013 used a cluster design but did not adjust for clustering; to calculate effective sample size, we used the Fleiss-Cuzick estimator (see Appendix 14 for calculations). Meta-analysis of the two studies found that the effects of unidirectional ATCS, compared with no calls in Hess 2013 or health information in Nassar 2014 were uncertain for immunisations in adults (RR 2.18, 95% CI 0.53 to 9.02; very low certainty evidence; Analysis 1.3). There was a substantial level of heterogeneity in the pooled studies (Tau² = 0.68; Chi² = 2.71, df = 1 (P = 0.10); I² = 63%).

Secondary outcomes

Process outcomes: satisfaction/acceptability of ATCS

- Children

Over 85% of the participants in Dini 2000 responded positively about the acceptability of unidirectional ATCS. Lieu 1998 found ATCS (IVR) to be an acceptable medium to deliver immunisation-related reminders, with over 91% of the participants who received the intervention finding it very easy or somewhat easy to understand. Neither study reported comparison group data.

- Adolescents

For 388 (27%) households in the unidirectional ATCS group, the reminder call was unanswered or was picked up by voice mail, but authors reported no comparison group data (Szilagyi 2013).

- Adults

Nassar 2014 reported that the unidirectional ATCS intervention may lead to a slight increase in participants reporting that they learnt about the H1N1 virus (66.6% of participants), compared with 63.6% in the health information group (P = 0.41; low certainty).

Process outcomes: cost-effectiveness

- Children

In Dini 2000, unidirectional ATCS was more cost-effective than phone plus letters (USD 4300 vs USD 4738) but less cost-effective than letters only (USD 2254) (no data available for the no-calls comparison group). Franzini 2000 reported that the average cost per child in the Autodialer was USD 15.46 compared with USD 11.46 in the controls (no calls); the incremental physician's office cost per child immunised relative to control was USD 4.06 (low certainty). In Lieu 1998, the estimated cost per child immunised was USD 9.80 using automated telephone messages alone, compared with USD 10.50 for letters alone.

- Adolescents

Szilagyi 2013 reported that the total cost of the unidirectional ATCS intervention (excluding research costs) was USD 23,738.00, but authors did not report cost data for the usual care comparison group. Of all adolescents receiving a telephone reminder, the average cost was USD 16.68 per adolescent per year.

Physical activity

Eight studies evaluated various types of ATCS for improving physical activity levels, comparing them to no-coach IVR call, no calls, usual care, usual care plus MOVE programme, attention only, or an IVR call promoting healthy eating (David 2012; Dubbert 2002; Jarvis 1997; King 2007; Morey 2009; Morey 2012; Pinto 2002; Sparrow 2011). For this outcome, the studies were too heterogeneous for statistical pooling. For a summary of the effects of these comparisons on physical activity and related outcomes, see Summary of findings 2.

Primary outcomes: *behavioural outcomes*

Various indices of physical activity

- Multimodal/complex intervention versus no intervention

Dubbert 2002 found that the intervention (10 nurse delivered calls plus 10 automated phone calls) may have improved slightly the frequency of walks compared with no calls during initiation (P = 0.003) and maintenance (P = 0.004) phases (low certainty evidence).

- Multimodal/complex intervention versus usual care

Morey 2009 reported that the intervention (a combination of counselling by a lifestyle counsellor, automated telephone messaging, endorsement and tailored mailings) had probably little or no effect on usual gait speed or functional/disability outcomes, but probably improved slightly rapid gait speed (P = 0.04) and minutes of moderate/vigorous physical activity per week, compared with usual care at 12 months (mean (SD) = 126.6 min/week (142.9) versus 69.6 min/week (116.1); P < 0.001; moderate certainty evidence). Similarly, Morey 2012 reported that the multimodal intervention may slightly increase endurance physical activity at 12 months (mean (SD) = 133.60 min/week (136.47) versus 112.62 min/week (135.45); P < 0.001; low certainty evidence).

Together, these results suggest that multimodal/complex interventions may have little effect on several indices of physical activity, compared with usual care or no intervention.

- ATCS Plus versus control (IVR)

David 2012 found that the ATCS Plus intervention may have little or no effect on time to complete the one-mile walk compared with (no-coach IVR call) controls. Similarly, Pinto 2002 found that compared with IVR control group, the intervention may have improved slightly the proportion of participants meeting recommendations for moderate-intensity or vigorous-intensity physical activity (P = 0.04), energy expenditure (P = 0.02), and motivational readiness (P = 0.04) at three months, but may have little or no effect on these outcomes at six months. In both studies the level of certainty for the evidence was low.

Together, these results suggest that ATCS Plus interventions may have little effect on several indices of physical activity, compared with IVR controls.

- IVR versus usual care or attention or general health education (via IVR)

Jarvis 1997 found that the intervention may have little or no effect on physical activity levels (minutes walked per week) compared with usual care at three months (low certainty evidence). King 2007 reported that compared with attention control, the intervention may increase slightly minutes of moderate to vigorous physical activity at 6 and 12 months (P = 0.01, P = 0.045), but it may have little or no effect on this outcome at 18 months (P = 0.10; low certainty evidence). Sparrow 2011 found that compared with weekly general health education (via IVR) controls, the intervention may have improved slightly muscle strength (P = 0.035), balance (P = 0.029), and reduce depressive symptoms (P = 0.030), but may have little or no effect on walking distance (P = 0.91; low certainty evidence).

Taken together, these results suggest that IVR interventions may slightly improve several indices of physical activity, but the quality of evidence is low, and results are mixed across different measures of physical activity.

Overall, the results suggest that less complex ATCS interventions (i.e. IVR interventions) may be slightly more likely to improve outcomes related to exercise than more complex interventions (ATCS Plus or multimodal interventions) when compared with usual care or various controls. However, these interventions were not directly tested against one another.

Primary outcomes: *clinical outcomes*

Body mass index (BMI), anthropometric measures, metabolic markers

- Multimodal/complex intervention versus usual care

Morey 2012 reported that there may be little or no differences between the multimodal intervention (similar to Morey 2009, a combination of counselling by a lifestyle counsellor, automated telephone messaging, endorsement and tailored mailings) and usual care in terms of fasting insulin and glucose levels, glycated haemoglobin (mean (SD) = 5.90% (0.44) versus 5.93% (0.36); P = 0.08); BMI (mean (SD) = 30.74 kg/m^2 (3.88) versus 30.64 kg/m^2 (3.62); P = 0.31); waist circumference (mean (SD) = 103.92 cm (10.02) versus 104.43 cm (11.73); P = 0.68); or physical function (mean (SD) = 62.52 (21.79) versus 66.24 (20.91); P = 0.09; low certainty evidence).

- ATCS Plus versus control

David 2012 found that the ATCS Plus intervention may have little or no effect on BMI, weight (kg), waist (cm) or waist-hip ratio, compared with (no-coach IVR call) controls (low certainty evidence).

Together, these results suggest that ATCS Plus and multimodal/complex interventions may have little effect on measures of body weight or metabolic markers, compared with usual care or control.

Secondary outcomes

Cognitive outcomes: self-efficacy

David 2012 found that the ATCS Plus intervention may have little or no effect on self-efficacy for walking compared with no-coach IVR call controls (low certainty evidence).

Process outcomes: satisfaction with ATCS

In Jarvis 1997, users were very satisfied with the IVR system. Analysis of users' satisfaction data shows a high user satisfaction score for Telephone-Linked Communication for Activity Counseling and Tracking (IVR), with the mean of 8.6 points (where 1 = very dissatisfied and 10 = very satisfied); 74% of the women rated their satisfaction with the intervention as 10 of 10. Intervention users' perceived benefit score was 7.5 of 10; 63% of the women rated the benefit of TLC as 10 of 10. However, for satisfaction and perceived benefit outcomes, authors reported no data for the usual care comparison group.

Patient-centred outcomes: quality of life

In Dubbert 2002 the multimodal intervention may have had little or no effect on physical or mental health quality of life as measured by the Short Form-36 Health Survey (SF-36) summary scores, compared with no intervention (low certainty evidence). King 2007 reported that the intervention may have little or no effect on physical functioning and well-being at 12-months, compared with attention control (IVR group: vitality plus scale (range from 10 (negative) to 50 (positive) adjusted mean square = 35.9 points (SD 6.3) versus attention control: 34.8 points (SD 5.8); IVR group: satisfaction with fitness scale (20 items) adjusted mean square = 32.8 points (SD 12.1) versus control: 30.0 points (SD 11.9); low

certainty evidence). Morey 2012 reported there may be little or no differences between the multimodal intervention and usual care in terms of health-related quality of life at 12 months (mean (SD) = 58.12 points (42.29) versus 61.68 points (41.82); P = 0.92; scale from 0 to 100, with higher scores indicating better outcome; low certainty evidence).

Screening

Thirteen trials compared ATCS intervention to no intervention, usual care or usual community care for changing screening rates (Baker 2014; Cohen-Cline 2014; Corkrey 2005; DeFrank 2009; Durant 2014; Fiscella 2011; Fortuna 2014; Hendren 2014; Heyworth 2014; Mosen 2010; Phillips 2015; Simon 2010a; Solomon 2007). For a summary of the effects of these comparisons on screening rates for different conditions, see Summary of findings 3.

Primary outcomes: *clinical outcomes*

Breast cancer screening

- Multimodal/complex intervention versus usual care

Fiscella 2011 and Hendren 2014 compared the effects of usual care with those of multimodal/complex interventions, which included combinations of multiple ATCS calls, patient outreach (letters), and prompts for patients and clinicians, on screening rates for breast cancer at 12 months.

Meta-analysis of these two studies, considered to be sufficiently homogeneous, found that the multimodal/complex intervention increased breast cancer screening rates compared with usual care (RR 2.17, 95% CI 1.55 to 3.04; high certainty evidence; Analysis 2.1). There was no evidence of heterogeneity among the studies (Tau^2 = 0.00; Chi^2 = 0.79, df = 1 (P = 0.37); I^2 = 0%).

- IVR versus enhanced usual care (letter or reminder)

Meta-analysis of two studies considered to be sufficiently homogeneous found that compared with enhanced usual care (letter or reminder, IVR has probably little or no effect on breast cancer screening (RR 1.05, 95% CI 0.99 to 1.11; moderate certainty evidence; Analysis 2.1; DeFrank 2009; Phillips 2015). There was no evidence of heterogeneity among the studies (Tau^2 = 0.00; Chi^2 = 0.26, df = 1 (P = 0.61); I^2 = 0%).

- Unidirectional ATCS (plus letter) versus letter alone

Fortuna 2014 found that compared with letter alone, unidirectional ATCS (plus letter) probably has little or no effect on breast cancer screening rates at 12 months (22.8% versus 17.8%; adjusted OR 1.3, 95% CI 0.7 to 2.4; moderate certainty evidence).

Overall, these results suggest that more complex ATCS interventions (i.e. multimodal interventions) may be more likely to improve outcomes related to breast cancer screening than less complex interventions (IVR or unidirectional ATCS), when compared with usual care or control. However, these interventions were not directly tested against one another.

Colorectal cancer screening

- Multimodal/complex intervention versus usual care

Baker 2014, Fiscella 2011, and Hendren 2014 compared usual care versus multimodal/complex interventions, which included combinations of ATCS calls, letters, prompts for patients and clinicians, and provision of testing (colorectal cancer kits), on colorectal cancer screening rates.

Meta-analysis of these three studies, considered to be sufficiently homogeneous, found that multimodal/complex interventions increased colorectal cancer screening rates (RR 2.19, 95% CI 1.88 to 2.55; high certainty evidence; Analysis 2.2). There was no evidence of heterogeneity among the studies (Tau^2 = 0.00; Chi^2 = 1.29, df = 2 (P = 0.52); I^2 = 0%).

- IVR versus control (no call)

Durant 2014 compared IVR with control, reporting that IVR probably increased colorectal cancer screening, with 1773 participants from the IVR group and 100 from the no calls control group completing colorectal cancer screening within three months (without segmentation) (moderate certainty evidence).

- IVR versus usual care or enhanced usual care (letter)

Meta-analysis of two studies considered to be sufficiently homogeneous found that compared with usual care, IVR probably increased colorectal cancer screening at six months (RR 1.36, 95% CI 1.25 to 1.48; moderate certainty evidence; Analysis 2.2; Cohen-Cline 2014; Mosen 2010). There was no evidence of heterogeneity among the studies (Tau^2 = 0.00; Chi^2 = 1.01, df = 1 (P = 0.31); I^2 = 1%). Mosen 2010 also reported that compared with usual care, IVR probably increased completion of any colorectal cancer screening (23.9% versus 17.6%; moderate certainty evidence).

Two other studies evaluating this comparison reported results at later time points (Phillips 2015; Simon 2010a).

Meta-analysis of these two studies, considered to be sufficiently homogeneous, found that IVR had probably little or no effect on colorectal cancer screening rates, compared with usual care or letters only at longer follow-up (9 to 12 months) (RR 1.01, 95% CI 0.97 to 1.05; moderate certainty evidence; Analysis 2.2). There was no evidence of heterogeneity among the studies (Tau^2 = 0.00; Chi^2 = 0.47, df = 1 (P = 0.49); I^2 = 0%). Simon 2010a also reported that IVR probably improved slightly colorectal cancer screening: a total of 21.4% of participants in the IVR group and 20.3% in the

usual care group underwent colonoscopy following the intervention (adjusted OR 1.08, 95% CI 1.00 to 1.16; P = 0.04; moderate certainty evidence). The trialists reported including screening via colonoscopy as a secondary outcome as they anticipated that the intervention may also increase rates of uptake due to increased public awareness that colonoscopy is the most sensitive and frequently recommended screening test (Simon 2010a).

Overall these results suggest that compared with usual care or letter, IVR interventions probably increase colorectal cancer screening rates at some time points (6 months), but probably have little or no effect on colorectal cancer screening rates at later time points (9 to 12 months).

- Unidirectional ATCS versus letter

Fortuna 2014 found that compared with letter alone, unidirectional ATCS (plus letter) had probably little or no effect on colorectal cancer screening rates at 12 months (15.3% versus 12.2%; adjusted OR 1.2, 95% CI 0.6 to 2.4; moderate certainty evidence). Overall, these results suggest that more complex ATCS interventions (i.e. multimodal interventions) may be slightly more likely to improve colorectal cancer screening rates than less complex interventions (IVR and unidirectional ATCS) when compared with usual care or letters alone. However, these interventions were not directly tested against one another.

Cervical cancer screening

- ATCS Plus versus control (no call)

Corkrey 2005 compared an ATCS Plus intervention with control, reporting that the intervention probably improved slightly the cervical cancer screening rate at two months (increase by 0.43%; moderate certainty evidence).

Osteoporosis screening

- Multimodal/complex intervention versus no intervention

Solomon 2007 found that a multimodal intervention (education and reminders delivered to primary care physicians, mailings and ATCS) may increase the uptake of bone mineral density test or filling a prescription for osteoporosis medication at 10 months, compared with no intervention (adjusted model: 14% versus 10%; RR 1.52, 95% CI 1.13 to 2.05; P = 0.006; low certainty evidence).

- ATCS Plus versus usual care

Heyworth 2014 reported that the effects of the ATCS Plus intervention versus usual care for bone mineral density screening were uncertain (adjusted analyses 18.6% versus 24.6 %, P < 0.001; very low certainty evidence).

Overall, these results suggest that multimodal interventions increase breast cancer and colorectal cancer screening rates when compared with usual care, and when compared with control they

may increase osteoporosis screening rates. An ATCS Plus intervention probably slightly improves the rate of cervical cancer screening compared with control; however, results are based on a single comparison. The effects of ATCS Plus interventions on osteoporosis screening rates are uncertain. Compared with control, usual care or enhanced usual care, IVR interventions probably improve colorectal cancer screening rates at earlier (six months) but not later time points, but they probably have little or no effect on breast cancer screening rates. Unidirectional ATCS interventions, compared with letter or control, probably have little or no effect on breast cancer or colorectal cancer screening rates.

Secondary outcomes

Process outcomes: cost-effectiveness

- ATCS versus controls

In Baker 2014, the estimated cost of the multimodal outreach intervention was USD 34.59 per patient, and the estimated cost per completed colorectal cancer screening test was USD 43.13; however, no cost-effectiveness data were available for the usual care arm. In Corkrey 2005 the cost per additional screen for cervical cancer in the IVR group was AUD 388.23 (in a random sample of women who were aged 20 to 69 years, without a hysterectomy, and unscreened); authors provided no cost-effectiveness data for the control group. Durant 2014 reported a communication cost per screening of USD 14.84; this was further calculated to 18,738 colorectal cancer prevention years, with a resultant communication cost of USD 1.56 per colorectal cancer prevention year. In Phillips 2015, the cost of mammography mailings was USD 2.36, and colorectal cancer letters (including faecal immunochemical test kits) cost USD 7.17 per patient per mailing, compared with USD 0.92 per patient receiving IVR alone.

Stress management

Primary outcomes: *clinical outcomes*

Carers' psychological outcomes

- ATCS Plus versus usual care

Mahoney 2003 found that compared with usual care, ATCS Plus has probably little or no effect on caregivers' appraisal of the bothersome nature of care, depression, or state anxiety at 6, 12, and 18 months (moderate certainty evidence).

Substance use

Primary outcomes: *clinical outcomes*

Days of drug use

- ATCS Plusversus versus motivational interviewing

Aharonovich 2012 found that compared with usual delivery of motivational interviewing, delivery via ATCS Plus delivered motivational interviewing probably had little or no effect on days of using primary drug over the previous 30 days at 30 and 60 days post-treatment (Cohen's d = 0.62; moderate certainty evidence).

Weight management

Seven studies evaluated ATCS for facilitating weight management: five in adults and two in children (Bennett 2012; Bennett 2013; Estabrooks 2008; Estabrooks 2009; Goulis 2004; Vance 2011; Wright 2013). For a summary of the effects of these comparisons on weight management and related outcomes in adults and children, see Summary of findings 4.

Primary outcomes: *clinical and behavioural outcomes in adults*

BMI scores

- ATCS (multimodal/complex intervention, ATCS Plus, IVR) versus usual care/no intervention

Five trials evaluated ATCS versus usual care or no intervention for weight management in adults (Bennett 2012; Bennett 2013; Estabrooks 2008; Goulis 2004; Vance 2011). Meta-analysis of three trials considered to be sufficiently homogeneous showed that compared with usual care, ATCS interventions may have reduced slightly BMI in adults (MD −0.64 kg/m^2, 95% CI −1.38 to 0.11; low certainty evidence; Analysis 3.1; Bennett 2012; Bennett 2013; Goulis 2004). There was a substantial level of heterogeneity among the studies (Tau^2 = 0.25; Chi^2 = 6.41, df = 2 (P = 0.04); I^2 = 69%). Vance 2011 did not provide sufficient data to contribute to the meta-analysis but reported that BMI in the intervention group (ATCS Plus plus written materials and group meetings) may have slightly been improved (mean reduction = 0.46 kg/m^2; P < 0.001), compared with control (written materials and group meetings) (low certainty evidence). We did not include the remaining two trials in the meta-analysis, as they reported weight loss rather than BMI (Estabrooks 2008, Vance 2011). The three studies pooled in meta-analysis for BMI (Bennett 2012; Bennett 2013; Goulis

2004) also measured weight loss and other primary outcomes, reported below.

Weight loss

- ATCS (multimodal/complex intervention, ATCS Plus, IVR) versus usual care/controls

Bennett 2012 found that compared with usual care (self-help booklet), the ATCS Plus intervention probably reduced slightly body weight in adults at 18 months (MD −0.95 kg, 95% CI −2.03 to 0.14; moderate certainty evidence). Bennett 2013 found that compared with usual care, the multimodal/complex intervention may have reduced body weight in adults at 18 months (MD −1.7 kg, 95% CI −3.3 to −0.2; low certainty evidence). Vance 2011 found that compared with written materials and monthly group meetings alone, the addition of ATCS Plus to these interventions may have reduced slightly body weight (for within-group differences P < 0.001; mean reduction = 6.11 kg) and waist circumference (P < 0.001; mean reduction = 1.94 cm; low certainty evidence).

- IVR versus usual care/control

Estabrooks 2008 found that compared with no calls, IVR may have had little or no effect on the percentage of lost body weight (mean (SD) 2.63% (3.08) versus 1.64% (1.78); P = 0.13) and on the change in body weight (mean (SD) 85.9 kg (18.6) versus 85.8 kg (18.2), P = 0.13) at three months (low certainty evidence). Goulis 2004 found that, compared with usual care, IVR probably reduced slightly body weight at six months (mean (SD) 89.2 kg (14.7) versus 99.6 kg (23.8); P = 0.05), but it probably had little or no effect on obesity assessment scores (mean (SD) 45.9 (19.6) versus 50.8 (16.5); moderate certainty evidence).

Blood pressure, glucose and cholesterol levels

- ATCS (ATCS Plus, IVR) versus usual care

Bennett 2012 found that there was probably little or no difference between the ATCS Plus intervention and usual care (self-help booklet) arms at 18 months in terms of systolic (MD −5.83 mmHg, 95% CI −10.38 to −1.28) or diastolic (MD −2.24 mmHg, 95% CI −5.16 to 0.69) blood pressure (moderate certainty evidence).

- ATCS Plus versus control

Vance 2011 found that compared with a control group (written materials and group meetings), the intervention group (ATCS Plus plus written materials and group meetings) may have improved slightly their systolic blood pressure (P = 0.01; mean reduction = 2.97 mmHg) and blood glucose levels (P = 0.02; mean reduction = 3.02 mg/dL) at 12 weeks (low certainty evidence).

- IVR versus usual care

Automated telephone communication systems for preventive healthcare and management of long-term conditions (Review)   38

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Goulis 2004 found that, compared with usual care, IVR probably had little or no effect on systolic blood pressure (mean intervention group (SD) 123.8 mmHg (14.2) versus 128.6 mmHg (19.4) usual care); diastolic blood pressure (mean intervention group (SD) 74.6 mmHg (8.5) versus 79.5 mmHg (14.0) usual care); plasma glucose levels (mean intervention group (SD) 104.7 mg/dL (25.0) versus 108.3 mg/dL (31.3) usual care); or high-density lipoprotein cholesterol (mean intervention group (SD) 47.5 mg/dL (12.0) versus 45.3 mg/dL (12.1) usual care), but it probably reduced slightly total cholesterol (mean intervention group (SD) 220.7 mg/dL (42.6) versus 239.6 mg/dL (41.5) usual care; P = 0.05); and triglyceride levels at six months (mean intervention group (SD) 122.3 mg/dL (31.4) versus 140.7 mg/dL (37.2) usual care; P = 0.01; moderate certainty evidence).

Medication adherence

- ATCS Plus versus usual care

Bennett 2012 found that there was probably little or no difference between the ATCS Plus intervention and usual care (self-help booklet) arms at 18 months in terms of medication adherence measured with the Hill-Bone compliance to hypertension therapy scale (MD −0.31, 95% CI −0.86 to 0.25, P = 0.28; moderate certainty evidence).

Physical activity

- IVR versus control

Estabrooks 2008 found that compared with no calls, IVR may have had little or no effect on daily minutes of moderate to vigorous physical activity (mean (SD) 25.15 min/d (29.82) versus 21.38 min/d (12.18), P = 0.47) or dietary habits (starting the conversation questionnaire scale (range from 7 (best) to 31 (worst)) at three months (mean 19.34 points (2.61) versus 20.13 points (2.84), P = 0.60; low certainty evidence).

Adverse outcomes

In Bennett 2012, there was one serious musculoskeletal injury reported in the intervention group and three events (one cardiovascular and two cases of gallbladder disease) in the usual care group. In Bennett 2013, there were six serious adverse events reported in participants in the multimodal ATCS intervention arm. These included gynaecological surgery in two participants and knee replacement, breast abscess, musculoskeletal injury, and cancer diagnosis in one participant each. All of these events required hospitalisation except for the cancer diagnosis. Authors of both studies reported that they could not determine whether the adverse events resulted from participation in the study.

Overall, these results suggest that ATCS (multimodal, ATCS Plus) interventions may slightly reduce BMI scores and body weight in adults, compared with usual care or control, while IVR interventions appear less effective. The effects of interventions on other clinical or behavioural measures appear mixed. It is not clear whether adverse events are associated with ATCS interventions or not.

Primary outcomes: *clinical and behavioural outcomes in children*

Weight management (BMI z-scores)

Two trials that were too heterogeneous for pooling evaluated different ATCS interventions for facilitating weight management in children (Estabrooks 2009; NCT01953653).

- ATCS Plus versus control

Estabrooks 2009 found that compared with Family Connections (education by a dietician in small groups) control group, ATCS Plus had probably little or no effect on BMI z-scores (mean intervention (SD) 1.98 kg/m^2 (0.03) versus control 1.95 kg/m^2 (0.04)); moderate self-reported physical activity (mean intervention (SD) 2.79 days/week (1.95) versus control 2.71 days/week (2.21)); sedentary behaviours (screen time) (mean intervention (SD) 5.47 h/d (1.96) versus control 5.60 h/d (2.04)); or dietary habits (sugary drinks) (mean intervention (SD) 1.80 L/week (1.64) versus control 1.76 L/week (1.85)) at 12 months (moderate certainty evidence).

- IVR versus control

Wright 2013 found that compared with a wait-list control, IVR probably had little or no effect on BMI z-scores (mean intervention (SD) 1.9 kg/m^2 (0.28) versus control 1.9 kg/m^2 (0.3), P = 0.48)); total caloric intake (mean intervention (SD) 744.0 kcal (385.0) versus control 958 kcal (475.0); P = 0.06); fruit intake (mean intervention (SD) 1.1 cups/day (0.7) versus control 1.5 cups/day (1.1); P = 0.12)), and sedentary behaviours (television viewing time) (mean intervention (SD) 1.0 h/d (1.5) versus control 1.8 h/d (2.4); P = 0.22)) at three months (moderate certainty evidence). Overall, these results suggest that ATCS interventions, compared with control, probably have little effect on weight management assessed by BMI z-scores or other proxy measures of weight management in children.

Secondary outcomes

Process outcomes: adherence to the service

- ATCS versus usual care

At 24 months in Bennett 2012, intervention group participants had completed 70.6% of the total 18 telephone counselling calls; 80.4% had completed calls 1 to 6; 65.0%, calls 7 to 12; and 66.7%, calls 13 to 18. Over 40.0% of intervention participants tracked their behaviour change goals weekly for at least 50% of trial weeks, and 25.0% tracked weekly for at least 75% of trial weeks. However, authors reported no data for these measures of adherence for the usual care (self-help booklet) group.

Process outcomes: satisfaction

- IVR versus control

Estabrooks 2008 reported that more than 50% of the participants in the IVR group were satisfied with the intervention, but authors reported no comparative data for satisfaction in the control group.

Patient-centred outcomes: quality of life

- IVR versus usual care

Goulis 2004 found that, compared with usual care, IVR probably had little or no effect on quality of life (as measured both by EQ-5D and SF-36 instruments) (moderate certainty evidence).

ATCS for reducing non-attendance rate (preventive healthcare or management of long-term conditions)

Seven studies evaluated ATCS (as appointment reminders) versus no intervention or nurse-delivered reminder calls for reducing non-attendance rates (Dini 1995; Griffin 2011; Maxwell 2001; Parikh 2010; Reekie 1998; Tanke 1994; Tanke 1997). For this outcome, the studies were too heterogeneous for statistical pooling. For a summary of the effects of these comparisons on appointment attendance, see Summary of findings 5.

Primary outcomes: *behavioural outcomes*

Non-attendance rates

- ATCS Plus versus nurse-delivered calls

Griffin 2011 found that compared with a nurse-delivered call, an ATCS Plus call delivered either three or seven (IVR3 or IVR7) days prior to flexible sigmoidoscopy or/and colonoscopy examinations probably had little or no effect on either appointment non-attendance or preparation non-adherence at six weeks (moderate certainty evidence).

- IVR versus no reminder

Parikh 2010 found that compared with no reminder, IVR improved attendance at four months (OR 1.52, 95% CI 1.34 to 1.71, P < 0.0001; high certainty evidence).

- Unidirectional ATCS versus control (no calls)

Two studies compared the effects of unidirectional ATCS and control on attendance rates at time points up to one month (Dini 1995; Tanke 1997), and three studies assessed the effects of this comparison at time points ranging from six weeks to six months (Maxwell 2001; Reekie 1998; Tanke 1994).

Dini 1995 found that unidirectional ATCS may have improved attendance at one month (rate ratio 1.60, 95% CI 1.29 to 1.98, P < 0.05). Tanke 1997 reported that compared with no calls, unidirectional ATCS may have improved return rates of tuberculin test at three days (OR 1.71, P < 0.05). Taken together, these studies provided low certainty evidence for this outcome.

In three further studies of low certainty, which assessed non-attendance rates at later time points, there were mixed results when unidirectional ATCS interventions were compared with no-call control groups. Reekie 1998 reported that unidirectional ATCS probably reduced non-attendance rates at six weeks (OR 3.41, 95% CI 1.87 to 6.2, P < 0.001; moderate certainty evidence). In contrast, Maxwell 2001 found that unidirectional ATCS probably had little or no effect on non-attendance rates at two months (moderate certainty evidence), while Tanke 1994 found that attendance rates may have been increased at six months (OR 1.50, P < 0.01; low certainty evidence).

Overall, these results suggest that certain ATCS interventions (IVR, unidirectional ATCS) may improve attendance rates when compared with control, although the certainty of the evidence varied from high to low.

Secondary outcomes

Process outcomes: satisfaction

- ATCS Plus, IVR, unidirectional versus controls (nurse-delivered calls, no calls)

Griffin 2011 reported that the intervention may have had little or no effect on participants' perceptions of experiences compared with the nurse-call control group for flexible sigmoidoscopy. However, for the colonoscopy group, those who had received the nurse-delivered calls versus the IVR3 or the IVR7 intervention calls (ATCS Plus) had slightly more positive perceptions about the call (35% versus 21% versus 26%; low certainty evidence). In Parikh 2010, 72% of the participants in the IVR group stated that the reminder was helpful, compared with 31% in no reminder (control) group who answered the same question (high certainty evidence). In Tanke 1994, 85% of the participants in the unidirectional ATCS group stated that the reminders were helpful (attitude questionnaire, question 3: mean response 6.73; scale range

from 1 (negative) to 7 (positive)). In Tanke 1997, 65% of the participants in the unidirectional ATCS group endorsed the most positive response about the automated reminders.

ATCS for managing long-term conditions

Adherence to medication or laboratory tests

We included 25 studies that compared ATCS with various control strategies (no intervention, usual care, or other ATCS interventions) for facilitating adherence to either medications or laboratory tests (Adams 2014; Bender 2010; Bender 2014; Boland 2014; Cvietusa 2012; Derose 2009; Derose 2013; Feldstein 2006; Friedman 1996; Glanz 2012; Green 2011; Ho 2014; Leirer 1991; Lim 2013; Migneault 2012; Mu 2013; Ownby 2012; Patel 2007; Reynolds 2011; Sherrard 2009; Simon 2010b; Stacy 2009; Stuart 2003; Vollmer 2011; Vollmer 2014). In several of these studies, we could group results and consider them together, as interventions and outcomes were similar. For other studies, we could not combine results with data from other trials within the same comparison due to differences in outcome measures, timing of outcome assessment, or both. For a summary of the effects of ATCS interventions, compared with various controls, on adherence to either medications or laboratory tests in various groups of participants, see Summary of findings 6.

Primary outcomes: *behavioural outcomes*

Adherence

- Multimodal/complex interventions versus usual care or control (education and call)

Ho 2014 reported that compared with the usual care group, multimodal intervention (ATCS Plus, medication reconciliation and tailoring, patient education and collaborative care) probably improved adherence to cardioprotective medications at 12 months (89% versus 74%, P = 0.003; moderate certainty evidence). Stuart 2003 reported uncertain effects of a complex intervention (education, nurse-delivered call and IVR intervention) versus control on adherence to antidepressant medications at four months (very low certainty evidence).

- ATCS Plus versus control or other ATCS

Cvietusa 2012 reported that compared with control group (unspecified), ATCS Plus probably improved time to first inhaled corticosteroid refill (HR 1.26, 95% CI 1.12 to 1.42), and probably improved slightly the proportion of days with medication on hand in children (38% versus 28%, P < 0.001; moderate certainty evidence). Stacy 2009 reported that compared with an enhanced care

control group (via IVR), ATCS Plus probably improved statin adherence (measured with six-month point prevalence persistency; adjusted OR 1.64, 95% CI 1.19 to 2.26; moderate certainty evidence).

- ATCS Plus versus usual care or no calls

Three studies reported the effects of ATCS Plus versus usual care on medication adherence, and we considered findings together. Derose 2013 reported that ATCS Plus probably improved adherence to statins (RR 1.63, 95% CI 1.50 to 1.76, P < 0.001), as did Vollmer 2014, reporting a small increase in statin adherence at 12 months (mean change 0.02, 95% CI 0.01 to 0.03). Similarly, Vollmer 2011 reported an increase in adherence to inhaled corticosteroids (mean change 0.02, 95% CI 0.01 to 0.03, P = 0.002). Taken together these results suggest that ATCS Plus interventions, compared with usual care, probably improve medication adherence (moderate certainty evidence).

Three further studies assessed the effects of ATCS Plus on other measures of adherence that could not be combined.

Sherrard 2009 found that compared with usual care, ATCS Plus may have improved medication adherence compared with usual care (74.5% versus 49.7% compliant with the intervention; RR 0.34, 95% CI 0.20 to 0.56; P < 0.001) and may have improved slightly a composite measure that assessed increased medication adherence and reduced adverse events (51% versus 39%, RR 0.60, 95% CI 0.37 to 0.96, P = 0.041; low certainty evidence).

Derose 2009 found that compared with no calls, ATCS Plus probably had little or no effect on adherence to testing (completion of all three recommended laboratory tests for diabetes patients) at 12 weeks (OR 1.09, 95% CI 0.92 to 1.28; moderate certainty evidence).

Simon 2010b found that compared with usual care (no intervention), ATCS Plus probably had little or no effect on retinopathy examination rates (adjusted HR 0.93, 95% CI 0.71 to 1.22) tests for glycaemia (HR 0.72, 95% CI 0.38 to 1.37), hyperlipidaemia (HR 1.31, 95% CI 0.56 to 3.05), or nephropathy (HR 1.14, 95% CI 0.69 to 1.89) in diabetic patients at 12 months (moderate certainty evidence).

Overall, these results suggest that ATCS Plus interventions probably improve adherence to medications but may have little effect on adherence to tests, compared with usual care or no calls.

- IVR versus control (other ATCS) or no calls

Four studies evaluated IVR interventions compared with other ATCS or no calls for effects on adherence but reported different outcome measures that could not be combined.

Adams 2014 found that compared with a single IVR call, the more comprehensive (repeated) IVR intervention may have slightly improved the comprehensiveness of screening and counselling in primary care parent-child consultations (85.7% intervention group versus 72.6% control; P = 0.04; low certainty evidence). Bender 2010 reported that compared with no calls, IVR may have improved adherence to anti-asthmatic medications at 10 weeks (inter-

vention group mean 64.5% (SD 17.2) versus control mean 49.1% (SD 16.8) adherent at 10 weeks, P = 0.003; low certainty evidence). Leirer 1991 reported that compared with no calls, the IVR intervention may have reduced slightly medication non-adherence (assessed as mean hours not adhering to medication, mean intervention group (SD) 3.68 h (2.62) versus 14.76 h (SD 13.98) control group; P < 0.03); low certainty evidence). Mu 2013 found that compared with no calls, IVR probably improved slightly medication refill rates at one month (26.41% intervention versus 21.85% control, P < 0.001; moderate certainty evidence).

Overall these results suggest that IVR interventions probably slightly improve measures of medication and other adherence compared with control (other ATCS) or no calls, but evidence was of uniformly low certainty.

- IVR versus usual care

Nine studies assessed the effects of IVR interventions compared with usual care. Several studies reported comparable outcomes and time points and could be grouped for consideration.

Four studies reported medication adherence: two at 3 to 6 months (Boland 2014; Friedman 1996), and two at 8 to 12 months (Glanz 2012; Migneault 2012).

Boland 2014 reported that IVR improved adherence to glaucoma medications at three months (IVR median (range) 73% (32 to 96) versus usual care 67% (7 to 98), as did Friedman 1996 for antihypertensive medication adherence at 6 months (6% higher in IVR group, P = 0.03). In comparison, at later time points, Migneault 2012 and Glanz 2012 reported little effect on adherence when IVR was compared with education-only usual care at 8 months or usual care at 12 months, respectively.

Taken together, these studies suggest that IVR interventions probably slightly increase medication adherence at shorter time points (up to six months) but probably have little or no effect at longer time points when compared with usual care (moderate certainty evidence).

Two studies assessed IVR versus usual care for medication adherence, using refill rates, and we considered their findings together. Green 2011 and Reynolds 2011 reported that the IVR intervention increased medication refill rates by 5.7% (P < 0.001) and 6.3% (P < 0.001), respectively, at two weeks. Taken together, these results suggest that IVR probably slightly increased medication adherence, assessed by refill rates at two weeks (moderate certainty evidence).

Bender 2014 and Patel 2007 assessed the effects of IVR on medication adherence, as measured by the medication possession ratio (MPR), but we did not consider them together because they measured outcomes at very different time points. Patel 2007 reported that the IVR intervention led to a very slight increase in the MPR at three to six months, compared with usual care (0.759 intervention group versus 0.738 usual care (moderate certainty evidence). In comparison, Bender 2014 reported that the MPR probably increases by 25.4% with IVR over usual care over the 24-month interval (moderate certainty evidence).

Feldstein 2006 assessed the effects of IVR interventions on adherence to testing (completion of all recommended laboratory tests), reporting that compared with usual care, the IVR intervention probably improved participants' adherence (HR 4.1, 95% CI 3.0 to 5.6, P < 0.001; moderate certainty evidence). However, this study did not adjust for clustering (unit of analysis error) and so may have reported an overly precise effect estimate.

Overall, the results suggest that IVR interventions probably improve adherence to medications/laboratory tests when compared with usual care; however, most results were based on studies of moderate certainty evidence, and the size of effects were variable and sometimes very small.

- Unidirectional ATCS versus control (no intervention)

Two studies assessed the effects of unidirectional ATCS interventions in comparison with no intervention on medication adherence: Lim 2013 reported little effect on adherence at five months, while Ownby 2012 reported a small increase in medication adherence (mean (ATCS group) 75.7, 95% CI 65.0 to 86.5 versus mean (control group) 60.3, 95% CI 47.2 to 73.2; P = 0.02). Taken together, results from these two studies suggest that unidirectional ATCS may improve adherence to medications to a small degree compared with control, although this is based on low certainty evidence.

Primary outcomes: *clinical outcomes*

Blood pressure/lipids, disease control

- Multimodal/complex intervention versus usual care

Ho 2014 reported that compared with usual care, a multimodal intervention (ATCS Plus, medication reconciliation and tailoring, patient education and collaborative care) probably had little or no effect on achieving reduced blood pressure targets (49% usual care versus 59% intervention group; P = 0.23) or low-density lipoprotein cholesterol level targets (83% usual care versus 72% intervention; P = 0.14; moderate certainty evidence).

- ATCS Plus versus usual care

Vollmer 2014 reported that compared with usual care, ATCS Plus probably reduced slightly overall systolic blood pressure (mean change= −0.5 mmHg, 95% CI −1.0 to 0.0; P = 0.041) but probably had little or no effect on overall low-density lipoprotein levels (mean Δ change −0.6 ml/dL, 95% CI −1.8 to 0.7; P = 0.379; moderate certainty evidence).

- IVR versus usual care

In Migneault 2012 the IVR intervention probably had little or no effect on diet, physical activity, systolic blood pressure, or diastolic blood pressure at 12 months (moderate certainty evidence). Similarly, Friedman 1996 reported that IVR may have had little or no effect on systolic blood pressure at six months (mean change from

baseline −11.5 mmHg intervention group versus −6.8 mmHg usual care; P = 0.20) but that it may have slightly decreased diastolic blood pressure (mean change from baseline −5.2 mmHg intervention group versus −0.8 mmHg usual care; P = 0.02; low certainty evidence).

- IVR versus no calls

Bender 2010 reported that compared with no calls, IVR probably had little or no effect on asthma control test (5-item questionnaire where higher scores indicate better outcome) (intervention group mean (SD) −1.12 (3.90) versus −1.84 (4.14) control; P = 0.530; moderate certainty evidence).

- Unidirectional ATCS versus control

Lim 2013 reported that there may have been little effect or no difference between unidirectional ATCS and control in terms of therapeutic coverage (low certainty evidence).

Secondary outcomes

Process outcomes: healthcare use

- ATCS Plus versus usual care

Sherrard 2009 reported that the ATCS Plus intervention may have had little or no effect on emergency room visits (RR 1.04, 95% CI 0.63 to 1.73) or hospitalisations (RR 0.77, 95% CI 0.41 to 1.45; low certainty evidence), while Vollmer 2011 reported that among the participants who were successfully contacted, the rate of acute asthma healthcare utilisation may have increased slightly in the intervention group compared with usual care control (RR 1.06, P = 0.038; low certainty evidence).

Process outcomes: satisfaction with ATCS

- Multimodal/complex intervention versus control (education and call)

In Stuart 2003, 50% of the participants rated the system as very helpful, 40% as somewhat helpful, and 10% as not helpful; authors did not provide data for the comparison group (very low certainty evidence).

- ATCS Plus versus usual care

In Sherrard 2009, 90% of the participants were satisfied with the medication information provided by ATCS Plus, and 93% responded that they preferred an IVR follow-up as opposed to no calls (low certainty evidence). Authors did not report comparative data for this study.

- IVR versus control

Adams 2014 reported that parents in the IVR personal health partner (PHP) intervention group were slightly more likely than those in control group (single IVR call) to report feeling "more

prepared"for the visit (81% versus 67%, P = 0.001) and to report that use of PHP reduced their visit time (63% versus 45%, P < 0.001). However, authors also reported that the IVR intervention may have had little or no effect on medication management (19.1% versus 9.7%; P = 0.19; low certainty evidence). In Friedman 1996, 85% of the physicians stated they read reports from the IVR system regularly.

Process outcomes: acceptability of service

- ATCS Plus versus control

In Cvietusa 2012, two-thirds of intervention group parents reported that the ATCS Plus calls were helpful and that the programme improved the care of their child's asthma.

- IVR versus usual care

In Friedman 1996, 94% of patients reported that the IVR system "was easy to use". There were no data presented for comparison groups for the acceptability outcomes in either of these two studies, and the evidence was of low certainty.

Process outcomes: cost-effectiveness

- IVR versus usual care

In Friedman 1996, the computed cost per patient user for six months of IVR use was USD 32.50 (low certainty evidence). There were no comparison data presented for costs.

Cognitive outcomes: beliefs, cognition

- IVR versus no calls

Bender 2010 reported that compared with no calls, IVR probably improved beliefs about medications (range scores above 0 (more positive beliefs) and scores below 0 (more negative beliefs)) (intervention group mean (SD) 0.25 (1.07) versus −0.51 (0.913) control; P = 0.007; moderate certainty evidence), while Leirer 1991 reported that compared with no calls, the IVR intervention may have had little or no effect on cognitive abilities (low certainty evidence).

Patient-centred outcomes: quality of life

- IVR versus no calls

Bender 2010 reported that compared with no calls, IVR probably had little or no effect on asthma-related quality of life (32 questions where higher scores indicate better outcome) (intervention group mean (SD) −0.15 (0.92) versus −0.38 (1.06) control; P = 0.42; moderate certainty evidence).

Illicit drug addiction

We only identified one study that focused on addiction to illicit drugs (Moore 2013).

Primary outcomes: *clinical outcomes*

Substance use

- ATCS Plus versus usual care

Moore 2013 reported that compared with usual care, ATCS Plus may have had little or no effect on self-reported opioid, cannabis, or cocaine use (low certainty evidence).

Primary outcomes: *behavioural outcomes*

ATCS Plus may have had little or no effect on the number of counselling sessions attended when compared with usual care at four weeks (mean (SD) intervention group 3.3 sessions (9.5) versus 1.0 session (1.0) usual care; adjusted P = 0.72; low certainty evidence).

Secondary outcomes

Cognitive outcomes: coping skills

The intervention may have had little or no effect on coping skills when compared with usual care at four weeks (mean 0.82 intervention group versus mean 0.54 usual care group; low certainty evidence).

Process outcomes: acceptability of ATCS

Ratings of acceptability and perceived efficacy (each rated from 1 to 5 points on an ascending scale) showed negligible change over the four weeks of study. In the intervention group, mean interest at the end of the study was 3.6 (SD 0.9), mean perceived efficacy was 3.7 (SD 1.0), and mean perceived ease of use was 4.8 (SD 0.4). For these acceptability outcomes, authors reported no data from the comparison group.

Process outcomes: satisfaction

ATCS Plus may have had little or no effect on satisfaction with methadone treatment scores (five-item Likert-like scale) when compared with usual care at four weeks (mean (SD) 4.1 (1.2) intervention group versus 4.4 (0.8) usual care group; adjusted P = 0.62; low certainty evidence).

Alcohol consumption

Eight trials compared ATCS to no intervention, usual care, another intervention (advice/education; packaged cognitive behavioural therapy (via IVR)) or an informational pamphlet in managing alcohol consumption (Andersson 2012; Hasin 2013; Helzer 2008; Litt 2009; Mundt 2006; Rose 2015; Rubin 2012; Simpson 2005). For this outcome, the studies were too heterogeneous for statistical pooling. For a summary of the effects of these comparisons on alcohol intake, see Summary of findings 7.

Primary outcomes: *behavioural outcomes*

Alcohol consumption

- ATCS Plus versus no intervention or usual care

Three studies compared ATCS Plus versus control or usual care, reporting several different measures of alcohol use (Helzer 2008; Mundt 2006; Rose 2015).

Helzer 2008 found that compared with control (no calls), ATCS Plus may have had little or no effect on weekly alcohol consumption (number of drinks/week) at six months (mean 22.4 intervention group versus 18.3 control group; P > 0.05; low certainty evidence). Likewise, Mundt 2006 found that compared with no intervention, ATCS Plus may have had little or no effect on drinking days, heavy drinking days, or total drinks consumed (P > 0.05; low certainty evidence). Rose 2015 reported that compared with usual care, ATCS Plus may have had little or no effect on the number of drinks per drinking day (P = 0.45; low certainty evidence).

Overall, these results suggest that ATCS Plus interventions may have little or no effect, when compared with no intervention or usual care, on measures of alcohol consumption, although the certainty of the evidence was low in all cases.

- ATCS Plus versus another intervention

Two studies compared ATCS Plus interventions with another form of intervention, reporting different alcohol use measures that could not be combined.

Compared with advice/education, Hasin 2013 found that ATCS Plus may have reduced the number of drinks per drinking day in the last 30 days at two months (effect size Cohen's d = 0.44, 95% CI 0.07 to 0.81, P = 0.01; low certainty evidence), but it probably had little or no effect at 12 months. Litt 2009 compared ATCS Plus with packaged cognitive behavioural therapy, finding a slight reduction in the proportion of days abstinent at 12 weeks post-treatment (P < 0.05) but negligible effect on the number of heavy drinking days, coping or drinking problems, or continuity of abstinence (low certainty evidence).

Overall, these results suggest that ATCS Plus interventions may have little or no effect on alcohol consumption when compared with selected other interventions.

- IVR versus control (no intervention)

Two studies compared the effects of IVR and control on different measures of alcohol consumption.
Andersson 2012 found that compared with no intervention, IVR probably improved slightly results of the AUDIT score at six weeks (moderate certainty evidence). Simpson 2005 found that compared with no calls, IVR may have had little or no effect on drinking habits, alcohol craving, or post-traumatic stress disorder symptoms at four weeks (low certainty evidence).
- IVR versus control (information)

Rubin 2012 reported that compared with an informational pamphlet, IVR may have reduced slightly the number of heavy drinking days per month (effect size −0.74, P = 0.02) and drinks per drinking day (effect size −0.49), and it may have increased slightly the percent days abstinent per month (effect size 0.45) at six-month follow-up (low certainty evidence).
Overall, these results suggest that IVR interventions may slightly improve some measures of alcohol consumption, compared with no intervention or information provision, but the size of the effect is small and the evidence of low certainty.

Secondary outcomes

Process outcomes:acceptability of ATCS
- ATCS Plus versus usual care

In Rose 2015, 88% of the patients found the ATCS system easy to use overall (88% responded 'somewhat' or 'very easy'), and users rated each feature as somewhat or very useful (low certainty evidence). There were no comparison data presented for acceptability.

Asthma

Vollmer 2006 and Xu 2010 evaluated two different ATCS interventions versus usual care for managing asthma.

Primary outcomes: *clinical outcomes*

Asthma control
- ATCS Plus versus usual care

Vollmer 2006 found that compared with usual care, ATCS Plus may have had little or no effect on asthma control in the 12 months post-randomisation (low certainty evidence).

Primary outcomes: *behavioural outcomes*

Medication use
- ATCS Plus versus usual care

Vollmer 2006 found that compared with usual care, ATCS Plus may have had little or no effect on medication use (past four weeks) in the 12 months post-randomisation (low certainty evidence).
- IVR versus usual care

Xu 2010 found that compared with usual care, IVR may have had little or no effect on medication (oral steroid rescue medication) use (OR 0.55, 95% CI 0.22 to 1.38; P = 0.20) (low certainty evidence).
Overall, these results suggest that ATCS interventions may have little or no effect on improving selected outcomes in asthma, compared with usual care, but the evidence was of low certainty and was based on only two trials.

Secondary outcomes

*Patient-centred outcomes: *quality of life**
- ATCS Plus versus usual care

Vollmer 2006 found that compared with usual care, ATCS Plus may have had little or no effect on quality of life (low certainty evidence).
- IVR versus usual care

Xu 2010 found that compared with usual care, IVR may have had little or no effect on health-related quality of life (low certainty evidence).

Process outcomes: satisfaction
- ATCS Plus versus usual care

Vollmer 2006 suggested that ATCS Plus probably had little or no effect on satisfaction, compared with usual care. The mean satisfaction with asthma care (on a 7 point scale) was 6 and 5.9 in the intervention and usual care groups, respectively (P = 0.17; low certainty evidence).

Process outcomes: cost-effectiveness/resource use

- ATCS Plus versus usual care

Vollmer 2006 found that compared with usual care, ATCS Plus may have had little or no effect on healthcare use in the 12 months post-randomisation (low certainty evidence).

- IVR versus usual care

Xu 2010 found that compared with usual care, IVR may have reduced slightly the total healthcare costs (mean AUD −451, 95% CI −1075 to 172), but it may have had little or no effect on healthcare utilisation (OR 1.17, 95% CI 0.46 to 2.98, P = 0.75; low certainty evidence).

Cancer

Seven studies evaluated the effectiveness of ATCS compared with control, usual care, usual care delivered by another ATCS (IVR), interviews with clinicians, or telephone calls by nurses in managing cancer patients (Cleeland 2011; Kroenke 2010; Mooney 2014; Siegel 1992; Sikorskii 2007; Spoelstra 2013; Yount 2014). For this outcome, the studies were too heterogeneous for statistical pooling. For a summary of the effects of these comparisons on symptom severity in cancer patients, see Summary of findings 8.

Primary outcomes: *clinical outcomes*

Symptom severity, distress, or burden

- Multimodal/complex intervention versus usual care

Kroenke 2010 reported that compared with usual care, a multimodal/complex intervention (ATCS plus symptom monitoring by a nurse and medications) probably reduced pain at three months (standardised effect size* 0.67, 95% CI 0.33 to 1.02) and probably reduced slightly pain at 12 months (standardised effect size 0.39, 95% CI, 0.01 to 0.77) (moderate certainty evidence).
*Standardised effect sizes were calculated as the mean group difference divided by the pooled baseline SD, where an effect size of 0.2 is modest and 0.5 is moderate (according to authors' definition).

- ATCS Plus versus control or usual care delivered via ATCS

Cleeland 2011 found that compared with automated monitoring (via IVR) and usual symptom care, ATCS Plus may have reduced slightly symptom threshold events (rate ratio (for difference between groups) 0.88, 95% CI 0.78 to 0.98) and the cumulative distribution of symptom threshold events; however, it may have had little or no effect on mean symptom severity between discharge and follow-up (low certainty evidence). Mooney 2014 found that compared with an attention control group (via IVR), ATCS Plus probably had little or no effect on symptom severity or distress scores (MD 0.06, P = 0.58; moderate certainty

evidence). Spoelstra 2013 found that compared with usual care (symptom management toolkit (SMT) and an automated voice response (AVR) phone system alone), the ATCS Plus intervention (AVR system and SMT complemented by nurse strategies to manage unresolved symptoms and improve adherence) may have had little or no effect on symptom severity (range 0 (the symptom did not occur) to 10 (worst imaginable) (mean (SD) intervention group 11.0 (10.4) versus 11.6 (12.1) usual care group); low certainty evidence). Yount 2014 reported that compared with monitoring alone (via IVR), ATCS Plus (monitoring and reporting functions) may have had little or no effect on symptom burden at 12 weeks (low certainty evidence).

Overall, these results suggest that ATCS Plus interventions may have little or no effect on symptoms (severity, distress or burden) in cancer patients, when compared with control or usual care delivered via another ATCS, although the evidence was of mostly low certainty, and in some studies the involvement of ATCS systems as part of usual care may have prevented any effects of the intervention from being detected.

- IVR versus nurse calls

Sikorskii 2007 found that compared with telephone calls by nurses, the automated telephone symptom management intervention may have had little or no effect on symptom severity (low certainty evidence).

Depression

- Multimodal/complex intervention versus usual care

Kroenke 2010 reported that compared with usual care, a multimodal/complex intervention probably reduced slightly depression at 3 months (standardised effect size 0.42, 95% CI 0.16 to 0.69) and at 12 months (standardised effect size 0.41, 95% CI 0.08 to 0.72), but it probably had little or no effect on disability (range from 0 to 10) (mean (SD) intervention 3.95 points (2.95) versus usual care 4.57 points (3.24); P = 0.011) or co-interventions (depression treatment by mental health professional) (mean (SD) intervention 34 (26.6) versus usual care 39 (29.8); P = 0.56) at 12 months follow-up (moderate certainty evidence).

Primary outcomes: *behavioural outcomes*

Medication adherence

- ATCS Plus versus usual care (via IVR)

Spoelstra 2013 found that compared with usual care (symptom management toolkit (SMT) and an automated voice response (AVR) phone system alone), the ATCS Plus intervention (AVR system and SMT complemented by nurse strategies to manage unresolved symptoms and improve adherence) may have had little or

no effect on medication non-adherence (intervention group 40% versus usual care group 18%; low certainty evidence).

Overall, compared with usual care or control, these results suggest that multimodal/complex interventions probably improve both pain and depression measured at different time points, whereas ATCS Plus interventions may have little or no effect on symptoms or adherence to medications. Similarly, IVR may have little or no effect on symptoms, compared with either control or when used as a comparison with ATCS Plus, although evidence was of generally low certainty and based on few studies.

Secondary outcomes

Patient-centred outcomes: quality of life

- Multimodal/complex interventions versus usual care

Kroenke 2010 reported that the multimodal intervention probably had little or no effect on overall quality of life (range from 0 (worse) to 10 (better)) compared with usual care (mean (SD) intervention group 6.20 points (2.27) versus 6.07 points (2.18) usual care group; P = 0.46) at 12 months follow-up (moderate certainty evidence).

- ATCS Plus versus control (via IVR)

Yount 2014 reported that compared with monitoring alone (via IVR), ATCS Plus (monitoring and reporting functions) may have had little or no effect on health-related quality of life (27-item, with higher scores indicating better outcome) (intervention mean (SD) 77.9 points (19.8) versus control 77.1 points (18.0); P = 0.78) at 12 weeks (low certainty evidence).

Process outcomes: healthcare use, costs

- Multimodal/complex intervention versus usual care

Kroenke 2010 reported that the multimodal intervention probably had little or no effect on healthcare use compared with usual care (mean (SD) intervention 15.6 outpatient physician visits (9.9) versus usual care 16.4 outpatient physician visits(13.4); P = 0.55) at 12 months follow-up (moderate certainty evidence).

Process outcomes: satisfaction, acceptability of the service

- ATCS Plus versus control (via IVR)

In Mooney 2014, participants reported high satisfaction and ease of use for the automated ATCS Plus system. Overall, 94% found the automated system quite or very easy to use, 91% found the call length acceptable, and 77% said they were quite or very satisfied with using the system. Authors reported no comparison group data

for this acceptability outcome. Yount 2014 reported that compared with monitoring alone (via IVR), ATCS Plus (monitoring and reporting functions) may have had little or no effect on satisfaction with explanations provided to them (mean (SD) 2.60 (0.57) versus 2.70 (0.53); P = 0.23) at 12 weeks (low certainty evidence).

Cognitive outcomes: barriers, unmet needs

- ATCS Plus versus control (via IVR)

Yount 2014 reported that compared with monitoring alone (via IVR), ATCS Plus (monitoring and reporting functions) may have had little or no effect on symptom management barriers (mean (SD) 56.7 (14.4) versus 52.7 (16.9); P = 0.094) or self-efficacy (mean (SD) 88.2 (18.9) versus 90.5 (19.9); P = 0.45) at 12 weeks (low certainty evidence).

- IVR versus control

Siegel 1992, comparing a comprehensive clinician-delivered needs assessment with IVR-delivered needs assessment, reported uncertain effects on the prevalence of unmet needs (very low certainty evidence).

Chronic pain

Kroenke 2014 and Naylor 2008 evaluated two different ATCS interventions versus usual care.

Primary outcomes: *clinical outcomes*

Pain

- Multimodal/complex intervention versus usual care

Kroenke 2014 found that compared with usual care, the intervention (ATCS Plus, nurse care, and stepped care with analgesics) probably reduced pain intensity at 12 months (mean (SD) intervention group 3.57 (2.22) versus 4.59 (2.13) usual care group; MD = −1.02, 95% CI −1.58 to −0.47; P < 0.001, where a 1 point change is clinically relevant), pain severity (scores range from 0 to 10,with higher scores representing worse pain) (MD −1.00, 95% CI −1.53 to −0.46; P < 0.001), pain interference (brief pain inventory) (MD −1.05, 95% CI −1.71 to −0.39; P < 0.001), and differences in response rates at 12 months (total pain score responders) (MD 1.91, 95% CI 1.36 to 2.69; P < 0.001; moderate certainty evidence).

- IVR versus usual care

Naylor 2008 reported that compared with usual care, IVR may have reduced slightly typical pain intensity (range from 0 (no pain) to 10 (worst pain)) (mean usual care −1.0 (SD 1.8) versus IVR

group mean −2.3 (SD 2.3) at eight-month follow-up (low certainty evidence).

Overall, these results suggest that a multimodal/complex intervention probably improves, and an IVR intervention may slightly improve, measures of chronic pain management in adults.

Secondary outcomes

Patient-centred outcomes: quality of life

Naylor 2008 reported that compared with usual care, IVR may have slightly improved function/disability and coping as measured with SF-36 mental health composite (mean (SD) 10.4 (14.2) versus 1.1 (12.0); P < 0.05), SF-36 physical health composite (mean (SD) 8.9 (10.1) versus 2.6 (7.3); P < 0.001), and total pain experience (mean (SD) −18.1 (13.5) versus −3.5 (11.4); P < 0.0001); at eight-month follow-up (low certainty evidence).

Chronic obstructive pulmonary disease (COPD)

Primary outcomes: *clinical outcomes*

Exacerbations, health status

- ATCS Plus versus control (no calls)

Halpin 2009 reported that compared with no calls, the ATCS Plus intervention probably had little or no effect on the frequency of exacerbations or the proportion of participants experiencing one or more COPD exacerbation, and that there were probably little or no differences in the frequency, severity, or duration of events measured with the EXAcerbations of Chronic pulmonary disease Tool (EXACT) and patient-reported outcome scale, nor were there changes in health status (mean (standard error (SE)) intervention 49.7 points (2.4) versus control 51.5 points (2.4) between the ATCS Plus and no calls control group at four months (moderate certainty evidence).

Diabetes mellitus

Ten studies evaluated ATCS versus usual care for managing diabetes mellitus (Graziano 2009; Homko 2012; Katalenich 2015; Khanna 2014; Kim 2014; Lorig 2008; Piette 2000; Piette 2001; Schillinger 2009; Williams 2012). In several of these studies, we could combine results because outcome measures and timing were comparable. In other cases, we could not combine results with data from other studies within the same comparison due to differences in outcome measures, timing of outcome assessment, or both. For a summary of the effects of ATCS interventions, compared with usual care for managing diabetes mellitus, see Summary of findings 9.

Primary outcomes: *clinical outcomes*

Glycated haemoglobin

- ATCS (ATCS Plus or IVR) versus usual care

We performed meta-analysis on seven trials considered to be sufficiently homogeneous (Graziano 2009; Khanna 2014; Kim 2014; Lorig 2008; Piette 2001; Schillinger 2009; Williams 2012). It showed that compared with usual care, ATCS (ATCS Plus, IVR) may have reduced slightly glycated haemoglobin levels (MD −0.26%, 95% CI −0.50 to −0.01; low certainty evidence; Analysis 4.1). There was a moderate level of heterogeneity of the pooled studies (Tau^2 = 0.06; Chi^2 = 11.41, df = 5 (P = 0.04); I^2 = 48%).

Homko 2012 and Katalenich 2015 did not report data amenable to meta-analysis for this outcome, reporting different outcomes or the same outcome differently. Reporting median glycated haemoglobin levels, Katalenich 2015 found that compared with usual care, ATCS Plus may have had little or no effect at six months (P > 0.05; low certainty evidence). Homko 2012 found that compared with usual care, IVR may have had little or no effect on fasting blood glucose levels in pregnancy (P = 0.26) or infant birth weight at 26 months (P = 0.30; low certainty evidence).

Blood glucose levels, diabetes-related symptoms

- ATCS Plus versus usual care

Lorig 2008 found that compared with usual care, ATCS Plus may have improved symptoms of hypoglycaemia (range from 0 to 12, with higher scores indicating worse outcome) (mean intervention change (SD) −0.453 (1.80) versus 0.029 (1.46); P = 0.042) and symptoms of hyperglycaemia (range from 0 to 12, with higher scores indicating worse outcome) (mean intervention change (SD) −0.827 (2.11) versus 0.029 (2.09); P < 0.001) at six months (low certainty evidence).

Piette 2001 found that compared with usual care, ATCS Plus probably slightly improved diabetes-related symptoms (all symptoms) at 12 months (adjusted values: intervention group mean (SE) 3.7 (0.2) versus 4.4 (0.2); P = 0.04; moderate certainty evidence).

Blood pressure, blood lipids

- ATCS Plus versus usual care

Khanna 2014 found that compared with usual care, ATCS Plus may have had little or no effect on systolic blood pressure (P = 0.43), diastolic blood pressure (P = 0.93), total cholesterol (P = 0.70), triglycerides (P = 0.55), high-density lipoprotein (P = 0.75), or low-density lipoprotein levels (P = 0.08) at three months (low certainty evidence).

Schillinger 2009 found that compared with usual care, ATCS Plus may have had little or no effect on systolic blood pressure (mean intervention (SD) 136.9 mmHg (20.4) versus 141.5 mmHg (23.9), standardised effect size 0.19, P = 0.20) or diastolic blood pressure (mean intervention (SD) 75.4 mmHg (12.3) versus 78.5 mmHg (18.5), standardised effect size 0.14, P = 0.40; low certainty evidence).

BMI, anthropometrics

- ATCS Plus versus usual care

Khanna 2014 found that compared with usual care, ATCS Plus may have had little or no effect on BMI (P = 0.21) or waist circumference (P = 0.31) at three months (low certainty evidence). Schillinger 2009 found that compared with usual care, ATCS Plus may have had little or no effect on BMI (mean intervention (SD) 30.7 kg/m^2 (6.9) versus 31.4 kg/m^2 (8.5), standardised effect size −0.06, P = 0.8); low certainty evidence).

Psychological outcomes, mental health

- ATCS Plus versus usual care

Piette 2000 found that compared with usual care, ATCS Plus probably had little or no effect on anxiety (P = 0.496) but probably improved slightly symptoms of depression (P = 0.023) (moderate certainty evidence). Lorig 2008 found that compared with usual care, ATCS Plus may have improved health distress (five-items scale) (mean intervention change (SD) 0.595 (1.30) versus control −0.089 (1.29); P = 0.009) at six months (low certainty evidence). Schillinger 2009 found that compared with usual care, ATCS Plus may have had little or no effect on mental health (SF-12, scale range 0-100 with higher scores indicating better outcome) (mean intervention (SD) 67.0 (25.8) versus 64.2 (27.2), standardised effect size 0.18, P = 0.20) (low certainty evidence).

Functional status

- ATCS Plus versus usual care

Piette 2000 found that compared with usual care, ATCS Plus probably had little or no effect on decreased activity due to illness (P = 0.248) but probably reduced slightly days in bed because of illness (P = 0.026; moderate certainty evidence). Lorig 2008

found that compared with usual care, ATCS Plus may have had little or no effect on self-reported global health (range from 0 to 5, with higher scores indicating better outcome) (mean intervention change (SD) −0.128 (1.30) versus control −0.023 (0.807); P = 0.713), activity limitation (range from 0 to 4) (mean intervention change (SD) −0.149 (1.05) versus control −0.119 (1.12); P = 0.273), or fatigue (range from 0 to 10, with higher scores indicating worse fatigue) (mean intervention change (SD) −0.254 (3.08) versus −0.145 (3.48); P = 0.694) at six months (low certainty evidence). Schillinger 2009 found that compared with usual care, ATCS Plus may have had little or no effect on physical health functional status (SF-12, scale range 0-100 with higher scores indicating better outcome) (mean intervention (SD) 60.2 (29.1) versus 56.7 (31.3), standardised effect size 0.11, P = 0.4) but may have improved slightly functional status (mean intervention (SD) 1.4 bed days/month (2.7) versus 3.1 bed days/month (7.2), rate ratio 0.5, 95% CI 0.3 to 1.0, P = 0.05; low certainty evidence).

Primary outcomes: *behavioural outcomes*

Self-monitoring of diabetic foot

- ATCS Plus versus usual care

Meta-analysis of two trials, considered to be sufficiently homogeneous, suggested that compared with usual care, ATCS Plus probably improved slightly self-monitoring of diabetic foot (SMD 0.24, 95% CI 0.06 to 0.42; moderate certainty evidence; Analysis 4.2; Piette 2001; Schillinger 2009). There was no evidence of heterogeneity among the studies (Tau^2 = 0.00; Chi^2 = 0.67, df = 1 (P = 0.41); I^2 = 0%). We expressed the effect size as standardised mean difference (SMD) because the studies used different measurement instruments, i.e. seven- item Likert-like scale and telephone interview.

Self-monitoring of blood glucose

- ATCS Plus versus usual care

Lorig 2008 found that compared with usual care, ATCS Plus may have had little or no effect on self-monitoring of blood glucose (mean intervention change (SD) 0.05 times/week (0.39) versus control 0.08 times/week (0.37); P = 0.457) at six months (low certainty evidence). At 12 months, however, pooled data from two studies showed that ATCS Plus probably improved slightly self-monitoring of blood glucose compared with usual care (moderate certainty evidence)(Piette 2001; Schillinger 2009).

- IVR versus usual care

Graziano 2009 found that compared with usual care, IVR probably increased slightly the mean change in frequency of self-monitoring of blood glucose (P < 0.001; moderate certainty evidence).

Weight monitoring

- ATCS Plus versus usual care

Piette 2001 found that compared with usual care, ATCS Plus probably had little or no effect on weight monitoring at 12 months (range from 0 = never to 5 = daily) (adjusted values: intervention group mean (SE) 2.6 (0.1) versus 2.5 (0.1); P = 0.60; moderate certainty evidence).

Physical activity, diet

- ATCS Plus versus usual care

Lorig 2008 found that compared with usual care, ATCS Plus may have had little or no effect on aerobic exercise (mean intervention change (SD) 3.60 min/week (107) versus control −3.47 min/week (115); P = 0.891) at six months (low certainty evidence). Schillinger 2009 found that compared with usual care, ATCS Plus may have slightly improved diet (mean (SD) 4.4 (1.1) versus 3.9 (1.5), standardised effect size 0.42; P = 0.003), and exercise (mean (SD) 2.6 (2.0) versus 1.9 (1.8), standardised effect size 0.47, P = 0.0008) and may have improved moderate intensity physical activity levels (two more hours/week with intervention) (standardised effect size 0.31, P = 0.03) but may have had little or no effect on vigorous intensity physical activity levels (standardised effect size 0.21, P = 0.10) at 12 months (low certainty evidence).

Medication adherence

- ATCS Plus versus usual care

Katalenich 2015 found that compared with usual care, ATCS Plus may have had little or no effect on adherence rates at six months (P = 0.04; low certainty evidence). Piette 2001 found that compared with usual care, ATCS Plus probably had little or no effect on medication use at 12 months (adjusted values: intervention group any medication problem 45 versus 39; P = 0.40; moderate certainty evidence).

Overall, the results suggest that compared with usual care, ATCS interventions (ATCS Plus, IVR) probably slightly reduce glycated haemoglobin levels and probably slightly improve self-monitoring of diabetic foot and blood glucose levels. ATCS Plus interventions may also slightly improve symptoms associated with diabetes, depression, and distress, but they may have little or no effect on medication adherence or use, anxiety, blood pressure, BMI, or weight monitoring, and they appear to have mixed effects on functional measures, diet, and physical activity levels.

Secondary outcomes

Process outcomes: satisfaction with care

- ATCS Plus versus usual care

Piette 2001 found that compared with usual care, ATCS Plus probably improved slightly satisfaction with care measured with the Employee Health Care Value Survey (range from 1 = poor to 5 = excellent) at 12 months (adjusted values: intervention group mean (SE) 3.8 (0.05) versus usual care 3.7 (0.04); P = 0.05; moderate certainty evidence). Schillinger 2009 found that compared with usual care, ATCS Plus may have improved participant assessment of chronic illness care (100-point scale, with higher scores representing greater chronic care model alignment) (mean intervention (SD) 58.9 (23.1) versus 48.2 (26.5), standardised effect size 0.51; P = 0.0003); low certainty evidence).

Process outcomes: cost-effectiveness

- ATCS Plus versus usual care

Katalenich 2015 found that compared with usual care, ATCS Plus may have reduced healthcare expenditure (estimated cost for intervention USD 681.82 per participant versus estimated cost of USD 1131.07 usual care per participant, P < 0.001; low certainty evidence).

Process outcomes: healthcare use

- ATCS Plus versus usual care

Lorig 2008 found that compared with usual care, ATCS Plus may have had little or no effect on healthcare utilisation as measured with physician visits (mean intervention change (SD) −0.028 visits/past six months (3.14) versus −0.064 visits/past six months (2.64); P = 0.852), accident and emergency visits (mean intervention change (SD) −0.107 visits/past six months (0.820) versus control −0.081 visits/past six months (0.943); P = 0.665), or length of hospital stay (mean intervention change (SD) 0.35 days (7.18) versus control −0.09 days (1.49); P = 0.26) (low certainty evidence). Piette 2001 found that compared with usual care, ATCS Plus probably increased the use of specialty services including podiatry clinics (adjusted values: intervention group 62 visits versus 42 visits; P = 0.003), foot examinations (92 examinations versus 72 examinations; P = 0.0002), and diabetes clinics (61 visits versus 25 visits; P = 0.03), and probably increased slightly cholesterol testing (87 versus 78; P = 0.05). However, it probably had little or no effect on opthalmopathy visits (40 visits versus 38 visits; P = 0.8; moderate certainty evidence).

Cognitive outcomes: self-efficacy

- ATCS Plus versus usual care

Lorig 2008 reported that ATCS Plus may have improved self-efficacy scores (assessed on a 0 to 10 scale) (mean change intervention (SD) 0.695 points (2.36) versus usual care 0.004 points (2.37); P < 0.001; low certainty evidence). Piette 2000 found that compared with usual care, ATCS Plus probably improved slightly self-efficacy (P = 0.006; moderate certainty evidence).

Patient-centred outcomes: quality of life

- ATCS Plus versus usual care

Katalenich 2015 found that compared with usual care, ATCS Plus may have had little or no effect on on quality of life at six months (P = 0.04; low certainty evidence). Piette 2000 found that compared with usual care, ATCS Plus probably had little or no effect on diabetes-specific health-related quality of life (P = 0.770; moderate certainty evidence). Williams 2012 found that compared with usual care, IVR may have improved the mental health-related quality of life component of the SF-36 (MD 3.0, 95% CI 0.8 to 5.2 P = 0.007) but may have had little or no effect on the physical component (MD 0.4, 95% CI −1.7 to 2.4, P = 0.7; low certainty evidence).

Heart failure

Four studies evaluated ATCS versus usual care for improving health outcomes and reducing healthcare utilisation in participants with heart failure (Capomolla 2004; Chaudhry 2010; Krum 2013; Kurtz 2011). For a summary of the effects of ATCS interventions versus usual care on heart failure outcomes, see Summary of findings 10.

Below, we report results for individual outcomes except for the study by Kurtz 2011, which defined adverse events as a composite outcome of cardiac mortality plus rehospitalisation for heart failure.

Primary outcomes: *clinical outcomes*

Hospitalisation for heart failure

Four studies reported the effects of ATCS interventions on this outcome, but we could not statistically pool results because of high heterogeneity (over 90%). We therefore present the results narratively.

- ATCS Plus versus usual care or usual community care

Chaudhry 2010 found that compared with usual care, the intervention had little or no effect on hospitalisation for heart failure (27.5% intervention group versus 27% usual care; P = 0.81; high certainty evidence), with Krum 2013 also reporting that there was

probably little or no effect for the intervention on this same outcome (14.3% intervention group versus 16.7% usual care; adjusted HR 0.78, 95% CI 0.45 to 1.33, P = 0.36; moderate certainty evidence). Capomolla 2004 reported that ATCS Plus may decrease hospitalisation rates for heart failure (25.4% intervention group versus 87.9% usual community care; P < 0.05; low certainty evidence).

- IVR versus usual care

Kurtz 2011 reported that the IVR intervention had uncertain effects on hospitalisation for heart failure (13% intervention group versus 34% usual care; P < 0.05; very low certainty evidence).

Cardiac mortality

- ATCS Plus, IVR versus usual care

Meta-analysis of two trials, considered to be sufficiently homogeneous, found that ATCS had uncertain effects on cardiac mortality compared with usual care (RR 0.60, 95% CI 0.21 to 1.67; very low certainty evidence; Analysis 5.1; Capomolla 2004; Kurtz 2011). There was no evidence of heterogeneity (Chi^2 = 0.99, df = 1 (P = 0.32); I^2 = 0%).

All-cause mortality

- ATCS Plus versus usual care or usual community care

Meta-analysis of three trials, considered to be sufficiently homogeneous, found that ATCS probably had little or no effect on all-cause mortality compared with usual care or usual community care (RR 1.00, 95% CI 0.79 to 1.28; moderate certainty evidence; Analysis 5.2; Capomolla 2004; Chaudhry 2010; Krum 2013). There was no evidence of heterogeneity (Chi^2 = 1.06, df = 2 (P = 0.59); I^2 = 0%).

All-cause hospitalisation

- ATCS Plus versus usual care or usual community care

Capomolla 2004 found that compared with usual community care, ATCS Plus may have reduced all-cause hospitalisation (for chronic heart failure, cardiac cause and other cause; 22 in intervention group versus 77 in control group; P < 0.009; low certainty evidence), and Krum 2013 similarly reported that the intervention probably slightly decreased all-cause hospitalisation (45.9% intervention group versus 55.9% usual care; P = 0.021; moderate quality evidence). However, Chaudhry 2010 (the largest, highest quality study) found that the ATCS Plus intervention had little or no effect on readmission for any reason (49.3% intervention group versus 47.4% usual care; P = 0.45; high certainty evidence).

Global health rating

- ATCS Plus versus usual care

Krum 2013 reported that the intervention probably improved slightly the proportion of participants with improved global health questionnaire ratings at 12 months (35.6% intervention group versus 28.4% receiving usual care; no further data; moderate certainty evidence).

Adverse events

- ATCS Plus versus usual care

Chaudhry 2010 did not report any adverse events during the study period.

- IVR versus usual care

Kurtz 2011 classified adverse events as cardiac mortality plus rehospitalisation for heart failure (reported as individual outcomes above), with uncertain effects upon this composite outcome reported (22% in intervention group versus 44% usual care group; P < 0.04; very low quality evidence).

Overall, these results suggest that, compared with usual care, ATCS interventions probably have little or no effect on hospitalisation for heart failure, all-cause mortality, or all-cause hospitalisation. Effects on cardiac mortality are uncertain, as are adverse events associated with the intervention in this population.

Secondary outcomes

Process outcomes: usability of ATCS

- ATCS Plus versus usual care

Capomolla 2004 found that adherence to the ATCS system was 81%. There were no comparison group data for the usability outcome in this study (low certainty evidence).

Process outcomes: cost-effectiveness/resource use

- ATCS Plus versus usual care

Capomolla 2004 found that compared with usual community care, ATCS Plus may have reduced emergency room use at (median) 11 months (1 visit in intervention group versus 12 visits in usual care group, P < 0.05; low certainty evidence).

Chaudhry 2010 found that compared with usual care, the intervention had little or no effect on length of hospital stay (mean (SD) intervention group 7.2 days (15.6) versus 7.0 days (14.9) usual care, P = 0.27) or number of hospitalisations (none: 50.7% intervention versus 52.6% usual care group; one admission: 24%

intervention versus 25.6% usual care; five or more admissions: 3% intervention versus 2.4% usual care group; high certainty evidence).

HIV/AIDS

Only Shet 2014 assessed the effects of ATCS interventions in HIV/AIDS, comparing a complex multimodal intervention (a combination of IVR calls, a weekly non-interactive neutral pictorial message, plus three counselling sessions and antiretroviral treatment) with usual care.

Primary outcomes: clinical outcomes

Time to virological failure

Shet 2014 reported that the intervention did not change the time to virological failure (unadjusted HR 0.98, 95% CI 0.67 to 1.47, P = 0.95; high certainty evidence).

Mortality

There were 21/315 (6.7%) deaths in the intervention compared with 23/316 (7.3%) in usual care arm. Mortality assessment showed that 4.51 deaths per 100 person-years (95% CI 2.94 to 6.91) occurred in the intervention arm, compared with 5.04 deaths per 100 person-years (3.35 to 7.58) in the standard care arm (high certainty evidence).

Primary outcomes: behavioural outcomes

Medication adherence

Shet 2014 found that the complex intervention had little or no effect on medication adherence (unadjusted incidence rate ratio 1.24, 95% CI 0.93 to 1.65, P = 0.14; high certainty evidence).

Attrition from the study

Attrition occurred at the rate of 3.43 dropouts per 100 person-years (95% CI 2.10 to 5.61) and 4.82 dropouts per 100 person-years (3.17 to 7.31) in the intervention and usual care arms, respectively (high certainty evidence).

Hypercholesterolaemia

Hyman 1996 and Hyman 1998 evaluated ATCS (IVR and ATCS Plus, respectively) versus usual care for managing hypercholesterolaemia.

Primary outcomes: *clinical outcomes*

Total cholesterol

- ATCS Plus versus usual care

Hyman 1998 found that compared with usual care, ATCS Plus may have had little or no effect on total cholesterol levels (P = 0.58; low certainty evidence).

- IVR versus usual care

Hyman 1996 found that compared with usual care, IVR may have had little or no effect on total cholesterol levels (P = 0.94; low certainty evidence).

Primary outcomes: *behavioural outcomes*

Dietary fat intake

- ATCS Plus versus usual care

Hyman 1998 found that ATCS Plus may have had little or no effect on dietary fat intake (−2.1 versus −2.0; low certainty evidence). Overall, these results suggest that, compared with usual care, ATCS interventions may have very little or no effect on total cholesterol levels or dietary intake of fats in people with hypercholesterolemia, although evidence was of low certainty and from a small number of studies.

Secondary outcomes

Cognitive outcomes: knowledge, self-efficacy

- ATCS Plus versus usual care

Hyman 1998 found that ATCS Plus may have had little or no effect on self-efficacy or on knowledge about saturated and polyunsaturated fats: at baseline both groups scored 37% of items correct on a 9-point knowledge scale; postintervention, the ATCS Plus group improved by 0.14 and the usual care group by 0.06 items on the scale (low certainty evidence).

Process outcomes: acceptability

- IVR versus usual care

Hyman 1996 reported that 83.3% of a subset evaluating the IVR intervention indicated the phone messages were helpful. There was no comparison group for this acceptability outcome.

Hypertension

Five trials evaluated the effectiveness of ATCS compared with usual care with and without education for managing hypertension (Bove 2013; Dedier 2014; Harrison 2013; Magid 2011; Piette 2012). For a summary of the effects of these comparisons on hypertension, see Summary of findings 11.

Primary outcomes*: clinical outcomes*

- ATCS (multimodal/complex intervention, ATCS Plus, unidirectional ATCS) versus usual care or enhanced usual care (plus information)

Systolic blood pressure

Meta-analysis of three trials, considered to be sufficiently homogeneous, found that ATCS probably reduced slightly systolic blood pressure compared with usual care with or without information (MD −1.89 mmHg, 95% −2.12 to −1.66; moderate certainty evidence; Analysis 6.1; Harrison 2013; Magid 2011; Piette 2012). There was no evidence of heterogeneity among the pooled studies (Tau^2 = 0.00; Chi^2 = 1.48, df = 2 (P = 0.48); I^2 = 0%).

Diastolic blood pressure

Meta-analysis of two trials reported no effect for ATCS on diastolic blood pressure compared with usual care (MD 0.02 mmHg, 95% CI −2.62 to 2.66; low certainty evidence; Analysis 6.2; Harrison 2013; Magid 2011). There was a substantial degree of heterogeneity in the meta-analysed studies (Tau^2 = 2.84; Chi^2 = 3.63, df = 1 (P = 0.06); I^2 = 72%).

We did not include two studies in the meta-analysis, as they reported different outcomes or insufficient information to allow inclusion (Bove 2013; Dedier 2014).

Bove 2013 found that compared with usual care, a multimodal/complex intervention (ATCS Plus plus sphygmomanometer, a weighting scale, pedometer, and instructions on their use) probably had little or no effect on blood pressure control at six months (54.5% controlled in intervention group versus 52.3% in usual care group, P = 0.43; moderate certainty evidence).

Dedier 2014 reported that compared with usual care plus education, IVR may have had little or no effect on systolic blood pressure at three months (P > 0.05; low certainty evidence).

Health status

- ATCS Plus versus enhanced usual care (plus information)

Piette 2012 found that compared with enhanced usual care, ATCS Plus may have slightly improved overall health status (mean (SE) 2.5 (0.09) versus 2.1 (0.08), P = 0.0009, where 1 = poor and 5 = excellent) at six weeks (low certainty evidence).

Depression

- ATCS Plus versus enhanced usual care (usual care plus information)

Piette 2012 found that compared with enhanced usual care, ATCS Plus may have reduced depressive symptoms on the 10-item Center for Epidemiologic Studies Depression Scale (CESD) at six weeks (MD −2.5, 95% CI −4.1 to −0.8; P = 0.004; low certainty evidence).

Primary outcomes: *behavioural outcomes*

Medication adherence/use

- Multimodal/complex versus usual care

Magid 2011 found that compared with usual care, a multimodal/complex intervention (ATCS Plus plus patient education, home blood pressure monitoring, and clinical pharmacist management of hypertension with physician oversight) may have had little or no effect on medication adherence assessed as either medication possession ratio (mean intervention group 0.85 (SD 0.19) versus usual care group mean 0.84 (SD 0.19), P = 0.88) or the proportion of people adherent (69.9% intervention versus 69.4% usual care classified as adherent; low certainty evidence).

- ATCS Plus versus enhanced usual care (plus information)

Piette 2012 found that compared with enhanced usual care, ATCS Plus may have reduced the number of medication-related problems measured using a seven-item index (intervention group mean (SE) 2.8 (0.2) versus control group 3.6 (0.2)) at six weeks (low certainty evidence).

Physical activity

- IVR versus enhanced usual care

Dedier 2014 reported that compared with usual care plus education, IVR may have increased slightly physical activity levels (143.2 min/week intervention group versus 110.2 min/week control group, P = 0.007; low certainty evidence).

Overall, these results suggest that, compared with usual care, ATCS interventions may have little or no effect on blood pressure or medication adherence in people with hypertension but may improve some outcomes such as medication problems, depressive symptoms, physical activity, and perceived health status to a small degree. However, almost all results were based on low certainty evidence.

Secondary outcomes

Process outcomes: satisfaction

- ATCS Plus versus enhanced usual care

Piette 2012 found that compared with usual care and information, ATCS Plus may have improved slightly participants' satisfaction with hypertension care scores at six weeks (mean (SE) intervention group 1.8 (0.06) versus 1.4 (0.09) usual care group; P = 0.06; where 0 = not receiving care for hypertension; 1 = receiving care but dissatisfied; 2 = satisfied; low certainty evidence).

Mental health

Three studies evaluated different ATCS interventions versus advice only (Farzanfar 2011), relaxation therapy (Greist 2002), or healthy lifestyle (Zautra 2012) for managing mental health problems.

Primary outcomes: *clinical outcomes*

Obsessive compulsive disorder symptoms

- ATCS Plus versus control (relaxation therapy)

Greist 2002 found that compared with control, ATCS Plus may have improved symptoms of obsessive compulsive disorder (Yale-Brown obsessive compulsive scale score, range 0-40) at three months (mean (SD) intervention group 19.0 points (7.2) versus control 24.1 points (6.7); P < 0.001; low certainty evidence).

Depression, stress symptoms, other outcomes

- ATCS Plus versus control (relaxation therapy)

Greist 2002 found that compared with control, ATCS Plus may have had little or no effect on depressive symptoms measured with the Hamilton rating scale for depression (range 0-50) at three months (mean intervention group (SD) 9.6 points (7.9) versus 10.0 points (8.2); P = 0.16) but may have improved results on the clinical global impressions scale (38% versus 14% 'much' or 'very much' improved; P = 0.002) and the patient's global impressions scale (38% versus 15% 'much' or 'very much' improved; P = 0.004) (low certainty evidence).

- IVR versus control (advice)

Farzanfar 2011 reported that compared with control, IVR may have had little or no effect on depressive symptoms measured with total depression score (scale from 0 to 27 with higher values indicating more depression) at six months (mean change from baseline for intervention group (SD) −2.2 points (4.7) versus −1.8 points (4.5) or symptoms of stress measured with stress questionnaire score (score from 1 to 16 with higher values indicating greater stress) (mean change from baseline for intervention group (SD) −2.1 points (3.4) versus −1.8 points (3.1); low certainty evidence).

- Unidirectional ATCS versus control (healthy lifestyle)

Zautra 2012 found that compared with control, the intervention may have had little or no effect on stress but may have reduced slightly depressive symptoms at one month (P < 0.05; low certainty evidence).

Well-being

- IVR versus control (advice)

Farzanfar 2011 reported that compared with control, IVR may have had little or no effect on well-being index total scores (score from 0 to 25 with higher values indicating better functioning) (mean change from baseline for intervention group (SD) 3.7 points (6.8) versus 3.5 points (7.1); low certainty evidence).

Overall, these results suggest that, compared with various controls, ATCS interventions may have little or no effect on several indices of mental health, but the results are based on a small number of studies, with evidence of low certainty.

Secondary outcomes

Process outcomes: acceptability of service

- IVR versus control (advice)

In Farzanfar 2011, more than 60% of the participants found the ATCS intervention useful, user-friendly, informative and appropriately paced (low certainty evidence). Authors reported no comparison group data for this outcome.

Process outcomes: satisfaction

- ATCS Plus versus control (relaxation therapy)

Greist 2002 found that compared with control, ATCS Plus may have improved satisfaction scores (low certainty evidence).

Patient-centred outcomes: quality of life

- IVR versus control (advice)

Farzanfar 2011 reported that compared with control, IVR may have had little or no effect on quality of life at six months (physical health scale) but may have improved slightly quality of life mental health scale scores (scale from 0 to 100) at six months (mean increase from baseline for intervention group (SD) 10.9 (10.1) versus 6.0 (12.7); P < 0.10 with higher scores indicating better outcome; low certainty evidence).

Obstructive sleep apnoea syndrome (OSAS)

DeMolles 2004 and Sparrow 2010 assessed ATCS interventions (IVR) versus usual care or attention placebo, respectively, for managing the symptoms of OSAS.

Primary outcomes: *clinical outcomes*

Sleep symptoms

- IVR versus usual care or control (attention placebo via IVR)

DeMolles 2004 found that compared with usual care, IVR may have had little or no effect on improving functional outcomes of sleep (P = 0.171) but may have slightly improved scores on the sleep symptoms checklist (maximum score 45, lower score indicates improvement) (intervention group mean (SD) 9.4 (6.0) versus usual care group mean 13.4 (6.6), P = 0.047; low certainty evidence).

Sparrow 2010 found that compared with control, the slightly increased continuous positive airway pressure (CPAP) adherence in the IVR group was associated with a greater reduction in depressive symptoms (regression coefficient −0.028, SE 0.014, 95% CI 0.056 to 0.000, P = 0.048) and improvements in function (regression coefficient 0.021, SE 0.007, 95% CI 0.008 to 0.035, P = 0.003; low certainty evidence).

Primary outcomes: *behavioural outcomes*

CPAP use

- IVR versus usual care or control (attention placebo via IVR)

DeMolles 2004 found that compared with usual care, IVR may have increased slightly CPAP use at two months (intervention group mean (SD) 4.4 h nightly use (3.0) versus 2.9 h nightly use (2.4) in usual care group, P = 0.07; low certainty evidence).

Sparrow 2010 found that compared with control, IVR may have increased slightly CPAP use at both 6 months (median 2.4 h

nightly use intervention group versus 1.48 h nightly use control) and 12 months (median 2.98 h nightly use intervention group versus 0.99 h nightly use control group; low certainty evidence). Overall, these results suggest that, compared with usual care or attention placebo, IVR interventions may slightly increase CPAP use in both the short and long term, with mixed effects on functional sleep outcomes and symptoms, although these results are based on low certainty evidence from only two small studies.

Smoking

We included 10 studies that evaluated ATCS versus various controls (no calls, usual care, control ('placebo' ATCS (IVR), self-help intervention, stage-matched manuals) on smoking abstinence and related outcomes (Brendryen 2008; Carlini 2012; Ershoff 1999; McNaughton 2013; Peng 2013; Reid 2007; Reid 2011; Regan 2011; Rigotti 2014; Velicer 2006). For a summary of the effects of ATCS interventions compared with various controls, see Summary of findings 12.

Primary outcomes: *clinical outcomes*

Smoking abstinence

- ATCS (multimodal/complex intervention, ATCS Plus, IVR) versus control (no calls, usual care, inactive IVR)

Meta-analysis of seven trials considered to be sufficiently homogeneous suggested that, compared with control, ATCS may have had little or no effect on maintaining smoking abstinence (RR 1.20, 95% CI 0.98 to 1.46; low certainty evidence; Analysis 7.1; Brendryen 2008; Ershoff 1999; McNaughton 2013; Regan 2011; Reid 2007; Rigotti 2014; Velicer 2006). There was a moderate level of heterogeneity of the meta-analysed studies (Tau^2 = 0.04; Chi^2 = 12.35, df = 6 (P = 0.05); I^2 = 51%).

Smoking abstinence (other measures)

- ATCS Plus, IVR versus usual care or no calls

Rigotti 2014 also reported that compared with usual care, ATCS Plus improved self-reported continuous abstinence rates at six months (28% versus 16%; RR 1.70, 95% CI 1.15 to 2.51; P = 0.007; high certainty evidence); while McNaughton 2013 reported that compared with no calls, IVR may have had little or no effect on biochemically confirmed smoking abstinence at two years (21.7% of intervention group versus 42.9% of control group; P = 0.13; low certainty evidence).
We did not include three studies in meta-analysis: Reid 2011 did not report sufficient information to allow us to include their data

on abstinence, while Carlini 2012 and Peng 2013 reported outcomes other than abstinence rates.

- ATCS Plus versus usual care

Reid 2011 reported that compared with usual care, ATCS Plus may have improved the continuous smoking abstinence rate at 26 weeks (38.7% versus 29.5%; adjusted OR 1.58, 95% CI 1.04 to 2.42; P = 0.034), and this was maintained at 52 weeks (35.6% versus 28.6%; adjusted OR 1.45; 95% CI 0.94 to 2.22; P = 0.093; low certainty evidence).

Primary outcomes: *behavioural outcomes*

Medication use

- Complex/multimodal intervention versus control (self-help booklet)

Brendryen 2008 found that compared with control, a multimodal/ complex intervention probably had little or no effect on adherence to nicotine replacement therapy (93% in intervention group versus 87% control group; P = 0.07; moderate certainty evidence).

- ATCS Plus versus control (inactive IVR)

Regan 2011 found that compared with control, ATCS Plus probably had little or no effect on medication use (moderate certainty evidence).

Support programme enrolment

- ATCS Plus versus control (inactive IVR)

Carlini 2012 found that compared with control, ATCS Plus may have improved re-enrolment into a quitline support programme (OR 11.2, 95% CI 5.4 to 23.3, P < 0.001; low certainty evidence). Overall, these results suggest that compared with various controls, ATCS interventions may have little or no effect on maintenance of smoking abstinence. ATCS Plus interventions increase abstinence at six months, but effects of IVR and ATCS Plus at longer time points appear inconsistent. ATCS Plus may improve cessation programme support enrolment, with probably little or no effect on adherence to medication, but the certainty of the evidence was variable (moderate to low).

Secondary outcomes

Process outcomes: cost-effectiveness

- ATCS Plus versus usual care

Rigotti 2014 found that the incremental per-participant costs in the intervention group were USD 540 (year 1) and USD 294 (subsequent years) (high certainty evidence). There was no comparative data presented for cost-effectiveness outcomes.

Process outcomes: acceptability
- IVR versus control (booklet)

Ershoff 1999 reported that 25% of intervention non-users felt that they did not know enough about the automated system; 33% did not think it could help them to quit smoking, and 20% did not like the idea of entering information into a computer. There was no comparison group for satisfaction outcomes.

Cognitive outcomes: self-efficacy
- Complex/multimodal intervention versus control (self-help booklet)

Brendryen 2008 found that compared with a self-help booklet, ATCS Plus (complex intervention) probably increased smoking cessation self-efficacy (seven-point scale) at 12 months (mean intervention group (SD) 5.10 points (1.41) versus control 4.38 points (1.31); P < 0.001); moderate certainty evidence).
- ATCS Plus versus control (inactive IVR)

Peng 2013 found that compared with control, ATCS Plus may have had little or no effect on self-efficacy, stage of change or decisional balance toward smoking cessation at four weeks (P > 0.05; low certainty evidence).

Spinal cord dysfunction

One study evaluated IVR versus usual care for managing spinal cord dysfunction (Houlihan 2013).

Primary outcomes: *clinical outcomes*

Pressure ulcers, depression

Houlihan 2013 reported that compared with usual care, the IVR (CareCall) may have had little or no effect on the number of pressure ulcers (in adjusted models), but may have reduced slightly the severity of depression at six months in those with depression at baseline (effect size −0.56; P = 0.038; low certainty evidence).

Sensitivity analyses

There were not enough data (at least 10 studies) included in any of the pooled analyses to perform sensitivity analyses.

Assessment of publication bias

Formal assessment of potential publication bias was not feasible given the small number of trials contributing data to outcomes within different comparisons in this review.

ATCS versus control on physical activity levels

Patient or population: participants at risk of developing long-term conditions
Settings: various settings
Intervention: ATCS (multimodal/complex intervention, ATCS+, IVR)
Comparison: no intervention, usual care, or IVR

Outcomes	Effect of intervention[a]	No of participants (studies)	Quality of the evidence (GRADE)
Behavioural outcome: physical activity Multimodal/complex intervention[b] versus no calls	The intervention may slightly improve the frequency of walks	181 (1 study)	⊕⊕◯◯ **Low**[c]
Behavioural outcome: physical activity, 12 months Multimodal/complex intervention[d] versus usual care	The intervention probably has mixed effects on gait speeds, little effect on functional outcomes (moderate certainty[e]) and may slightly increase physical activity levels (low certainty[f]).	700 (2 studies)	-
Behavioural outcome: physical activity ATCS Plus versus IVR control	2 studies reported that ATCS Plus intervention may have little or no effect on different indices of physical activity	369 (2 studies)	⊕⊕◯◯ **Low**[c]
Behavioural outcome: physical activity IVR versus usual care, control or health education	3 studies reported that IVR interventions may slightly improve several indices of physical activity (muscle strength, balance, moderate to vigorous physical activity) but may have little or no effect on others (physical activity levels, walking distance)	216 (3 studies)	⊕⊕◯◯ **Low**[g]
Clinical outcome: metabolic markers, 12 months Multimodal/complex intervention[d] versus usual care	The intervention may have little or no effect on glycated haemoglobin, fasting insulin and glucose levels	302 (1 study)	⊕⊕◯◯ **Low**[f]
Clinical outcome: body weight measures Multimodal/complex intervention[d] ATCS Plus versus usual care or control	ATCS Plus intervention may have little or no effect on BMI, weight, waist or waist-hip ratio, compared with control (71 participants; low certainty ev-	373 (2 studies)	⊕⊕◯◯ **Low**

	idence^c). Multimodal/complex intervention may have little or no effect on BMI, waist circumference or physical function, compared with usual care (302 participants; low certainty evidence^f).	
Adverse outcome: unintended adverse events attributable to the intervention Multimodal/complex intervention, ATCS Plus, IVR versus various controls	No studies reported adverse events.	-

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

ATCS: automated telephone communication systems; **ATCS Plus**: automated telephone communication systems with additional functions; **IVR**: interactive voice response.

^{a}The findings presented are based on a narrative summary and synthesis of results that were not amenable to statistical analysis; please see Effects of interventions for detailed findings.
^{b}Multimodal intervention included 10 nurse-delivered and 10 automated phone calls.
^{c}Downgraded as randomisation and allocation concealment were rated as at unclear risk of bias (-1); and results (for each outcome) were obtained from a single study at some potential risk of bias (-1).
^{d}Multimodal intervention included counselling by lifestyle counsellor, automated telephone messaging, endorsement and tailored mailings.
^{e}Downgraded as results were obtained from a single study (-1).
^{f}Downgraded as randomisation was rated as at unclear risk of bias (-1), and results for each outcome were obtained from a single study at some potential risk of bias (-1).
^{g}Downgraded as one study was at unclear risk for randomisation and at high risk for attrition, while two studies were at unclear risk for allocation concealment (-1); results were obtained from a single study (for each outcome) at some potential risk of bias (-1).

ATCS versus control on screening rates

Patient or population: participants at risk for breast, colorectal or cervical cancer; or osteoporosis
Settings: primary, secondary and tertiary care
Intervention: ATCS (multimodal/complex intervention, ATCS Plus, IVR, unidirectional)
Comparison: usual care, enhanced usual care or no intervention

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	**Corresponding risk**				
	Usual care or enhanced usual care or no intervention	**ATCS**				
Behavioural outcome: breast cancer screening Multimodal/complex intervention versus usual care at 12 months follow-up	**Study population**[a]		**RR 2.17** (1.55 to 3.04)	462 (2 studies)	⊕⊕⊕⊕ **High**	-
	167 per 1000	**363 per 1000** (259 to 508)				
	Moderate[b]					
	167 per 1000	**363 per 1000** (259 to 508)				
Behavioural outcome: breast cancer screening IVR versus enhanced usual care at median follow-up of 12 months	**Study population**[a]		**RR 1.05** (0.99 to 1.11)	2599 (2 studies)	⊕⊕⊕◯ **Moderate**[c]	Unidirectional ATCS versus letter 1 further study (Fortuna 2014) (N = 1008) found that unidirectional ATCS (plus letter) probably has little or no effect on breast cancer screening rates at 12 months, adjusted

					OR 1.3 (95% CI 0.7 to 2.4; moderate certainty[d]).
	585 per 1000	**614 per 1000** (579 to 649)			
	Moderate[b]				
	432 per 1000	**454 per 1000** (428 to 480)			
Behavioural outcome: colorectal cancer screening Multimodal/complex intervention versus usual care at median follow-up of 12 months	**Study population**[a]		**RR 2.19** (1.88 to 2.55)	1013 (3 studies)	⊕⊕⊕⊕ **High**	-
	249 per 1000	**545 per 1000** (468 to 635)			
	Moderate[b]				
	167 per 1000	**366 per 1000** (314 to 426)			
Behavioural outcome: colorectal cancer screening IVR versus usual care at 6-month follow-up	**Study population**[a]		**RR 1.36** (1.25 to 1.48)	16915 (2 studies)	⊕⊕⊕◯ **Moderate**[e]	IVR versus control 1 other study (Durant 2014) (N = 47,097) reported that IVR probably increases screening, with 1773 participants from the IVR group and 100 from the no-call control group completing colorectal cancer screening within 3 months (moderate certainty[f]). IVR versus usual care 1 study (Mosen 2010)

					(N = 6000) also reported that IVR probably increases completion of any colorectal cancer screening (moderate certainty[g]).
	119 per 1000	**161 per 1000** (148 to 176)			
	Moderate[b]				
	119 per 1000	**162 per 1000** (149 to 176)			
Behavioural outcome: colorectal cancer screening IVR, unidirectional ATCS versus usual care or letter at longer (9-12 months) follow-up	**Study population**[a]		**RR 1.01** (0.97 to 1.05)	21,335 (2 studies)	⊕⊕⊕◯ **Moderate**[h]	IVR versus usual care 1 study (Simon 2010a) (N = 20, 000) also reported that IVR probably increases slightly colorectal cancer screening via colonoscopy (moderate certainty[i]). Unidirectional ATCS versus letter 1 further study (Fortuna 2014) (N = 1008) at 12 months found that unidirectional ATCS (plus letter) has probably little or no effect on colorectal cancer screening rates at 12 months (15.3% versus 12.2%; adjusted OR 1.2; 95% CI 0.6 to 2.4; moderate certainty[d]).
	302 per 1000	**305 per 1000** (293 to 317)			
	Moderate[b]				
	245 per 1000	**247 per 1000** (238 to 257)			

Behavioural outcome: cervical cancer screening ATCS Plus versus control (no calls) at 3 month follow-up	See comment	See comment	Not estimable	75,532 (1 study)	⊕⊕⊕◯ **Moderate**[j]	Corkrey 2005 found that ATCS Plus intervention probably slightly improves cervical cancer screening rates at 3 months
Adverse outcome: unintended adverse events attributable to the intervention Multimodal/complex intervention, ATCS Plus, IVR, unidirectional versus various controls	No studies reported adverse events.					

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

ATCS: automated telephone communication systems; **ATCS Plus**: automated telephone communication systems with additional functions; **BMD**: bone mineral density; **CI**: confidence interval; **HR**: hazard ratio; **IVR**: interactive voice response; **OR**: odds ratio; **RR**: risk ratio.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]The assumed risk represents the mean control group risk across studies (calculated by GRADEPro).
[b]The assumed risk represents the median control group risk across studies (calculated by GRADEPro).
[c]Downgraded as risk of bias was unclear for allocation concealment in both studies, and randomisation and blinding rated unclear in one study (−1).
[d]Downgraded as confidence intervals were wide (imprecision) and included both a potential harm and a potential benefit (−1).
[e]Downgraded as risk of bias was unclear for all items in one study, and in the other allocation concealment and blinding were rated as unclear (−1).
[f]Downgraded as risk of bias was unclear for all items except 'other' bias, which was rated as high risk (−1).
[g]Downgraded as risk of bias was rated unclear for allocation concealment and blinding (−1).

[h]Downgraded as risk of bias was rated as unclear for allocation concealment in both studies and blinding was rated high risk in one study (−1).

[i]Downgraded as risk of bias was rated unclear for allocation concealment and high risk for blinding (−1).

[j]Downgraded as all items were rated as at unclear risk of bias (−1).

ATCS versus control for body weight

Patient or population: overweight or obese individuals (both children and adults)
Settings: various settings
Intervention: ATCS (multimodal/complex intervention, ATCS Plus, IVR)
Comparison: usual care, no intervention or control

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments[a]
	Assumed risk	**Corresponding risk**				
	Controls	**ATCS**				
Clinical and behavioural outcome: BMI score in adults Multimodal/complex intervention, ATCS Plus or IVR versus usual care at median follow-up of 18 months	The mean BMI in the control groups was 34.7 kg/m^2	The mean BMI of adults in the intervention groups was **0.64 kg/m^2 lower** (1.38 lower to 0.11 higher)	Not estimable	672 (3 studies)	⊕⊕◯◯ **Low**[b]	ATCS Plus versus control Vance 2011 (N = 140) found that ATCS Plus may reduce slightly BMI (low certainty evidence [c]).
Clinical and behavioural outcome: body weight in adults, 12 weeks	See comment	See comment	Not estimable	See comment	See comment	ATCS Plus versus control Vance 2011 (N = 140) found that ATCS Plus may reduce slightly body weight and waist circumference (low certainty evidence[c]). IVR versus control Estabrooks 2008 (N = 77) reported that IVR may have little or no effect on body weight

						(percent lost or change in) (low certainty evidence[d]).
Clinical and behavioural outcome: body weight in adults, at median follow-up of 18 months	See comment	See comment	Not estimable	See comment	See comment	ATCS (multimodal/ complex intervention, ATCS Plus, IVR) versus usual care Bennett 2012 (N = 365) found that ATCS Plus probably slightly reduces body weight at 18 months (moderate certainty evidence).[e] Bennett 2013 (N = 194) found that multimodal/complex intervention may reduce body weight at 18 months (low certainty evidence).[f] IVR versus usual care Goulis 2004 (N = 122) found that IVR probably reduces slightly body weight but probably has little or no effect on obesity assessment scores at 6 months (moderate certainty evidence).[f]
Clinical and behavioural outcome: blood pressure, blood glucose, cholesterol levels	See comment	See comment	Not estimable	See comment	See comment	ATCS (ATCS Plus, IVR) versus usual care/control Bennett 2012 (N = 365) found that ATCS Plus

| | | | | | probably has little or no effect on systolic or diastolic blood pressure at 18 months (moderate certainty evidence[e]).

ATCS Plus versus control
Vance 2011 found that ATCS Plus may slightly improve slightly systolic blood pressure and blood glucose levels at 12 weeks (low certainty evidence[c]).
IVR versus usual care
Goulis 2004 (N = 122) found that IVR probably has little or no effect on systolic or diastolic blood pressure, plasma glucose levels, or high-density lipoprotein cholesterol, but it probably slightly reduces total cholesterol and triglyceride levels at 6 months (moderate certainty evidence).[e] |
| **Clinical outcome**: BMI z-score in children at median follow-up of 7.5 months | See comment | See comment | Not estimable | See comment | ⊕⊕⊕◯
Moderate[e] | ATCS Plus versus control
Estabrooks 2009 (N = 220) found that ATCS Plus has probably little or no effect on BMI z-scores in children at 12 |

						months IVR versus control Wright 2013 (N = 100) found that IVR has probably little or no effect on BMI z-scores in children at 3 months
Behavioural outcome: physical activity, dietary habits in children at median follow-up of 7.5 months	See comment	See comment	Not estimable	See comment	⊕⊕⊕◯ **Moderate**[4]	ATCS Plus versus control Estabrooks 2009 (N = 220) found that ATCS Plus has probably little or no effect on self-reported physical activity, sedentary behaviours or dietary habits at 12 months IVR versus control (no calls) Wright 2013 (N = 100) found that IVR has probably little or no effect on total caloric intake, fruit intake, or sedentary behaviours at 3 months
Adverse outcome: unintended adverse events attributable to the intervention IVR versus usual care	See comment	See comment	See comment	559 (2 studies)	See comment	Bennett 2012 (N = 365) reported 1 serious musculoskeletal injury in the intervention group and 3 events (1 cardiovascular and 2 cases of gallbladder disease) in the usual care group (moderate certainty evidence).[e,g]

Bennett 2013 (N = 194) reported 6 serious adverse events in the intervention arm, including gynaecological surgery in 2 participants and knee replacement, breast abscess, musculoskeletal injury, and cancer diagnosis in 1 participant each; all participants except the one with the cancer diagnosis required hospitalisation (low certainty evidence).[f,g]

*The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

ATCS: automated telephone communication systems; **ATCS Plus**: automated telephone communication systems with additional functions; **BMI**: body Mass Index; **CI**: confidence interval; **IVR**: interactive voice response; **SMD**: Standardised mean difference.

GRADE Working Group grades of evidence

High quality: further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: we are very uncertain about the estimate.

[a]Additional findings presented are based on a narrative summary and synthesis of results that were not amenable to statistical analysis; please see Effects of interventions for detailed findings.

[b]Downgraded as allocation concealment was rated as at unclear risk of bias in all three studies, and randomisation unclear in one study, with high risk of performance bias in two studies (−1); downgraded as substantial level of heterogeneity was detected (inconsistency) (−1).

[c]Downgraded as all items were rated as at unclear risk of bias (−1); and results were obtained from a single small study at potential risk of bias (−1).

[d]Downgraded as performance bias was rated as high risk (−1); and results were obtained from a single very small study at potential risk of bias (−1).

[e]Downgraded as results were each obtained from a single small study (−1).

^{f}Downgraded as randomisation and allocation concealment was rated as at unclear risk and performance bias was rated as high risk (−1); and results were obtained from a single small study at potential risk of bias (−1).
^{g}The authors of the study could not conclusively determine whether reported events resulted from study participation.

ATCS versus control as appointment reminders (reducing non-attendance rates)

Patient or population: patients/healthcare consumers
Settings: various settings
Intervention: ATCS (ATCS Plus, IVR, unidirectional)
Comparison: no intervention (calls) or nurse-delivered calls

Outcomes	Effect of intervention[a]	No of participants (studies)	Quality of the evidence (GRADE)
Health behaviour: attendance rates, 6 weeks ATCS Plus versus nurse-delivered calls	ATCS Plus calls delivered 3 or 7 days prior to flexible sigmoidoscopy or/and colonoscopy examinations probably have little or no effect on appointment non-attendance or preparation non-adherence	3610 (1 study)	⊕⊕⊕◯ **Moderate**[b]
Health behaviour: attendance rates, 4 months IVR versus no calls	IVR improves attendance rates: OR 1.52 (95% CI 1.34 to 1.71)	12,092 (1 study)	⊕⊕⊕⊕ **High**
Health behaviour: return tuberculin test rate, 3 days Unidirectional ATCS versus no calls	Unidirectional ATCS may improve test return rates.	701 (1 study)	⊕⊕◯◯ **Low**[c]
Health behaviour: attendance rates, 1 month Unidirectional ATCS versus no calls	Unidirectional ATCS may improve attendance rates RR 1.60 (95% CI 1.29 to 1.98)	517 (1 study)	⊕⊕◯◯ **Low**[c]
Health behaviour: attendance rates, 6-8 weeks Unidirectional ATCS versus no calls	2 studies reported conflicting results: Reekie 1998 (N = 1000) reported that unidirectional ATCS probably decrease non-attendance rates at 6 weeks; while Maxwell 2001 (N = 2304) reported the interventions probably have little or no effect at 2 months	3304 (2 studies)	⊕⊕⊕◯ **Moderate**[d]
Health behaviour: attendance rates, 6 months Unidirectional ATCS versus no calls	Unidirectional ATCS may improve attendance: OR 1.50 (P < 0.01)	2008 (1 study)	⊕⊕◯◯ **Low**[e]

Adverse outcome: unintended adverse events attributable to the intervention ATCS Plus, IVR, unidirectional ATCS versus various controls	No studies reported adverse events.

ATCS: automated telephone communication systems; **ATCS Plus**: automated telephone communication systems with additional functions; **CI**: confidence interval; **IVR**: interactive voice response; **OR**: odds ratio; **RR**: risk ratio.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]The findings presented are based on a narrative summary and synthesis of results, many of which were not amenable to statistical analysis; please see Effects of interventions for detailed findings.
[b]Downgraded as most items (including randomisation and allocation concealment) were rated as being at unclear risk of bias (−1).
[c]Downgraded as both studies considered were rated as being at high risk of bias on randomisation and at unclear risk on allocation concealment and other items (-2) (Dini 1995; Tanke 1994).
[d]Downgraded as all items were rated as being at unclear risk of bias (−1).
[e]Downgraded as randomisation was rated as at high risk of bias; and study was rated as at unclear risk of bias on other items (-2).

ATCS versus control for adherence to medication or laboratory tests

Patient or population: patients with various conditions or at risk of low adherence to medication or laboratory tests
Settings: various settings
Intervention: ATCS (multimodal/complex intervention, ATCS Plus, IVR, unidirectional ATCS)
Comparison: usual care, no calls, controls (other ATCS)

Outcomes	Effect of interventions [a]	No of participants (studies)	Quality of the evidence (GRADE)	Comments
Behavioural outcome: adherence to medication Multimodal/complex interventions[b] versus usual care or control	The effects of multimodal/complex interventions are inconclusive	888 (2 studies)	See comment	Ho 2014 (N = 241) reported that the multimodal/complex intervention probably improves adherence to cardioprotective medications at 12 months (moderate certainty[c]). Stuart 2003 (N = 647) found uncertain effects

			of the intervention on adherence to antidepressant medications (very low certainty[c,d]).
Behavioural outcome: adherence to medication ATCS Plus versus control or single IVR call	Results suggest that ATCS Plus probably slightly improve measures of adherence	2340 (2 studies)	See comment	Cvietusa 2012 (N = 1393) reported that ATCS Plus, compared with control, probably improves time to first inhaled corticosteroid refill and probably slightly improves the proportion of days with medication on hand in children (moderate certainty[e]). Stacy 2009 (N = 947) reported that ATCS Plus probably slightly improves statin adherence at 6 months, compared with a single IVR call (moderate certainty[f]).
Behavioural outcome: adherence to laboratory tests ATCS Plus or IVR versus no intervention or usual care	Results suggest that ATCS Plus probably has little or no effect on adherence to testing, while IVR probably improves test completion	15,218 (3 studies)	See comment	ATCS Plus versus no intervention Derose 2009 (N = 13, 057) found that ATCS Plus probably has little or no effect on adherence to testing (completion of all 3 recommended laboratory tests for diabetes patients) at 12 weeks (moderate certainty[g]). Simon 2010b (N = 1200) found that these interventions probably have little or no effect on retinopathy examination rates or tests for glycaemia, hyperlipidaemia or nephropathy in diabetic patients at 12 months (moderate certainty[h]). IVR versus usual care

			Feldstein 2006 (N = 961) found that IVR probably improves patients' completion of all recommended laboratory tests at 25 days follow-up (moderate certainty[i]).
Behavioural outcome: adherence to medication or composite outcome (medication adherence and rate of adverse events) ATCS Plus versus usual care	Results indicate that ATCS Plus probably improves medication adherence and may slightly improve a composite measure	35,816 (4 studies)	See comment	2 studies (Derose 2013 (N = 5216) and Vollmer 2014 (N = 21,752)) reported that ATCS Plus probably improves adherence to statins to some extent. Vollmer 2011 (N = 8517) found that ATCS Plus probably slightly improves adherence to inhaled corticosteroids (moderate certainty[j]). Sherrard 2009 (N = 331) found that ATCS Plus may slightly improve a composite measure of medication adherence and adverse events at 6 months follow-up (low certainty[c,k]).
Behavioural outcome: adherence to medication or laboratory tests IVR versus control	Results suggest that IVR probably improves slightly medication adherence	4,238,362 (4 studies)	See comment	Adams 2014 (N = 475) found that IVR may slightly improve comprehensiveness of screening and counselling (low certainty[c,l]). Bender 2010 (N = 50) reported that IVR may improve adherence to anti-asthmatic medications at 2.5 months follow-up (low certainty[c,e]). Leirer 1991 (N = 16) reported that IVR may slightly reduce medication non-adherence (low certainty[m]). Mu 2013 (N = 4,237,821)

Automated telephone communication systems for preventive healthcare and management of long-term conditions (Review)   **74**

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			found that IVR probably slightly improves medication refill rates at 1 month (moderate certainty[n]).
Behavioural outcome: adherence to medication IVR versus usual care	Results indicate that IVR probably slightly improves some measures of medication adherence	56,140 (8 studies)	See comment	2 studies (Boland 2014 (N = 70); Friedman 1996 (N = 267)) reported that IVR probably slightly improves adherence to glaucoma and anti-hypertensive medications at 3 and 6 months respectively (moderate certainty).[o] 2 further studies (Glanz 2012 (N = 312) ; Migneault 2012 (N = 337)) reported that IVR has probably little or no effect on medication adherence at 8 and 12 months, respectively (moderate certainty).[p] 2 studies (Green 2011 (N = 8306); Reynolds 2011 (N = 30,610)) assessed adherence via refill rates, reporting that IVR probably slightly improves medication refill rates at 2 weeks (moderate certainty).[q] 2 further studies reported medication adherence assessed by medication possession ratio (MPR) at different time points. Patel 2007 (N = 15,051) found that IVR probably slightly improves MPR at 3 to 6 months, while Bender 2014 (N = 1187) reported that IVR probably improves MPR at 24 months (both studies of moderate certainty[r]).

Behavioural outcome: adherence to medication Unidirectional ATCS versus control	Results suggest that unidirectional ATCS may have little effect, or improve medication adherence to a small degree	107 (2 studies)	See comment	2 studies (Lim 2013 (N = 80); Ownby 2012 (N = 27)) reported that the intervention may have little effect or slightly improve medication adherence (low certainty ^{s}).
Clinical outcome: blood pressure Multimodal/complex, ATCS Plus, IVR versus usual care	Results suggest that ATCS Plus probably slightly reduces blood pressure, while multimodal/complex or IVR interventions probably have little or no effect on blood pressure	22,597 (3 studies)	See comment	Multimodal/complex intervention versus usual care Ho 2014 (N = 241) reported that multimodal intervention probably has little or no effect on achieving reduced blood pressure targets (moderate certainty ^{c}). ATCS Plus versus usual care Vollmer 2014 (N = 21,752) reported that ATCS Plus probably slightly reduces systolic blood pressure (moderate certainty ^{t}). IVR versus usual care Migneault 2012 (N = 337) reported that IVR probably has little or no effect on systolic or diastolic blood pressure (moderate certainty ^{c}), while Friedman 1996 (N = 267) found that IVR may have little or no effect on systolic blood pressure but may slightly decrease diastolic blood pressure (low certainty ^{c,f}).
Adverse outcome: unintended adverse events attributable to the intervention Multimodal/complex intervention, ATCS	No studies reported adverse events.			

| Plus, IVR, unidirectional versus various controls | | |

[a] Multimodal intervention included ATCS Plus, medication reconciliation and tailoring, patient education and collaborative care in Ho 2014; and education, nurse-delivered call and IVR in Stuart 2003.

[b] The findings presented are based on a narrative summary and synthesis of results that were not amenable to statistical analysis; please see Effects of interventions for detailed findings.

[c] Downgraded as results were obtained from a single study at potential risk of bias (−1).

[d] Downgraded as rated as at high risk for attrition, reporting and other bias and at unclear risk on randomisation and allocation concealment (-2).

[e] Downgraded as almost all items were rated as being at unclear risk of bias (−1).

[f] Downgraded as rated as at unclear risk of bias on randomisation, allocation concealment and other items (−1).

[g] Downgraded as rated at unclear risk of bias on allocation concealment and other items (−1).

[h] Downgraded as rated as at unclear risk for all items (except attrition bias, rated as low risk) (−1).

[i] Feldstein 2006 did not appear to account for clustering, which may have resulted in an overestimation of the precision of the effect estimate (−1).

[j] Three studies assessed together (Derose 2013; Vollmer 2011; Vollmer 2014): downgraded for risk of bias (allocation concealment rated as unclear in two studies and performance bias rated as high risk in one study) (−1).

[k] Downgraded as rated at unclear risk of bias on randomisation and at high risk of detection bias (−1).

[l] Downgraded as rated at unclear risk of bias on most items (except performance bias, rated as low risk) (−1).

[m] Downgraded as all items were rated as being at unclear risk of bias (−1) and results were obtained from a single study with a very small sample size (N = 16) (−1).

[n] Downgraded as most items were rated as being at unclear risk of bias (except randomisation and allocation concealment); performance bias rated as high (−1).

[o] Two studies assessed together (Boland 2014; Friedman 1996): downgraded for risk of bias as allocation concealment was rated as unclear in both studies, randomisation and attrition bias rated unclear in one study each, and there was a high risk of other bias (baseline imbalances) in one study (−1).

[p] Two studies assessed together (Glanz 2012; Migneault 2012): downgraded for risk of bias as allocation concealment was rated as unclear in one study, and detection bias and other bias (baseline imbalances) were both rated as being at high risk in one study (−1).

[q] Two studies assessed together (Green 2011; Reynolds 2011): downgraded for risk of bias as all items were rated as unclear in both studies (−1).

[r] Downgraded as all items were rated as being at unclear risk of bias (−1).

[s] Two studies assessed together (Lim 2013; Ownby 2012): downgraded for risk of bias as allocation concealment and attrition bias were rated as being at unclear risk in both studies, and detection bias was rated as being at high risk in one study (−1); downgraded on imprecision as combined sample size was small (N = 107) (−1).

[t] Downgraded as allocation concealment was at unclear risk of bias, and there was a high risk of performance bias (−1).

ATCS versus control on alcohol consumption			
Patient or population: participants addicted to alcohol **Settings**: various settings **Intervention**: ATCS (ATCS Plus, IVR) **Comparison**: no intervention, usual care, advice/education or packaged CBT			
Outcomes	**Effect of intervention**[a]	**No of participants (studies)**	**Quality of the evidence (GRADE)**
Behavioural outcomes: number of drinks per drinking day ATCS Plus, IVR versus usual care, (various) controls at median follow-up of 2 months	ATCS Plus versus usual care Rose 2015 (N = 158) reported that ATCS Plus may have little or no effect on the number of drinks per drinking day at 2 months (low certainty[b,c]). ATCS Plus versus control (advice/education) Hasin 2013 (N = 254) found that ATCS Plus may reduce the number of drinks per drinking day in the last 30 days at 2 months (low certainty[b,c]), but it may have little effect at 12 months. IVR versus control (information) Rubin 2012 (N = 47) reported that IVR may slightly reduce the number of drinks per drinking day at 6 months (low certainty[c,e]).	459 (3 studies)	⊕⊕◯◯ **Low**
Behavioural outcomes: drinking days, heavy drinking days, or total number of drinks consumed ATCS Plus, IVR versus (various) controls	ATCS Plus versus no intervention Mundt 2006 (N = 60) found that ATCS Plus may have little or no effect on drinking days, heavy drinking days, or total number of drinks consumed (low certainty[c,f]). ATCS Plus versus control (packaged CBT) Litt 2009 (N = 110) found that ATCS Plus may have little or no effect on the number of heavy drinking days at 12 weeks posttreatment (low certainty[c,g]).	217 (3 studies)	⊕⊕◯◯ **Low**

	IVR versus control (information) Rubin 2012 (N = 47) reported that IVR may slightly reduce the number of heavy drinking days per month at 6 months (low certainty^{c,e}).		
Behavioural outcomes: proportion of days abstinent, other alcohol consumption indices, 12 weeks ATCS Plus versus control (packaged CBT)	ATCS Plus may slightly reduce the proportion of days abstinent but have little or no effect on coping or drinking problems or continuity of abstinence (Litt 2009).	110 (1 study)	⊕⊕◯◯ **Low**^{c,g}
Behavioural outcomes: weekly alcohol consumption, 6 months ATCS Plus versus usual care	ATCS Plus may have little or no effect on weekly alcohol consumption (Helzer 2008).	338 (1 study)	⊕⊕◯◯ **Low**^{c,h}
Behavioural outcomes: AUDIT score, 6 weeks IVR versus control (no intervention)	IVR probably improve slightly AUDIT scores (Andersson 2012).	1423 (1 study)	⊕⊕⊕◯ **Moderate**^{i}
Behavioural outcomes: other alcohol consumption indices, 4 weeks IVR versus control (no intervention)	IVR may have little or no effect on drinking habits, alcohol craving, or PTSD symptoms (Simpson 2005).	98 (1 study)	⊕⊕◯◯ **Low**^{c,h}
Adverse outcome: unintended adverse events attributable to the intervention ATCS Plus, IVR versus various controls	No studies reported adverse events.		

ATCS Plus: automated telephone communication systems with additional functions; **AUDIT**: Alcohol Use Disorders Identification Test; **CBT**: cognitive behavioural therapy; **IVR**: interactive voice response; **PTSD**: post-traumatic stress disorder.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]The findings presented in this table are based on a narrative summary and synthesis of results that were not amenable to statistical analysis; please see Effects of interventions for detailed findings.
[b]Downgraded as all items except randomisation were rated as being at unclear risk of bias (−1).

[c]Results were obtained from a single small study at potential risk of bias (−1).
[d]Downgraded as allocation concealment was rated as being at unclear risk of bias, and there was a high risk of performance bias (−1).
[e]Downgraded as all items except 'other' bias were rated as being at unclear risk of bias (−1).
[f]Downgraded as rated as being at unclear risk of bias on randomisation, allocation concealment and others, and at high risk of attrition bias (−1).
[g]Downgraded as rated as being at unclear risk of bias on allocation concealment and attrition bias, and at high risk of performance bias (−1).
[h]Downgraded as rated as being at unclear risk of bias on randomisation, allocation concealment and other items (−1).
[i]Downgraded as all items were rated as being at unclear risk of bias (−1).

ATCS versus control on severity of cancer symptoms

Patient or population: cancer patients
Settings: various settings
Intervention: ATCS (multimodal/ complex intervention, ATCS Plus, IVR)
Comparison: usual care, control (other ATCS, nurse-delivered calls)

Outcomes	Effects of intervention [a]	No of participants (studies)	Quality of the evidence (GRADE)	Comments
Clinical outcomes: symptoms (severity or burden) ATCS Plus versus usual care (via ATCS) or control, 4-12 weeks	Results suggest that ATCS Plus may have little or no effect on symptom severity, distress or burden	701 (4 studies)	See comment	Cleeland 2011 (N = 79) found that ATCS Plus may slightly reduce symptom threshold events and cumulative distribution of symptom threshold events; and it may have little or no effect on mean symptom severity between discharge and 4 week follow-up (low certainty [b,c]). Mooney 2014 (N = 250) found that ATCS Plus probably has little or no effect on symptom severity scores at 6 week follow-up (moderate certainty[c]). Spoelstra 2013 (N = 119) found that ATCS Plus may have little or no effect on symptom severity at 10 week follow-up (low certainty

			^{c,d}). Yount 2014 (N = 253) reported that ATCS Plus may have little or no effect on symptom burden at 12 weeks (low certainty^{c,e}).
Clinical outcomes: symptom severity, 10 weeks IVR versus nurse delivered calls	Results suggest that IVR may have little or no effect on symptom severity	437 (1 study)	⊕⊕◯◯ **Low**^{c,f}	-
Clinical outcomes: pain Multimodal/complex intervention^g versus usual care	Results indicate that multimodal intervention probably reduces pain at 3 months and probably slightly reduces pain at 12 months	405 (1 study)	⊕⊕⊕◯ **Moderate**^{c}	-
Clinical outcomes: depression Multimodal/complex intervention^g versus usual care	Results indicate that multimodal intervention probably slightly reduces depression at 3 and 12 months	405 (1 study)	⊕⊕⊕◯ **Moderate**^{c}	-
Clinical outcomes: **d**istress, 6 weeks ATCS Plus versus usual care (via IVR)	Results indicate that ATCS Plus probably has little or no effect on distress	250 (1 study)	⊕⊕⊕◯ **Moderate**^{c}	-
Behavioural outcome: medication adherence ATCS Plus versus usual care	Results indicate that ATCS Plus may have little or no effect on medication non-adherence	119 (1 study)	⊕⊕◯◯ **Low**^{c,d}	-
Adverse outcome: unintended adverse events attributable to the intervention Multimodal/complex intervention, ATCS Plus, IVR versus various controls	No studies reported adverse events.			

ATCS: automated telephone communication systems; **ATCS Plus**: automated telephone communication systems with additional functions; **IVR**: interactive voice response.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]The findings presented in this table are based on a narrative summary and synthesis of results that were not amenable to statistical analysis; please see Effects of interventions for detailed findings.

[b]Downgraded as allocation concealment was rated as being at unclear risk of bias (-1).

[c]Downgraded as results were obtained from a single study at potential risk of bias (-1).

[d]Downgraded as randomisation and allocation concealment were rated as being at unclear risk of bias, and selective reporting rated as high risk (-1).

[e]Downgraded as randomisation and allocation concealment were rated as being at unclear risk of bias, and performance bias was rated as being at high risk (-1).

[f]Downgraded as allocation concealment was rated as being at unclear risk of bias, along with several other items (-1).

[g]Multimodal/complex intervention included ATCS plus symptom monitoring by a nurse and medications.

ATCS versus usual care for managing diabetes mellitus

Patient or population: patients with diabetes mellitus
Settings: various settings
Intervention: ATCS (ATCS Plus, IVR)
Comparison: usual care

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments[a]
	Assumed risk	Corresponding risk				
	Usual care	ATCS				

			Not estimable	1216 (7 studies)	⊕⊕◯◯ **Low**[b]	ATCS Plus versus usual care 1 further study, Katalenich 2015 (N = 98), found that ATCS Plus may have little or no effect on median glycated haemoglobin levels compared with usual care at 6 months follow-up (low certainty [c]). IVR versus usual care 1 additional study, Homko 2012 (N = 80), found that IVR may have little or no effect on fasting blood glucose levels in pregnancy or infant birth weight at 26 months (low certainty [c]).
Clinical outcome: glycated haemoglobin or blood glucose ATCS Plus, IVR versus usual care at median follow-up of 6 months	The mean glycated haemoglobin in the control groups was 8.41%	The mean glycated haemoglobin in the intervention groups was **0.26% lower** (0.50 to 0.01 lower)				
Behavioural outcome: self-monitoring of diabetic foot (various scales) ATCS Plus versus usual care at 12 months follow-up	The mean self-monitoring of diabetic foot in the control groups was 4.5 (range from 0 to 7, with higher scores indicating better foot care)	The mean self-monitoring of diabetic foot in the intervention groups was **0.40 points higher**[d] (0.10 to 0.71 points higher)	Not estimable	498 (2 studies)	⊕⊕⊕◯ **Moderate**[e]	-
Behavioural outcome: self-monitoring of blood glucose ATCS Plus, IVR versus usual care, 6-12 months	See comment	See comment	Not estimable	See comment	See comment	ATCS Plus versus usual care Lorig 2008 (N = 417) found that ATCS Plus may have little no effect on self-monitor-

					ing of blood glucose at 6 months (low certainty evidence[f]). At 12 months, 2 studies (Piette 2001 (N = 272); Schillinger 2009 (N = 339)) reported that ATCS Plus probably slightly improves self-monitoring of blood glucose (moderate certainty[e]). IVR versus usual care Graziano 2009 (N = 112) found that IVR probably slightly increases the mean change in frequency of self-monitoring of blood glucose (moderate certainty evidence [g]).
Behavioural outcome: medication adherence or use ATCS Plus versus usual care, 6-12 months	See comment	See comment	Not estimable	370 (2 studies)	See comment	Katalenich 2015 (N = 98) reported that ATCS Plus may have little or no effect on adherence rates at 6 months (low certainty[c]), and Piette 2001 (N = 272) found that ATCS Plus has probably little or no effect on medication use at 12 months (moderate certainty[g].

Behavioural outcome: physical activity, diet, weight monitoring ATCS Plus versus usual care, 6-12 months	See comment	See comment	Not estimable	1028 (3 studies)	See comment	Lorig 2008 (N = 417) found that ATCS Plus may have little or no effect on aerobic exercise at 6 months (low certainty^f). Schillinger 2009 (N = 339) found that ATCS Plus may slightly improve diet and exercise and moderate intensity physical activity levels, but it may have little or no effect on vigorous intensity physical activity levels at 12 months (low certainty^c). Piette 2001 (N = 272) reported that ATCS Plus probably has little or no effect on weight monitoring (moderate certainty^g).
Adverse outcome: un-in-tended adverse events attributable to the intervention ATCS Plus, IVR versus usual care	No studies were found that reported adverse events.					

The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

ATCS Plus: automated telephone communication systems with additional functions; **CI**: confidence interval; **HRQoL**: health-related quality of life; **IVR**: interactive voice response; **SMD**: standardised mean difference.

GRADE Working Group grades of evidence

High quality: further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: we are very uncertain about the estimate.

[a] Additional results are based on a narrative summary and synthesis of results that were not amenable to statistical analysis; please see Effects of interventions for detailed findings.

[b] Downgraded as allocation concealment was rated as being at unclear risk in four studies and attrition bias was rated as being at high risk in two studies (−1), and there was a moderate level of heterogeneity in the results (−1).

[c] Downgraded as allocation concealment was rated as being at unclear risk (−1), and results were based on a single small study at some potential risk of bias (−1).

[d] An SD of 1.7 (on a 7-point Likert scale, where higher score means better behavioural outcome) was chosen from a representative study by Schillinger 2009, and this was used to convert the SMD to a familiar scale. 0.24 (SMD) x 1.7 (SD) = 0.40 points higher (on a 7 point scale).

[e] Two studies assessed together (Piette 2001; Schillinger 2009): downgraded as allocation concealment was rated as being at unclear risk in one study and performance bias was rated as being high risk in one study (−1).

[f] Downgraded as all items were rated as being at unclear risk, except attrition bias which was rated as being at high risk of bias (−1), and results were based on a single study at some risk of bias (−1).

[g] Downgraded as results were based on a single study (−1).

ATCS versus usual care for patients with heart failure

Patient or population: patients with heart failure
Settings: various settings
Intervention: ATCS (multimodal/complex intervention, ATCS Plus, IVR)
Comparison: usual care or usual community care

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments[a]
	Assumed risk	Corresponding risk				
	Usual care or usual community care	ATCS				
Clinical outcome: cardiac mortality ATCS Plus, IVR versus usual care or usual community care at median follow-up of 11.5 months	Study population[b]		RR 0.60 (0.21 to 1.67)	215 (2 studies)	⊕◯◯◯ **Very low**[d,e]	-
	95 per 1000	57 per 1000 (20 to 158)				
	Moderate[c]					
	96 per 1000	58 per 1000 (20 to 160)				
Clinical outcome: all-cause mortality ATCS Plus versus usual care or usual community care at median follow-up of 11 months	Study population[b]		RR 1 (0.79 to 1.28)	2165 (3 studies)	⊕⊕⊕◯ **Moderate**[f]	-
	106 per 1000	106 per 1000 (84 to 136)				
	Moderate[c]					
	106 per 1000	106 per 1000 (84 to 136)				

Clinical outcome: heart failure hospitalisation ATCS Plus, IVR versus usual care or usual community care at median follow-up of 11.5 months	See comment	See comment	Not estimable	2329 (4 studies)	See comment	ATCS Plus versus usual care or usual community care Chaudhry 2010 (N = 1653) found that the intervention had little or no effect on hospitalisation for heart failure (high certainty) Krum 2013 (N = 405) also reported that there was probably little or no effect of the intervention for this same outcome (moderate certainty[g]), while Capomolla 2004 (N = 133) reported that ATCS Plus may decrease hospitalisation rates for heart failure (low certainty[h]). IVR versus usual care Kurtz 2011 (N = 138) reported that IVR intervention has uncertain effects on hospitalisation for heart failure (very low certainty[i]).
Clinical outcome: all-cause hospitalisation ATCS Plus versus usual care or usual community care	See comment	See comment	Not estimable	2191 participants (3 studies)	See comment	ATCS Plus versus usual care Capomolla 2004 (N = 133) found that ATCS Plus may reduce all-cause hospitalisation (for chronic heart fail-

					ure, cardiac cause and other cause; low certainty[h]), and Krum 2013 (N = 405) similarly reported that the intervention probably slightly decreased all-cause hospitalisation (moderate certainty[g]). [f] Chaudhry 2010 (N = 1653) found that ATCS Plus has little or no effect on readmission for any reason (high certainty)
Clinical outcome: global health (well-being) rating (7-item questionnaire) ATCS Plus versus usual care 12 months	See comment	See comment	Not estimable	405 participants (1 study)	⊕⊕⊕◯ **Moderate**[g]	Krum 2013 (N = 405) reported that ATCS Plus probably increases slightly the proportion of patients with improved global health questionnaire ratings at 12 months
Clinical outcome: emergency room and other health service use outcomes ATCS Plus versus usual care or usual community care	See comment	See comment	Not estimable	1786 participants (2 studies)	See comment	Emergency room use Capomolla 2004 (N = 133) found that ATCS Plus may reduce emergency room use at (median) 11 months (low certainty[h]). Other service use Chaudhry 2010 (N = 1653) found that ATCS Plus had little or no effect on number of

					days in hospital or number of hospitalisations (readmissions) (high certainty)
Adverse outcome: unin- tended adverse events attributable to the intervention ATCS Plus, IVR versus usual care	See comment	See comment	See comment	1791 (2 studies)	See comment	ATCS Plus versus usual care Chaudhry 2010 (N = 1653) reported that no adverse events had occurred during the study (high certainty) IVR versus usual care Kurtz 2011 (N = 138) classified adverse events as cardiac mortality plus rehospitalisation for heart failure, reporting uncertain effects upon this composite outcome (very low certainty[i]).

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

ATCS Plus: automated telephone communication systems with additional functions; **CI**: confidence interval; **CI**: confidence interval; **RR**: risk ratio.

GRADE Working Group grades of evidence

High quality: further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: we are very uncertain about the estimate.

[a]Additional results are based on a narrative summary and synthesis of results that were not amenable to statistical analysis; please see Effects of interventions for detailed findings.

[b]The assumed risk represents the mean control group risk across studies (calculated by GRADEPro).

[c]The assumed risk represents the median control group risk across studies (calculated by GRADEPro).

[d]Downgraded as selection bias was rated as being at high risk in one study and allocation concealment was rated as being at unclear risk in both (−1).

[e]Downgraded as the total number of events is less than 300 (−1), and wide CIs around the effect estimate included both a substantial potential benefit and a substantial potential harm (−1).

[f]Downgraded as risk of bias was unclear on randomisation in one study and allocation concealment in two studies (Capomolla 2004; Krum 2013) (−1).

[g]Downgraded as result is based on a single study (−1).

[h]Downgraded as randomisation and allocation concealment judged as being at unclear risk of bias (−1); downgraded as results are based on a single study (−1).

[i]Downgraded as randomisation judged as being at high risk and unclear on allocation concealment and other items (-2); downgraded as result is based on a single study (−1).

ATCS versus usual care for management of hypertension

Patient or population: patients with hypertension
Settings: various settings
Intervention: ATCS (multimodal/complex intervention, ATCS Plus, IVR, unidirectional)
Comparison: usual care, with and without education

Outcomes	Illustrative comparative risks* (95% CI)		No of Participants (comparisons)	Quality of the evidence (GRADE)	Comments[a]
	Assumed risk	**Corresponding risk**			
	Usual care	**ATCS**			
Clinical outcome: systolic blood pressure (automated sphygmomanometer or electronic pressure monitor) ATCS Plus or IVR versus usual care at median follow-up of 6 weeks	The mean systolic blood pressure in the control group was **141.1 mmHg**	The mean systolic blood pressure in the intervention groups was **1.89 mmHg lower** (2.12 to 1.66 lower)	65,256 (3 studies)	⊕⊕⊕◯ **Moderate**[b]	1 additional study (Dedier 2014) (N = 253) reported that compared with usual care plus education, IVR may have little or no effect on systolic blood pressure at 3 months (low certainty[c]).
Clinical outcome: diastolic blood pressure (automated sphygmomanometer and electronic cuff) ATCS Plus, unidirectional versus usual care at median follow-up of 14 weeks	The mean diastolic blood pressure in the control group was **81.2 mmHg**	The mean diastolic blood pressure in the intervention groups was **0.02 mmHg higher** (2.62 lower to 2.66 higher)	65,056 (2 studies)	⊕⊕◯◯ **Low**[d,e]	-
Clinical outcome: blood pressure control, 26 weeks Multimodal/complex intervention[f] versus usual care	See comment	See comment	166 (1 study)	⊕⊕⊕◯ **Moderate**[g]	Bove 2013 (N = 241) found that a multimodal/complex intervention probably has little or no effect on blood pressure control

Clinical outcome: Health status[h], depression [i], 6 weeks ATCS Plus versus enhanced usual care (plus information)	See comment	See comment	200 (1 study)	⊕⊕◯◯ **Low**[j]	Piette 2012 (N = 200) found that ATCS Plus may slightly improve health status and may decrease depressive symptoms
Behavioural outcome: medication use Multimodal/complex [k], ATCS Plus versus usual care or enhanced usual care (plus information)	See comment	See comment	483 (2 studies)	⊕⊕◯◯ **Low**	Multimodal/complex versus usual care Magid 2011 (N = 283) found that multimodal/complex intervention may have little or no effect on medication adherence assessed by Medication Possession Ratio or proportion adherent (low certainty[l]). ATCS Plus versus enhanced usual care Piette 2012 (N = 200) found that ATCS Plus may reduce the number of medication-related problems[m] (low certainty[j]).
Behavioural outcome: physical activity levels, 12 weeks IVR versus enhanced usual care	See comment	See comment	253 (1 study)	⊕⊕◯◯ **Low**[c]	IVR versus enhanced usual care Dedier 2014 (N = 253) reported that IVR may slightly increase physical activity levels
Adverse outcome: unintended adverse events attributable to the intervention Multimodal/complex inter-	No studies reported adverse events.				

vention, ATCS Plus, IVR, uni-directional ATCS versus various controls		

ATCS Plus: automated telephone communication systems with additional functions; **CI**: confidence interval; **IVR**: interactive voice response; **MD**: mean difference; **SD**: standard deviation.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]Additional results are based on a narrative summary and synthesis of results that were not amenable to statistical analysis; please see Effects of interventions for detailed findings.

[b]Downgraded as risk of bias for randomisation was rated unclear in one study, allocation concealment was rated as at unclear risk in two studies, and in one study each, performance bias and other bias (baseline imbalances in blood pressure) were rated as being at high risk (−1).

[c]Downgraded as all domains were judged to be at unclear risk of bias (−1), and results were based on a single small study at some potential risk of bias (−1).

[d]Downgraded due to unclear risk of bias for allocation concealment in one study, and high risk for other bias (baseline imbalances in blood pressure) in one study (−1).

[e]Downgraded as a substantial amount of heterogeneity was detected and effects were in opposite directions (−1).

[f]Multimodal/complex intervention included ATCS Plus plus sphygmanometer, a weighting scale, pedometer and instructions on their use.

[g]Downgraded as results were based on a single small study at some potential risk of bias (−1).

[h]Health status was self-reported perceived general health status, assessed on a 5-point scale (where 1 = poor, 2 = fair, 3 = good, 4 = very good, and 5 = excellent).

[i]Depression assessed using the 10-item Center for Epidemiological Studies-Depression Scale.

[j]Downgraded as risk of bias was rated as unclear for allocation concealment and most other domains, with a high risk of performance bias (−1); and results were based on a single small study at some potential risk of bias (−1).

[k]Multimodal/complex intervention included ATCS Plus plus patient education, home blood pressure monitoring, and clinical pharmacist management of hypertension with physician oversight.

[l]Downgraded due to high risk of bias for other bias (baseline imbalances in blood pressure) (−1); results were based on a single small study at some potential risk of bias (−1).

[m]Medication-related problems assessed using a 7-item scale (yes/no responses) on barriers to medication taking, including cost, side effects, complexity of regimen, worries over taking medicines and/or over long-term effects of medication.

ATCS versus control for smoking cessation

Patient or population: patients with tobacco dependence
Settings: various settings
Intervention: ATCS (multimodal/complex intervention, ATCS Plus, IVR)
Comparison: usual care, control (no calls, 'placebo' (inactive) ATCS, self-help intervention, stage-matched manuals)

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments[a]
	Assumed risk	**Corresponding risk**				
	Control	**ATCS**				
Behavioural outcome: smoking abstinence Multimodal/complex intervention, ATCS Plus, IVR versus (various) controls or usual care at median follow-up of 12 months	Study population[b]		**RR 1.2** (0.98 to 1.46)	2915 (7 studies)	⊕⊕◯◯ **Low**[d,e]	ATCS Plus versus usual care 1 further study, Reid 2011 (N = 440), reported that ATCS Plus may improve smoking abstinence rates at 26 weeks, and this may be maintained at 52 weeks (low certainty evidence [f]).
	201 per 1000	241 per 1000 (197 to 293)				
	Moderate[c]					
	241 per 1000	289 per 1000 (236 to 352)				
Behavioural outcome: medication use Multimodal/complex, ATCS Plus versus control (inactive IVR or self-help booklet)	See comment	See comment	See comment	1127 (2 studies)	⊕⊕⊕◯ **Moderate**[g]	Multimodal/complex intervention versus control (self-help booklet) Brendryen 2008 (N = 396) found that a multimodal/complex intervention probably has little or no effect on adherence to NRT (moder-

					ate certainty evidence) ATCS Plus versus con-
Behavioural outcome: support programme enrolment ATCS Plus versus control (inactive IVR)	See comment	See comment	See comment	521 (1 study)	⊕⊕◯◯ **Low**[h]	Carlini 2012 found that ATCS Plus may improve re-enrolment into a quit line support programme
Adverse outcome: unintended adverse events attributable to the intervention Multimodal/complex intervention, ATCS Plus, IVR versus various controls	No studies were found that reported adverse events.					

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

ATCS Plus: automated telephone communication systems with additional functions; **CI**: confidence interval; **IVR**: interactive voice response; **NRT**: nicotine replacement therapy; **OR**: odds ratio; **RR**: risk ratio;

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]Additional results are based on a narrative summary and synthesis of results that were not amenable to statistical analysis; please see Effects of interventions for detailed findings.
[b]The assumed risk represents the mean control group risk across studies (calculated by GRADEPro).
[c]The assumed risk represents the median control group risk across studies (calculated by GRADEPro).
[d] Downgraded due to unclear risk of bias for allocation concealment in four studies and high risk of attrition bias in one study (−1).
[e]Downgraded for inconsistency, as two studies by Ershoff 1999 and McNaughton 2013 showed contradictory results favouring the control group and heterogeneity was moderate overall (−1).

[f]Downgraded as all items were judged to be at an unclear risk of bias (−1), and results were based on a single study at some risk of bias (−1).

[g]Downgraded as results (for each outcome) were based on a single study (−1).

[h]Downgraded as most items were judged to be at unclear risk of bias (−1), and results were based on a single study at some risk of bias (−1).

DISCUSSION

ATCS is a technology platform through which health professionals can collect relevant information or deliver decision support, goal setting, coaching, reminders or health-related knowledge to consumers via smartphones, tablets, landlines, or mobile phones, using either telephones' touch-tone keypad or voice recognition software. ATCS have the potential to transform modern healthcare systems by empowering consumers, changing their behaviours, improving clinical outcomes, and preventing disease. This systematic review evaluated the evidence on the effectiveness of ATCS interventions for improving a wide variety of health-related outcomes related to preventive healthcare and the management of long-term conditions.

Summary of main results

ATCS for preventive healthcare

Effectiveness of ATCS for improving immunisation uptake

The evidence suggests that ATCS (ATCS Plus, IVR, unidirectional) probably increase the uptake of immunisations in children compared with no calls, letters, or usual care (moderate certainty evidence). Compared with usual care, it probably slightly increases immunisation uptake in adolescents (moderate certainty evidence) and has uncertain effects on uptake in adults (very low certainty evidence) (Summary of findings for the main comparison). We considered results separately by population, as there was otherwise too high a degree of heterogeneity in pooled effect estimates. Subgroup analyses by type of ATCS were not possible due to the unequal number of studies in respective categories (ATCS Plus versus IVR versus unidirectional ATCS) and the small number of studies both within each comparison and overall. Although the evidence is promising for improving immunisation uptake, further studies may reduce the level of uncertainty associated with some of the results, particularly those in adults.

Effectiveness of ATCS for improving physical activity levels

Evidence for the effectiveness of ATCS in improving physical activity levels is of generally low certainty. Results suggest that multimodal/complex and ATCS Plus interventions may have little effect on several indices of body weight, metabolic markers or physical activity, whereas IVR interventions may improve several, but not all, measures of physical activity, when compared with usual care or other controls (Summary of findings 2). Although the evidence may indicate some promising effects for selected ATCS interventions, studies of higher methodological quality are needed to inform both practice and policy.

Effectiveness of ATCS for improving uptake of screening

The evidence suggests that for breast cancer screening, multimodal/complex interventions increase screening rates (high certainty evidence), whereas IVR or unidirectional ATCS interventions probably each have little or no effect (moderate certainty evidence) compared with control, usual care or enhanced usual care. For colorectal cancer screening, multimodal/complex interventions increase screening rates (high certainty evidence) compared with usual care, and IVR interventions probably improve screening rates at six months but not at later time points (moderate certainty evidence) when compared with control, usual care, or enhanced usual care. Unidirectional ATCS interventions probably have little or no effect on colorectal cancer screening rates (moderate certainty evidence) when compared with control. For cervical cancer, an ATCS Plus intervention probably slightly improves the rate of screening when compared with control (moderate certainty evidence), while for osteoporosis screening, a multimodal intervention may increase the uptake of screening compared with no intervention (low certainty evidence), but the effects of an ATCS Plus intervention are uncertain when compared with usual care (Summary of findings 3). These results suggest that more complex ATCS interventions (i.e. multimodal/complex interventions), may be more likely to improve outcomes related to breast cancer and colorectal cancer screening than less complex interventions (IVR and unidirectional ATCS). However, no trials directly tested these interventions against one another. Overall, the evidence is encouraging for the effectiveness of some (complex/multimodal) ATCS interventions for increasing screening uptake, and it seems unlikely that future trials will change the existing level of certainty.

Effectiveness of ATCS for reducing body weight

In adults, the evidence suggests that compared with various control, ATCS (multimodal/complex, ATCS Plus) may support slight weight loss (reduction in BMI or body weight), but effects of IVR were mixed (low certainty evidence) (Summary of findings 4). The effects of interventions on other clinical or behavioural measures in adults are mixed, and it is not clear whether adverse events may be associated with ATCS interventions, or not. In children, the evidence suggests that compared with control, ATCS interventions (ATCS Plus or IVR) probably have little effect on weight management assessed by BMI z-scores or other proxy measures of weight management (moderate certainty evidence). For studies assessing the effects of ATCS on weight management, meta-analysis was not possible due to the small number of studies and high degree of heterogeneity across studies. Overall, trials are needed to reduce the existing level of uncertainty related to the effects of ATCS interventions on weight management in both adults and children, and to investigate further any possible adverse events associated with ATCS interventions in this area.

Effectiveness of ATCS for reducing non-attendance rates (appointment reminders)

The evidence suggests that compared with no calls, ATCS Plus interventions probably have little or no effect on attendance rates. IVR or unidirectional interventions may each improve attendance rates (either preventive healthcare or management of long-term conditions), although the effects were somewhat inconsistent across time points (Summary of findings 5), and the evidence varied from high to low certainty. Further trials, which include economic modelling or cost-effectiveness analyses, may reduce the level of uncertainty about the effects of the range of ATCS interventions for improving appointment attendance.

ATCS for managing long-term conditions

Effectiveness of ATCS for improving adherence to medications or laboratory tests

The effects of ATCS on adherence to medications or laboratory tests provides the most general evidence across management of long-term conditions; see Summary of findings 6. The evidence suggests that the effects of multimodal/complex interventions versus usual care or control are inconsistent, and the evidence was of variable certainty, so more research is necessary to draw firm conclusions. However, ATCS Plus interventions probably improve medication adherence slightly to moderately compared with usual care or control but probably have little effect on adherence to tests. IVR interventions probably slightly improve measures of medication adherence compared with control and probably improve adherence to tests. The evidence also suggests that IVR interventions probably slightly improve adherence to medications at six months but have little or no effect at longer time points when compared with usual care. However, it is worth noting that most results were based on studies of moderate certainty evidence, and the size of effects were variable. For unidirectional ATCS, the evidence suggests that compared with control, these interventions may have little effect or may improve adherence to medications to a small degree. The effects of ATCS interventions on clinical outcomes (blood pressure control, blood lipids, asthma control, therapeutic coverage) were inconsistent, and we generally found little or no effect for the interventions. However, only a small number of studies contributed clinical outcome data, and the evidence was of moderate to low certainty, meaning that further research assessing these outcomes is needed to more clearly determine health effects as well as behavioural (adherence) effects. None of the ATCS interventions were directly tested against one another. Overall, the evidence suggests that some ATCS interventions might have promising effects on medication or test adherence, but further high quality research is needed to better define the size of effects and to reduce uncertainty before such interventions might be considered for use as part of routine practice. Having said this, the company that conducted the largest RCT in this area finds value in and

continues to place automated telephone refill reminders for medication.

Effectiveness of ATCS for reducing alcohol consumption

The evidence suggests that ATCS Plus interventions may have little or no effect on measures of alcohol consumption when compared with no intervention, usual care, or other interventions (cognitive-behavioural therapy or education/advice), although the certainty of the evidence was low in all cases. Similarly, IVR interventions may slightly improve some measures of alcohol consumption compared with no intervention or information provision, but the size of the effect is small, and the evidence of generally low certainty (Summary of findings 7). In this area, studies were too heterogeneous for statistical pooling, and further research seems likely to change the certainty of the evidence relating to the effects of ATCS interventions.

Effectiveness of ATCS for reducing severity of cancer symptoms

The evidence suggests that compared with usual care or control, multimodal/complex interventions probably reduce pain and depression at three months and beyond, although possibly to a smaller degree at later time points. ATCS Plus interventions may have little or no effect on symptoms (severity, distress or burden) or medication adherence, although the evidence was of mostly low certainty and in some studies the involvement of ATCS systems as part of usual care delivery may have prevented any effects of the intervention from being detected. Similarly, IVR may have little or no effect on severity of symptoms, compared with either control or ATCS Plus, although the evidence was of generally low certainty and based on few studies (Summary of findings 8). Further research in this area seems likely to change our certainty in the effects of using ATCS to try to alleviate cancer symptoms.

Effectiveness of ATCS for managing diabetes mellitus

The evidence suggests that, compared with usual care, ATCS interventions (ATCS Plus, IVR) may slightly reduce glycated haemoglobin levels and probably slightly improve diabetes-related self-management behaviours such as self-monitoring of feet and blood glucose levels, but they may have little or no effect on weight monitoring or medication adherence or use, and they appear to have mixed effects on diet and physical activity levels (Summary of findings 9). ATCS Plus interventions may sometimes be more cost-effective than usual care, but they may also influence healthcare use in ways whose impact is not yet fully understood. Overall, the evidence, although promising for some outcomes, was of low to moderate certainty. Future research, including studies that directly compare ATCS Plus and IVR interventions against one another, might reduce the existing uncertainties.

Effectiveness of ATCS for heart failure

Compared with usual care or usual community care, ATCS interventions (ATCS Plus, IVR) probably have little or no effect on hospitalisation for heart failure, all-cause mortality or all-cause hospitalisation. Effects on cardiac mortality are uncertain due to the very low certainty of the evidence for this outcome. Effects of ATCS on adverse events in this population are also uncertain due to the inconsistent findings of the two studies that specifically looked for adverse events (Summary of findings 10).

Effectiveness of ATCS for hypertension

Compared with usual care or enhanced usual care, ATCS interventions (multimodal/complex, ATCS Plus, IVR, unidirectional ATCS) may have little or no effect on blood pressure in people with hypertension. The evidence was of variable certainty (from low to moderate). Although for systolic blood pressure there was probably a small decrease with the use of ATCS, this was not confirmed by changes to diastolic blood pressure, which were negligible. ATCS interventions may have small positive effects on related outcomes including medication problems, depression symptoms, physical activity, and perceived health status, but little or no effect on medication adherence. The evidence is thus currently inconclusive for the main outcomes, and most results were based on low certainty evidence. Future trials might be considered to reduce the existing level of uncertainty in this area (Summary of findings 11).

Effectiveness of ATCS for smoking cessation

The evidence suggests that compared with various controls or usual care, ATCS interventions (multimodal/complex, ATCS Plus, IVR) may have little or no effect on maintenance of smoking abstinence; the evidence was of generally low certainty, and there was a moderate level of heterogeneity of the meta-analysed studies. ATCS Plus interventions may increase abstinence at six months, but the effects of IVR and ATCS Plus at longer time points appear inconsistent. ATCS Plus may improve cessation programme support enrolment, with probably little or no effect on adherence to medications, but the certainty of the evidence was variable (moderate to low). See Summary of findings 12.

Overall completeness and applicability of evidence

We identified two studies from low-income (Honduras/Mexico and India) and one from middle-income (Taiwan) countries, and the remaining 129 studies were conducted in high-income countries (the UK, the USA, Australia, Norway, France, Greece, Italy, Sweden, and Canada). Only 14 studies took place in the 1990s, while the remaining 118 date from 2000 onwards. In most studies, information about the theoretical model underpinning the ATCS intervention was missing. In a similar vein, a description of the

call's content was often insufficient, making it difficult to analyse, interpret, or replicate the findings in any depth, or to replicate the component studies.

In terms of practical application of the ATCS interventions, a large proportion of studies did not report whether or not participants received instructions on how to use the system. In several trials, it was unclear whether patients or healthcare professionals initiated the calls or whether (or not) the participants used a telephone keypad to interact with the systems. Information about the intervention's duration, frequency and intensity; safety (adverse effects) and cost-effectiveness; security arrangements; or speakers' features was frequently missing, too.

There are several possible advantages of ATCS systems. These include convenience, low cost, 24-hour access, and participant anonymity, meaning that responses may be less prone to the influences of stigma and perceived social desirability (Phillips 2015; Schroder 2009; Szilagyi 2013). Previous studies have also reported that both patients and professionals report a high degree of satisfaction with ATCS systems (Abu-Hasaballah 2007), which is consistent with our findings. The small number of studies assessing satisfaction or acceptability of ATCS systems reported that participants generally rated these aspects highly, which may add to the appeal of these systems in practice. ATCS systems may also provide a means to engage difficult-to-reach populations (Schroder 2009). However, some people with disabilities, such as severe hearing loss or difficulties with speech, may be unable to use such interventions or to engage with them fully, so researchers and practitioners should carefully consider the populations to which ATCS interventions might be best directed prior to implementation.

Included studies rarely reported adverse events associated with the delivery of ATCS interventions, such as information overload, preference for interactions with humans, or potentially worsened clinical or health-related outcomes. These remain a major uncertainty in the evidence around the possible benefits and harms of this group of interventions as a whole and require assessment through future studies.

We realise that we have been unable to meet some of the review's objectives, including determining which intervention design components may contribute to positive behavioural change, or which type(s) of ATCS are most effective for preventive healthcare or the management of long-term conditions. However, we considered subgroup analyses to be unfeasible because of the unequal distribution and insufficient number of studies in respective subgroups/categories and comparisons and because of the considerable heterogeneity of populations, interventions, comparator groups, and outcome measures used. Nevertheless, we managed to establish that in some instances complex/multimodal interventions appeared to be more effective than less complex ones, but this was observational in nature and varied across different conditions included in the review. This possible relationship between complexity of the ATCS intervention and effectiveness needs further investigation, possibly by unpacking and delineating the most ac-

tive components and essential features of ATCS interventions. For instance, exploring whether the degree of interactivity of ATCS influences effectiveness in different contexts is one such avenue. Identifying features of ATCS interventions that are key to their effectiveness for different purposes will also be important. Such questions might include considering whether and how preventive interventions (e.g. screening and immunisation reminders) are different from interventions used for managing long-term conditions. The role and purposes of ATCS interventions in these latter contexts may encompass a wider range of individual purposes, over variable time periods (e.g. episodic, continuous) and may require a greater degree of individual tailoring to meet the needs of users. Direct comparisons between different ATCS types would also be helpful in better understanding the effects of such interventions and to more clearly identify essential versus non-essential components and features. This review included studies that used complex/multimodal interventions as well as a wide variety of comparisons, including similar ATCS interventions against one another (e.g. Cleeland 2011; Peng 2013; Pinto 2002; Spoelstra 2013). While this increases the generalisability of the findings, much remains to be determined despite the large body of recent literature assembled here.

We acknowledge that this review's scope is very broad (both preventive healthcare and management of long-term conditions), and one of its strengths is that it is the first systematic and rigorous attempt to organise and evaluate the evidence of effectiveness on this topic area. We also acknowledge that there are many other potential ways of structuring or organising this review, such as according to the type of intervention (rather than condition), by the types of outcomes, or with an exclusive focus on preventive healthcare (rather than in combination with management of long-term conditions). We will consider factors such as these when planning the update of this review, and we will also assess the usefulness of different theoretical frameworks and/or logic models as a basis for structuring or informing the review at a general level.

Quality of the evidence

We assessed the quality of evidence using the GRADE system and presented findings in Summary of findings 6 for the comparison that provides the most general evidence across long-term conditions, and 'Summary of findings tables' 1 to 5 and 7 to 12 for additional comparisons. We found the certainty of evidence for most outcomes to be low, but this was variable (ranging from very low to high). It was predominantly low in certain subcategories of conditions, including adherence to medications or laboratory tests, alcohol consumption, appointment reminders, diabetes mellitus, physical activity and smoking, and it was predominantly of moderate quality for screening and cancer symptoms. In other cases such as immunisation, heart failure, hypertension, and weight management, the quality of the evidence varied considerably by outcome.

Reasons for downgrading the evidence most commonly pertained to the risk of bias (i.e. methodological limitations of included studies): we downgraded once where there was mostly an unclear risk of bias across all seven domains of the tool or when there was a high risk of selection bias and attrition bias, and we downgraded twice if there was a high risk of bias for multiple domains of randomisation; allocation concealment; or attrition, performance, or detection bias. We also downgraded once if the results were from a single study for a particular comparison/outcome (unless that study was large, precise, and generally without major limitations assessed by risk of bias). Other reasons for downgrading the evidence included inconsistency (we downgraded once where there was high heterogeneity/differences in direction of effect); indirectness (we downgraded once for one outcome only - physical activity levels where there were differences in population and comparisons used); and imprecision (we downgraded once if the sample size was small or the effect estimate had wide confidence intervals that gave different messages about the effects of the intervention at the upper and lower limits of the confidence interval). On the whole, we considered the randomisation procedure to be adequate in 53% of the studies and allocation concealment in 23%. We considered outcome data to be complete in 56% of the studies and selective reporting to carry a low risk in 29.5%. There were no baseline imbalances (indicating a low risk of 'other' bias) in 50% of the studies. However, as with many behavioural interventions, almost 83% of the studies either did not blind both participants and personnel, or they abandoned or inadequately described blinding, undermining our confidence that measures taken by the study were adequate to prevent knowledge of who received the intervention. Similarly, 83% of the studies were at unclear or high risk for blinding of outcome assessors, and while this may in many cases be more possible to achieve, even with behavioural interventions, only a minority of studies clearly performed this step.

Overall, the high potential for bias in many of the included studies (and so within subcategories of the review) reduces our certainty in the results (reflected by the GRADE ratings) and by extension our inferences from the findings. While this review provides the first rigorous, systematic assessment of the evidence of effectiveness across this broad area, the findings are constrained by the quality of the evidence in many of the identified subcategories. Future updates of this review may elect to focus on areas in which high(er) quality evidence exists, and they may include enough accumulated studies within particular topic subcategories to enable exploration of the robustness of effects through sensitivity analyses or other analytic approaches.

Potential biases in the review process

We minimised potential biases in the review process by strictly adhering to the guidelines outlined by Higgins 2011. Specifically, we believe that we have utilised a comprehensive search strategy; and in all cases, two reviewers independently assessed eligibility

criteria, extracted data, assessed risk of bias, and used the GRADE criteria to critically evaluate the quality of the evidence. However, it is possible that we have missed some relevant studies through our search processes. We also acknowledge that some of the review objectives have not been met, including the exploration of interventional design components that may contribute to positive behavioural change of consumers. This was due primarily to the unequal number and distribution of studies in respective categories (unidirectional, IVR, ATCS Plus, multimodal/complex interventions), rather than to deliberate decisions not to conduct such planned analyses. We also made the decision to present in 'Summary of findings' tables only those condition areas for which we had identified four or more studies for inclusion. We made this decision purely due to the size and scope of the review, not based on the findings of the studies. We do not believe that this approach has introduced bias to the review but report our methods in the interests of transparently documenting our decisions as researchers.

Agreements and disagreements with other studies or reviews

A review by Lieberman 2012 recommended that IVR-based treatment approaches be employed by multidisciplinary clinics and practitioners who treat patients with chronic pain, as these technologies are clinically beneficial, versatile, and cost-effective. Although that review was not systematic and therefore more susceptible to bias, it is generally in line with the findings of the present review. Similarly, Corkrey 2002b concluded that IVR shows promise in a number of health areas. They stressed the importance of further research into certain unexplored areas such as systematic evaluation of voice, multilingual interfaces, touch-phone prevalence, survey response rates, sample bias, use by the elderly, and acceptability. Piette 2012c suggested that automated telephone monitoring and self-care support calls can improve some outcomes of chronic disease management, such as glycaemic control and blood pressure control, in low- and middle-income countries. Similar Cochrane reviews investigated the effectiveness of mobile phone messaging (SMS, MMS) for preventive healthcare (Vodopivec-Jamsek 2012; Gurol-Urganci 2013), telephone- or mobile-delivered interventions for preventing HIV infection in HIV-negative persons (Van Velthoven 2013), and reminder systems to improve patient adherence to tuberculosis clinic appointments (Liu 2014). All reviews found limited evidence to support the effectiveness of those interventions.

A U T H O R S '   C O N C L U S I O N S

Implications for practice

Automated telephone communication systems have the potential to play an important role in the modern healthcare. The available evidence suggests that these systems have potentially important benefits. Furthermore, these systems typically have a high degree of customisation and adaptability to providers' and patients' needs and requirements, and technology (e.g. voice recognition) is improving rapidly. Several types of ATCS have been identified; however, there is insufficient evidence to determine which is most effective across all health areas. Several practical matters need to be considered including data protection and confidentiality of telephone numbers, participants' age (preference of smartphones versus landlines), language and dialect/ethnical-cultural differences, staffing (including health personnel or computer programmers), overall programme costs including service providers, seamless integration with electronic medical records, storage (and back-ups), and server use. When interpreting the findings of this systematic review, practitioners need to consider other factors such as participants' health state or geographical location, or features of the intervention such as the frequency, duration, and intensity of delivery, which may be related to the aims of the communication. Automated telephone communication systems that promote health and disease prevention may have a useful application when uptake of those services or interventions is low. Due to several gaps in the evidence base, we currently recommend the use of ATCS for managing long-term conditions only in an evaluative context, as these conditions typically have multidimensional aetiology and pathogenesis and require more complex therapeutic solutions. In such contexts, the use of ATCS may need to be embedded within systems of care and consider both benefits and potential harms associated with automating communication between healthcare professionals and patients. The certainty of evidence ranged from very low to high, and it was low for the comparison that provided the most general evidence across management of long-term conditions, meaning that future research is likely to impact on the findings presented here.

Implications for research

This is a promising and growing area of research, as reflected by our inclusion of over 100 randomised trials in a decade involving over 4 million participants. Our growing understanding of behaviour change psychology and human-technology interactions offers new avenues to further explore the (cost-)effectiveness, acceptability and also safety/adverse-effects of ATCS interventions. There are many potential applications of this innovative technology, and the role of ATCS will grow with the trend to replace or supplement human interventions with technology. Future research could focus on the potential incorporation of visual/video communication (e.g. from an avatar) into automated voice messages, thereby making the intervention even more interactive. Delineating the most active components of, or performing direct comparisons between,

complex/multimodal interventions and unidirectional ATCS in various health conditions might prove beneficial. Future research in the area may also look at different certainties of evidence, or different organisational structures, and these could be informed by theoretical models to better understand the mechanism of action of this range of interventions on a wide variety of health outcomes.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Adams 2014

Methods	**Aim**: to determine whether use of Personal Health Partner (PHP) was associated with significant differences in parental report of primary care visit content. Additional goals included evaluating the intervention effect on medication management, asthma care, and parent and clinician satisfaction **Study design**: RCT; **recruitment**: primary care (mail) **Study duration**: 25 months; **study type**: prevention; **subtype**: adherence to medication/ laboratory tests
Participants	**Inclusion criteria**: children aged 4 months to 11 years (and their parents) who had a routine healthcare maintenance or well-child visit. Parents and children had to speak English and could not be planning to move away from the Boston area within 3 months **Sample size**: 475; **mean age**: 5 years (child) 35 years (parent);**sex**: women - 48% (child) , 93% (parent); men - 52% (child) 7% (parent); **ethnicity**: African-American[a] 67% (child); 47% (parent); other 33% (child); 53% (parent) **Country**: USA
Interventions	**Personal Health Partner** (PHP) tailors call content based on the participant's age and prescription of asthma medication. Call content was based on American Academy of Pediatrics Bright Futures topics reflected in the electronic health record (EHR) templates at the study site as well as Medicaid-recommended health risk questions for routine healthcare maintenance (RHCM), asthma symptoms, and medication safety. When available, PHP scripts were based on validated tools. RHCM areas include general health supervision, developmental screening, diet and physical activity, tuberculosis risk assessment, smoking risk assessment, and maternal depression screening. Each call also addressed medication safety, examining what medications on the EHR medication list the child was actually taking, age-appropriate medication use, and proper use of asthma controller and reliever medication if applicable. The day before each scheduled visit, PHP data were transferred to the EHR. PHP questions yielding actionable data generate an "Alert" displayed within the "Alerts" section of the "Patient Entered Data Review" form **Control group** completed a single automated call, but the content was limited to the 18-question Framingham Safety Survey. At the completion of the call, parents in the control group received tailored advice related to unsafe behaviours reported during the call. Because the Framingham Safety Survey was not part of routine primary care at Boston Medical Center, data from these calls were not shared with the EHR
Outcomes	Comprehensiveness of screening and counselling (primary), assessment of medications and their management, and parent and clinician satisfaction (secondary)
Funding	Agency for Healthcare Research and Quality, grant R18HS017248
Declaration of conflict of interest	No potential conflicts of interest disclosed
Power calculations for sample size	No

Notes	The authors have been contacted for results from the Medication Adherence Scale with no response

Risk of bias		*Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Children were randomly assigned to groups at the start of each call" Comment: insufficient information to judge whether random sequence generation was ensured
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "Study staff members were not aware of allocation group at the time of interviews"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	No results from the Medication Adherence Scale have been reported Comment: insufficient information to judge whether this introduced bias
Other bias	Unclear risk	Insufficient information

Aharonovich 2012

Methods	**Aims**: to compare motivational interviewing (MI) HealthCall to MI-only to reduce non-injection drug use (NIDU) in urban HIV primary care patients **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**: 2 months; **study type**: prevention; **subtype**: substance abuse
Participants	**Inclusion criteria**: HIV-positive, English- or Spanish-speaking, aged 18 years, enrolled in a New York City hospital-affiliated HIV primary care clinic, using drugs ≥ 4 days during the prior 30 days (including illicit non-injection drugs or prescription drugs taken without prescription or more than prescribed) **Sample size**: 33; **mean age**: 46 years; **sex**: men - 76%; women - 24%; **ethnicity**: African American 64%, Hispanic 21%, Caucasian (understood to be white) 15% **Country**: USA

Interventions	**MI + HealthCall**: participants call HealthCall daily via a toll-free number to report on the targeted health behaviour and potentially related moods, behaviours, and situations that occurred in the prior 24 h. HealthCall menu for NIDU included a short set of prerecorded questions in English or Spanish about the previous day covering use of primary drug, dollar amount spent on the drug used, use of other drugs, HIV medication adherence, and feelings of wellness, stress, and overall quality of the day. Participants responded by pressing numbers on the telephone keypad. After the practice call, counsellors helped participants identify an accessible telephone and convenient time for daily calls and set the watch alarm to this time as a reminder to call. Counselors were bilingual (English/Spanish) and from the same race/ethnic groups as most of the participants. HealthCall data were automatically uploaded to a database and used to provide personalised feedback to participants about their drug use in a single-page form that included a computer-generated graph of participants' drug use as called into the IVR and a set of summary statistics during the 30- and 60-day visits. The personalised graph contained the participant's goal set in the baseline MI interview with the counsellor (NIDU Goal), with diamond-shaped dots representing the dollar amount of drugs used on the days that the participant called HealthCall
	Participants in MI-only arm (control) received a 20-25 min MI at baseline, using standard MI techniques, e.g. dialogue about health consequences of NIDU, exploring ambivalence, barriers to change, developing a change plan, including (for those who chose) a specific NIDU-reduction goal (reflected in USD amounts) for the next 30 days. Participants then received a digital alarm watch which they were told they could use as a medication reminder. At 30 and 60 days, counsellor and participant met for 10-15 min to review overall drug use and set or re-set a drug reduction goal for the next 30 days
Outcomes	Days used primary drug in last 30 days (primary); patient satisfaction (secondary)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The randomisation was done via 10-block standard ABAB design"
Allocation concealment (selection bias)	Low risk	Quote: "Patients were blinded to their random assignment until after the MI session"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Counsellors were not blinded to their random assignment

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Treatment groups did not differ on attrition (p = 0.10) and thus attrition is not likely to be a source of bias in our results."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	No significant baseline differences

Andersson 2012

Methods	**Aims**: to study if there is a difference in effect between automated interventions delivered by IVR and over the Internet **Study design**: RCT; **recruitment**: other - university (web-based survey) **Study duration**: 6 weeks; **study type**: management; **subtype**: alcohol consumption
Participants	**Inclusion criteria**: Swedish university students having an AUDIT score above cutoff (8 and 6) **Sample size**: 1423; **mean age**: *; **sex**: *; **ethnicity**: * **Country**: Sweden
Interventions	**Single IVR call** of less than 500 words, one week after the baseline assessment, consisting of feedback on the baseline assessment and instructions on how to obtain a recommended Blood Alcohol Concentration (BAC) below 0.6 (0.06 percentages) **Single Internet-delivered intervention** given one week after baseline **Repeated IVR call** **Repeated Internet-delivered intervention** given 1 and 2 weeks after intervention **No intervention** (controls)
Outcomes	Alcohol Use Disorders Identification Test (primary)
Funding	Swedish National Institute of Public Health and Edwin Berger Foundation
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	In the present review we report a comparison between single IVR call and no intervention. Information from abstract only

Risk of bias

Bias	Authors' judgement	Support for judgement

Andersson 2012 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Baker 2014

Methods	**Aims**: to determine whether a multifaceted intervention increases adherence to annual faecal occult blood testing compared with usual care **Study design**: RCT; **recruitment**: community centre (organisation referral) **Study duration**: 12 months; **study type**: prevention; **subtype**: screening
Participants	**Inclusion criteria**: age 51 to 75 years; preferred language listed as English or Spanish; and a negative faecal occult blood testing result obtained between 1 March 2011, and 28 February 2012 **Sample size**: 450; **mean age**: 60 years; **sex**: men - 28%; women - 72%; **ethnicity**: Latino - 87%, other - 13% **Country**: USA
Interventions	**The multimodal intervention group** received (1) a mailed reminder letter, a free faecal immunochemical test with low-literacy instructions, and a postage-paid return envelope; (2) an automated telephone and text message reminding them that they were due for screening and that a faecal immunochemical test was being mailed to them; (3) an automated telephone and text reminder 2 weeks later for those who did not return the faecal immunochemical test; and (4) personal telephone outreach by a colorectal cancer screening navigator after 3 months in addition to UC which included computerised reminders, standing orders for medical assistants to give participants home faecal immunochemical tests, and clinician feedback on colorectal cancer screening rates **Usual care (control group)** at participating health centres included computerised reminders, standing orders for medical assistants to give participants home faecal immunochemical tests, and clinician feedback on colorectal cancer screening rates

Outcomes	Completion of faecal occult blood testing within 6 months of the date the participant was due for annual screening (primary) Costs (secondary)
Funding	Grant P01 HS021141- the Agency for Healthcare Research and Quality
Declaration of conflict of interest	None reported
Power calculations for sample size	To detect a 10% difference (45% vs 35%) with 80% power (2-tailed alpha = 0.05), we would need 752 participants (376 in each arm). This is less than the 800 participants that we estimated will be eligible for the study
Notes	The estimated cost of the outreach intervention was USD 34.59 per participant

Risk of bias		*Risk of bias*
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random number generator
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Investigators were blinded to the outcomes in the control group
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "Using only EHR data for outcome assessment is conceptually similar to blinded outcome assessment"
Incomplete outcome data (attrition bias) All outcomes	Low risk	All 450 participants were included in the analyses
Selective reporting (reporting bias)	Low risk	Outcomes of interest reported
Other bias	Low risk	Groups were comparable at baseline

Bender 2010

Methods	**Aim**: to test the effectiveness of a theory-based IVR intervention to improve adherence to controller medications among adults with asthma **Study design**: RCT; **recruitment**: community (advert in newspaper) **Study duration**: 10 weeks; **study type**: management; **subtype**: adherence to medication/ laboratory tests
Participants	**Inclusion criteria**: no significant disease or disorder (chronic health disorders, current substance abuse or dependence, mental retardation, or psychiatric disorder); and lack of

	participation in any other asthma-related research or clinical trial **Sample size**: 50; **mean age**: 42 years; **sex**: women - 59%; men - 41% **Ethnicity**: white - 58%, African American - 20%, Hispanic - 18%, Asian - 4% **Country**: USA
Interventions	**In the IVR group,** each participant received ≥ 2 calls separated by 1 month. Calls were programmed to reach out at several time points throughout the day and evening until the participant answered. If an answering machine was reached, a toll-free number was provided, which the participant could use to call back. When a call connection was completed, the IVR call identified itself as coming from the Denver Interactive Asthma Learning System program and verified that the correct person had been called. Content of the call then included an explanation of how the call works followed by 3 questions inquiring whether during the previous week the participant had been awakened at night, had limited their activities, or had used their rescue inhaler more than twice because of asthma symptoms (symptom module). Participants who responded affirmatively to any of the 3 questions were told that daily use of their controller medication should help prevent such symptoms and were advised to discuss the symptoms with their physician. All participants also listened to a short module about the benefits of their asthma medication and were asked about whether they were filling and using their medication, with IVR responses tailored to specific participant responses (refill module). Finally, participants were informed about the Lung Line, a free telephone service staffed by nurses capable of answering most questions about asthma, and about the Colorado Quit Line, offering free telephone based tobacco cessation intervention (resources module) **Participants in the control group** received no calls.
Outcomes	Medication adherence (primary); Asthma Control Test, Asthma Quality of Life Questionnaire, Beliefs about Medications Questionnaire (secondary)
Funding	Astra Zeneca
Declaration of conflict of interest	None declared
Power calculations for sample size	Power and sample size calculations indicated that 25 participants in each group would provide 75% power to detect a group difference of 36%
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A randomisation table generated before study initiation determined group assignment by order of entry into the study"
Allocation concealment (selection bias)	Unclear risk	Insufficient information

Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "The investigators remained blind to treatment until the final data set was completed"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Participants were comparable at baseline

Bender 2014

Methods	**Aim**: to improve adherence in paediatric asthma **Study design**: RCT; **recruitment**: secondary care (*) **Study duration**: 24 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: children, ages 3-12 years, treated for persistent asthma at Kaiser Permanente of Colorado **Sample size**: 1187; **mean age**: *sex: * ethnicity: * **Country**: USA
Interventions	**Parents in the IVR group** received a call reminding them that inhaled corticosteroid fill was overdue, and assisted with automated mail order refills or transfer to a Kaiser Permanente of Colorado pharmacy or asthma nurse specialist. Telephone calls in this group pulled information from the electronic health record (EHR) enabling the automated call to provide personalised participant and medication information **Parents in the control group** received usual care
Outcomes	Medication adherence (primary); utilisation of care (secondary)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	Information from abstract only

Risk of bias

Bias	Authors' judgement	Support for judgement

Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Bennett 2012

Methods	**Aims**: to evaluate the effectiveness of a behavioural intervention that emphasised weight loss and hypertension medication adherence among primary care patients in the community health centre setting **Study design**: RCT; **recruitment**: community centre (telephone) **Study duration**: 24 months; **study type**: prevention; **subtype**: weight management
Participants	**Inclusion criteria**: BMI 30-50 kg/m^2 (and weighing < 181.4 kg (400 pounds)), undergoing treatment for hypertension, aged $\geq$ 21 years, and enrolled participant at one of the participating community health centres (CHC). Additionally, participants had to read and speak English or Spanish, provide informed consent, and be willing to change diet, physical activity, and weight **Sample size**: 365; **mean age**: 55 years; **sex**: men - 31%; women - 69%; **ethnicity**: non-Hispanic black - 71%, Hispanic - 13%, non-Hispanic white - 4%, other - 12% **Country**: USA
Interventions	**Be Fit, Be Well**: participants can choose to use either the Internet or print + IVR as a mode of delivery of the intervention. In print + IVR condition, participants track their behavioural goals daily on a paper log and then enter this information weekly using the telephone keypad during their IVR telephone call. The goals are divided into 3 categories: dietary, physical activity, and lifestyle goals. For the first 13 weeks, participants work on 3 goals; for the rest of the intervention period, they work on 4 goals simultaneously. Participants pick new behaviour change goals every 13 weeks. 2 goals ("Walk 10,000 steps per day" and "Take your blood pressure medicine the right way every day") remain constant throughout the intervention period. Skill training materials, in print, provide instruction in behavioural strategies to facilitate achieving their behavioural goals. The also provide additional dietary, physical activity, and lifestyle

	goals that may need additional contextualisation. Participants monitor their behavioural goals over the telephone using IVR. After entering data on their behaviour, participants receive immediate feedback on their progress compared to the previous entry. Participants receive social support via telephone coaches administered by community health educators (CHE) and group support sessions. CHE call the participants once a month in the 1st year and then bimonthly in the following year, during which they discuss progress, barriers, strategies to overcome barriers, self-monitoring, and social support. Each call lasts for 15-20 min. Group sessions include an interactive skill training and a physical activity component. The intervention materials include information on community resources such as public parks, local walking groups, and farmers' markets that can aid participants in their behaviour change efforts. All participants receive a walking kit that includes a pedometer and maps of the local community with associated step counts. Participants receive a personalised, tailored behaviour change "prescription" (generated from the baseline data) with the doctor's signature included electronically. This "prescription" presents recommendations for making changes in the targeted risk behaviours, and lets patients know that their doctor considers these recommendations to be important to their health **Participants in the control group** received usual care (self-help booklet)
Outcomes	Change in body weight and BMI (primary); change in blood pressure; medication adherence; adverse-events (secondary)
Funding	National Heart, Lung, and Blood Institute; National Cancer Institute
Declaration of conflict of interest	NA
Power calculations for sample size	The trial was designed to provide 80% power to detect a mean weight change in 24 months of 2.75 kg in the intervention arm, assuming no weight change in usual care
Notes	All participants are diagnosed with hypertension. In addition, 36% are diagnosed with hypercholesterolaemia, and 20% with type 2 diabetes mellitus

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated allocations were performed, blocked by clinic and sex
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "The trial design precluded blinding either patients or interventionists to treatment assignment."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information

Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "All 365 participants are included in the primary outcomes analysis, including 15 participants (4.1%) who had only a baseline assessment."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Both the groups were balanced in all other characteristics at baseline

Bennett 2013

Methods	**Aims**: to compare changes in weight and cardiometabolic risk during a 12-month period among black women randomised to a primary care-based behavioural weight gain prevention intervention or to usual care **Study design**: RCT; **recruitment**: community centre (mail) **Study duration**: 18 months; **study type**: prevention; **subtype**: weight management
Participants	**Inclusion criteria**: aged 25-44 years, BMI of 25-34.9 kg/m^2, $\geq$ 1 visit to a Piedmont Health Center in the previous 24 months, North Carolina residency, and self-reported English fluency **Sample size**: 194; **mean age**: 35 years; **sex**: women - 100%; **ethnicity**: black - 100% **Country**: USA
Interventions	**The multimodal intervention** (the Shape Program) contained 5 components: obesogenic behaviour change goals; self-monitoring via IVR phone calls; tailored skills training materials; 12 interpersonal counselling calls; and a 12-month YMCA membership **Participants in the control group received** usual care: study staff made no attempts to influence the medical treatment provided to those in the usual care arm. Every 6 months, we sent usual-care participants newsletters that covered general wellness topics but did not discuss weight, nutrition, or physical activity
Outcomes	Change in body weight and BMI (primary); maintenance of change at 18 months; adverse-events (secondary)
Funding	R01DK078798 from the National Institute for Diabetes and Digestive and Kidney Diseases; and K05CA124415 from the National Cancer Institute
Declaration of conflict of interest	None declared
Power calculations for sample size	This trial was designed to have 80% power to detect significant BMI differences of 1.03 kg/m^2 between treatment groups 12 months after baseline
Notes	6 serious adverse events were reported among participants in the intervention arm, including gynaecological surgery in 2 participants and knee replacement, breast abscess, musculoskeletal injury, and cancer diagnosis in 1 participant each; all participants except the one with the cancer diagnosis required hospitalisation. The authors of the study could not conclusively determine whether reported events resulted from study participation

Risk of bias		Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "After completing baseline assessments, research staff initiated a computer-generated randomisation algorithm to allocate participants equally (1:1) across the two treatment arms (intervention and usual care); those in the intervention arm were further randomised to one of two interventionists."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "The study design precluded blinding patients and interventionists to treatment assignment."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data balanced in numbers across groups (low attrition). ITT analysis was used to include all participants who received the intervention or usual care in the analysis. ITT analyses were based on the mean difference in weight and BMI between treatment arms at 12 months after adjustment for health centre
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	The groups were well-balanced at baseline.

Boland 2014

Methods	**Aims**: to assess the ability of automated reminders to improve adherence with once-daily glaucoma medications **Study design**: RCT; **recruitment**: primary care (*) **Study duration**: 6 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: patients non-adherent with their medications after 3 months of electronic monitoring (prospective cohort study phase) **Sample size**: 70; **mean age**: 66 years; **sex**: men - 49%, women - 51%; **ethnicity**: African American - 58%, European - 32%, Asian - 6%, Hispanic - 3%, Middle Eastern - 1%

	Country: USA
Interventions	**Automated reminders** (by telephone or text message) informed each participant in the intervention group that it was time to take his or her medication. The IVR system also allowed participants to reset the reminder and receive it again in 1 hour: "Hello, this is your automated reminder to take your eye drop. Press 1 if you have or are about to take your drop. If you are not able to take your eye drop right now and would like a second reminder in 1 hour, please press 2 now." **Participants in the control group** received usual care
Outcomes	Medication adherence
Funding	Microsoft BeWell Fund
Declaration of conflict of interest	None reported
Power calculations for sample size	No
Notes	Communication with the author: "there was only one person (1.42% of the sample) who specified SMS (text) reminders in the study, however"

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Study participants were then assigned to a control or intervention group using assignments randomised equally in blocks of 10 and placed in envelopes."
Allocation concealment (selection bias)	Low risk	Quote: "Study participants were then assigned to a control or intervention group using assignments randomised equally in blocks of 10 and placed in envelopes."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Quote: "Large percentage of participants lost to and unavailable for follow-up, however ITT analysis was used in addition to real efficacy approach"

Selective reporting (reporting bias)	Low risk	Relevant outcomes were reported
Other bias	High risk	Quote: "At baseline, there were statistically significant differences between the two groups with regard to age, educational level, and Mini-Mental State Examination (MMSE) score"

Bove 2013

Methods	**Aims**: to compare the effectiveness of an Internet and telephone-based telemedicine communication system to usual care from a primary care provider in managing patients with hypertension **Study design**: RCT; **recruitment**: primary care (advert in clinic) **Study duration**: 6 months; **study type**: management; **study subtype**: hypertension
Participants	**Inclusion criteria**: systolic blood pressure > 140 mmHg **Sample size**: 241; **mean age**: 60 years; **sex**: women - 79%; men - 21%; **ethnicity**: African American - 81%, white- 15%, Hispanic - 3%, other - 1% **Country**: USA
Interventions	**Participants in the multimodal intervention group** reported their weight, blood pressure, steps/day, cigarettes/day, at least twice weekly via an Internet or IVR phone system to the clinical centre. If the systolic blood pressure was < 140 mmHg, the**telemedicine** system automatically sent a short message to the participant stating that the measures were acceptable, a short message on health care, and instructions to continue with the scheduled transmission of data. Monthly blood pressure summaries were sent to all subjects and to their primary care providers **Participants in the control group** received usual care by their physicians
Outcomes	Blood pressure control at 6 months (primary)
Funding	The Agency for Healthcare Quality and Research
Declaration of conflict of interest	NA
Power calculations for sample size	To achieve a power of 0.8 with α value of 0.05, the authors aimed to recruit 252 subjects to accommodate a dropout rate of 20% and an expected 30% incidence of diabetes
Notes	The telemedicine (intervention group) subjects used telephone communication 65% of the time

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement

Random sequence generation (selection bias)	Low risk	Quote: "Consecutive patients were assigned a random number from a random number list. Patients assigned odd numbers were placed in the control group, and patients assigned even numbers were placed in the telemedicine group."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data balanced in numbers across groups (low attrition)
Selective reporting (reporting bias)	Low risk	The study protocol is available and all predefined outcomes have been reported
Other bias	Low risk	Participants were comparable at baseline

Brendryen 2008

Methods	**Aims**: To assess the long-term efficacy of a fully automated digital multimedia smoking cessation intervention **Study design**: RCT; **recruitment**: community (banner advertisements in Internet newspapers) **Study duration**: 12 months; **study type**: management; **study subtype**: smoking
Participants	**Inclusion criteria**: people who were willing to make an attempt to quit smoking, were aged ≥ 18 years, smoked ≥ 10 cigarettes daily and had access to the Internet, email and a cellphone on a daily basis **Sample size**: 396; **mean age**: 36 years; **sex**: men - 50%, women - 50%; **ethnicity**: * **Country**: Norway
Interventions	**Multimodal intervention** (Happy Ending (HE)). The IVR programme lasted for 6 weeks, with participants receiving 2 messages per day, delivered through mobile phones. In the morning when the participants logged on to the HE, they received IVR message. They received automated reminders if failed to log in. In the evening, participants received an automated call that asked about their smoking behaviour during the day. If they had smoked, they were directed to the tailored relapse prevention therapy. Craving helpline was available 24 h from day 15 onwards and participants were able to choose to hear therapeutic problem solving message related to emotion regulation, motivation boost, or stress regulation. Participants were encouraged to call the helpline each time they felt

	tempted to have a cigarette. Until week 11, the intervention had multiple daily contact points and was highly intensive. HE recommended the use of nicotine replacement therapy and they could choose between gum (2 mg or 4 mg) and patches (15 mg/16 h). HE also offered an 11-month follow-up phase. During this phase, the log-off procedure continued daily for another 4 weeks, twice a week for another 2 weeks, and then once a week for the remaining follow-up period. All the features provided in the active phase remained functional including craving helpline and supportive IVR messages **Participants in the control group** received self-help intervention (booklet)
Outcomes	Repeated point abstinence at 1, 3, 6 and 12 months post-cessation (primary); nicotine replacement therapy adherence, self-efficacy and nicotine dependence (secondary)
Funding	University of Oslo, Happy Ending AS and the Norwegian Research Council. Pfizer Norway provided a free supply of nicotine replacement therapy
Declaration of conflict of interest	The second author has a financial interest in the intervention, as a shareholder of Happy Ending AS
Power calculations for sample size	The report confirms that power analysis was performed. 396 were required
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computerised random number generator
Allocation concealment (selection bias)	Low risk	Quote: "The names and identities of the subjects, however, were concealed to the experimenter during randomization."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data have been imputed using appropriate methods; ITT analysis was used to include all participants who received the intervention or usual care in the analysis
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are of interest in the review have been reported

Brendryen 2008 *(Continued)*

Other bias	Low risk	Quote: "At baseline, there were no variables on which treatment and control subjects differed significantly"

Capomolla 2004

Methods	**Aims**: to evaluate the effectiveness of comprehensive home telemonitoring service (TMS) in participants discharged from a Heart Failure Unit **Study design**: RCT; **recruitment**: primary care (organisation referral) **Study duration**:12 months; **study type**: management; **subtype**: heart failure
Participants	**Inclusion criteria**: patients with chronic heart failure **Sample size**: 133; **mean age**: 57 years; **sex**: men - 88%, women - 12%; **ethnicity:** * **Country**: Italy
Interventions	**TMS**: participants called a toll-free number. After entering the unique identification code, the IVR system asked a series of question about vital signs and symptoms such as weight, systolic blood pressure, heart rate, dyspnoea, asthenia, oedema, therapy changes, blood urea nitrogen, creatinine, sodium, potassium, and bilirubin. Participants answered by using the touchpad of their home or mobile phone. If advice or help was needed, participants could leave a message to contact the medical staff. Those who failed to call the system for > 2 days were personally contacted by phone. Similarly, those with abnormal readings were flagged up and received a phone call from the medical team **Participants in the control group** received usual community care. At discharge, participants were referred to their community primary care physician and cardiologist or cardiology department. During follow-up the process of care was governed by different providers which managed the participant's needs with a heterogeneous range of strategies: emergency room management, hospital admission and outpatient access
Outcomes	All-cause mortality; re-hospitalisations; emergency room use (composite primary); and adherence to the treatment (secondary)
Funding	Ministero della Salute funds
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	All participants received educational materials, including cardiac failure book, telemonitoring service booklet, daily computerised medications plan, pillboxes with scheduling time, summary sheets of domestic and physical activities. Participants received an individualised personal care plan designed by the physician

Risk of bias   *Risk of bias*

Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	All assigned participants were included in the analysis
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are of interest in the review have been reported
Other bias	Low risk	Quote: "No significant clinical or instrumental differences were observed between two groups"

Carlini 2012

Methods	**Aims**: to test the efficacy of IVR in recycling low-income smokers who had previously used Quitline (QL) support back to QL support for a new quit attempt **Study design**: RCT; **recruitment**: primary care (mail) **Study duration**: 4 months; **study type**: management; **study subtype**: smoking
Participants	**Inclusion criteria**: previous Quitline callers and current smokers. **Sample size**: 521; **mean age**: 40 years; **sex**: women - 62.50%; men - 37.50%; **ethnicity**: white, non-Hispanic - 81%, African American - 6%, other - 5%, Hispanic or Latino - 4%, Native American or Pacific Islander - 3%, Asian - 1% **Country**: USA
Interventions	**The ATCS Plus intervention** utilised in this trial was developed in 2 steps. The first step focused on creating the content of the IVR messages: 4 prototype IVR messages about possible barriers to re-engagement in QL support for quitting smoking were developed, based on previous work with low income ethnic/racial minority smokers. These prototype messages were tested and changed according to feedback received through individual telephone interviews with fifteen Medicaid insured and uninsured smokers who had previously used a QL and agreed to be contacted further. The messages aimed to redefine relapse as a learning opportunity and not as a failure; motivate new quit attempts by reminding smokers about benefits in quitting (e.g. personal health and well being, financial savings, concern for family members); educate smokers about the different offerings of QL support services; reiterate how QL support can increase the chances

	of quitting; and inform smokers of their eligibility to re-enrol in QL services **The control group** received only the first 2 components of the ATCS intervention (greeting and screening of smoking status), followed by a message thanking them for the information
Outcomes	Re-enrollment into Quitline support line (primary)
Funding	National Cancer Institute grants: R21CA141568 and 1R25-CA117865
Declaration of conflict of interest	No competing interests
Power calculations for sample size	No
Notes	ClinicalTrials.gov Identifier: NCT01260597

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "Eligible participants were randomised to the intervention or usual care prior to entry into the IVR calling database."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Low risk	The study protocol is available and all pre-defined outcomes have been reported
Other bias	Unclear risk	Insufficient information

Chaudhry 2010

Methods	**Aims**: to determine the effect of automated symptom and self-reported weight monitoring compared with usual care on the combined endpoint of all cause hospitalisation and mortality in patients recently hospitalised for heart failure **Study design**: RCT; **recruitment**: secondary care (organisational referral) **Study duration**: 6 months; **study type**: management; **study subtype**: heart failure
Participants	**Inclusion criteria**: patients recently discharged from a heart failure hospitalisation **Sample size**: 1653; **median age**: 61 years; **sex**: women - 42%; men - 58%; **ethnicity**: white - 49%, black - 39%, other - 12% (inclusive of Hispanic or Latino - 3%) **Country**: USA
Interventions	**Tele-HF**: an automated, daily symptom and self-reported weight monitoring intervention. During each call, participants heard a series of questions about general health and heart-failure symptoms, and they enter responses using the telephone keypad. Information from the telemonitoring system was downloaded daily to a secure Internet site and was reviewed every weekday (except on holidays) by site coordinators. Any variance in any of the information are flagged up for clinician's attention who would then offer advice to the participant (e.g. modify diet, increase diuretic dose or adhere to medications); consult with the physicians in their practice site; advise an urgent clinic or emergency department visit; or refer the participant to another specialist, as appropriate **Participants in the control group** received usual care (educational materials)
Outcomes	Readmission for any reason or death from any cause (primary); hospitalisation for heart failure, number of days in the hospital, number of hospitalisations, and adverse events (secondary)
Funding	National Heart, Lung, and Blood Institute
Declaration of conflict of interest	NA
Power calculations for sample size	With an alpha error of 0.05 and a power of 90%, for a 25% relative risk reduction, 1640 participants were needed (820 in each group), with a follow-up period of 6 months
Notes	Adherence in the telemonitoring group was defined as placement of $\geq$ 3 calls a week to the telemonitoring system (a cutoff point representing approximately half the expected usage). A total of 85.6% of participants in the telemonitoring group made $\geq$ 1 call; among these participants, adherence to the intervention was highest, at 90.2%, during the first week of the study period and decreased to 55.1% by week 26. A total of 29,163 variances were generated during the study period, with a median of 21 (interquartile range, 5 to 54) per participant

Risk of bias
                    Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Comment: sequence of computer-generated random numbers, with stratification on the basis of the study site

Allocation concealment (selection bias)	Low risk	Quote: "Randomization was centralized and performed by telephone. Randomization is stratified by study site, and force randomised within each study site in blocks of 20 (10 intervention, 10 control), to ensure a balance across study arms within each site. The randomisation sequence is developed by the coordinating centre using a computer random-number generator. The sequence is unknown to the attending cardiologists and nurses"
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Study investigators and personnel (except for members of the data and safety monitoring board) were unaware of the treatment-group results until endpoint data had been finalised for all the participants
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "An independent Events Review Committee will assess and classify the primary and secondary end point events in a centralized and blinded manner . . . A committee of physicians, all of whom were unaware of the treatment-group assignments, adjudicated each potential readmission to ensure that the event qualified as a readmission."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data have been imputed using appropriate methods
Selective reporting (reporting bias)	Low risk	The study protocol is available and all pre-specified outcomes have been reported in the pre-specified way
Other bias	Low risk	Quote: "Baseline characteristics of the patients were similar between the two groups"

Cleeland 2011

Methods	**Aims**: to examine whether at-home symptom monitoring plus feedback to clinicians about severe symptoms contributes to more effective postoperative symptom control **Study design**: RCT; **recruitment**: primary care (advert in clinic) **Study duration**: 1 month; **study type**: management; **study subtype**: cancer
Participants	**Inclusion criteria**: men and women scheduled for thoracic surgery for primary lung cancer or lung metastases; $\geq$ 18 years old, able to understand English and the study requirements, and willing and able to respond to a repeated IVR-administered symptom

	rating scale
	Sample size: 79; **mean age**:60 years;**sex**: women - 47%; men - 53%; **ethnicity**: white, non-Hispanic - 85%, other - 15% **Country**: USA
Interventions	**In the intervention group**, the IVR screened the 5 targeted symptoms. On the occurrence of ≥ 1 symptom threshold events for a participant, the IVR system immediately generated an email alert to the surgical team's advanced practice nurse (APN). The email provided the participant's name, phone number(s), and case history number, along with the severity of each symptom that had generated a symptom. If a participant missed a scheduled call, the IVR system initiated up to 2 more calls, spaced 45 min apart. If a participant in the intervention group had ≥ 1 symptom threshold events, the staff member initiated an alert email to the participant's surgical team **Participants in the control group** received only automated monitoring and usual symptom care.
Outcomes	Symptom threshold events, cumulative distribution of symptom threshold events, differences in mean symptom severity (primary)
Funding	RSGPB-03-244-01-BBP from the American Cancer Society, and Grant No. R01 CA026582 from the National Cancer Institute
Declaration of conflict of interest	None declared
Power calculations for sample size	59 participants per arm would be needed to detect a medium effect size difference in postoperative symptom severity between groups, using a 2 tailed alpha = 0.05 and 80% power
Notes	2 different types of ATCS were compared against each other

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Random assignment was completed electronically by MD Anderson's protocol management system."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information

Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "All 79 patients completed the 4-week study"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Cohen-Cline 2014

Methods	**Aims**: to understand whether IVR could be effective to engage individuals overdue for colorectal cancer screening in community practice settings and to determine if the effect would persist over time **Study design**: RCT; **recruitment**: primary care (telephone) **Study duration**: 12 months; **study type**: prevention; **study subtype**: screening
Participants	**Inclusion criteria**: men and women aged 50-81 years who were not adherent to colorectal cancer screening **Sample size**: 11,010; **mean age**: 61 years; **sex**: women - 46%; men - 54%; **ethnicity**: white - 86%, other - 14% **Country**: USA
Interventions	**The intervention** was a single IVR telephone call (average length = 5 min) to the primary telephone number listed in the participant's records. The call included the following features: assessment of prior colorectal cancer screening; information about the benefits of screening and elicitation of the barriers to screening; and offer of a faecal occult blood testing kit mailed to the participant's home. The IVR call mentioned both faecal occult blood testing and colonoscopy as recommended screening tests. If the IVR system left a message, only 1 additional message was sent. When there was no answer or a busy signal at the telephone number, up to 6 total attempts were made to reach the participant **Participants in the control group** received usual care, defined as a personalised outreach letter, mailed annually to all Group Health members before their birthday, informing them of upcoming preventive service needs, including cancer screening
Outcomes	The receipt of any recommended colorectal cancer screening (primary)
Funding	NA
Declaration of conflict of interest	One author (DCG) is a shareholder in Group Health Physicians, which contracts exclusively with Group Health Cooperative to provide medical services. The remaining authors declared no conflicts of interest
Power calculations for sample size	No
Notes	Participants in both the intervention and usual care could have received the outreach letter at any point during the 12-month follow-up period near their birthday

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "We randomised 10,000 individuals to the intervention and 3279 individuals to usual care. Because the intervention was originally implemented as a pilot quality improvement initiative, the decision was made to maximize the number of individuals who could receive the IVR intervention with the available resources."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	There were significantly more men in the control group (P < 0.001), but there is insufficient evidence that this imbalance has introduced bias

Corkrey 2005

Methods	**Aims**: to assess the efficacy of an IVR brief intervention in increasing cervical screening rates in 1 Australian region; to determine the cost per additional cervical screen; to compare the cost per additional cervical screen to other cervical screening interventions **Study design**: RCT; **recruitment**: primary care (mail) **Study duration**: 6 months; **study type**: prevention; **subtype**: screening
Participants	**Inclusion criteria**: women, aged 18-69 years who had not had a hysterectomy **Sample size**: 75,532;**Mean age**: * ; **sex**: women - 100% **Country**: Australia
Interventions	**Brief advice IVR** cervical screening intervention was provided by Generalized Electronic Interviewing System (GEIS) software. The GEIS software explained the nature of the call; identified if women aged 18-69 years were present; selected 1 eligible woman; determined her screening status; delivered a message that either congratulated her on being correctly screened, a message of encouragement if she was under-screened, or another

	message appropriate to her status; offered additional messages to counter common barriers to screening; offered additional information on cervical screening and cancer; offered to readout contact sources where she could obtain more information; offered to have someone ring her back if she still had questions; and offered to record any question she may wished answered. GEIS could reschedule the call and participants could request call backs. GEIS generated an email to advise a local staff member responsible for cervical screening promotion in the Hunter region along with any question the woman had recorded. The script contain domains concerned with Pap status determination, cervical screening barrier messages, demographic items, information items, and contact numbers **Participants in the control group** received no calls
Outcomes	Cervical cancer screening status at 6 months (primary); costs (secondary)
Funding	Hunter Medical Research Institute and the University of Newcastle
Declaration of conflict of interest	NA
Power calculations for sample size	"To obtain a screening rate increase equal to 1.0% of the adult female population, an additional 75,532 (0.01/2) = 378 women would be needed to be screened in the intervention postcodes."
Notes	The cost per additional screening obtained in this study is favourable compared to the other studies, which suggests that the IVR method could be used to target identified individuals

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "A brief advice IVR cervical screening intervention was delivered to 17,008 randomly selected households in the Hunter region in New South Wales (NSW) between April and July 2001 in 15 randomly selected postcodes. The change in screening rates before and after the intervention was compared to another 15 randomly selected control postcodes"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Cvietusa 2012

Methods	**Aim**: to test whether a speech recognition (SR) reminder system would improve adherence to an ICS in a large unselected population of paediatric asthma patients **Study design**: RCT; **recruitment**: * **Study duration**: 12 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: children, aged 3-12 years with persistent asthma **Sample size**: 1393; **mean age**:*sex: * **ethnicity**: * **Country**: USA
Interventions	**The intervention group** received up to 3 tailored SR reminder calls when they were due to refill their inhaled corticosteroids. The calls provided information about asthma, facilitated a rapid inhaled corticosteroids refill, and offered an opportunity to receive a call back from an asthma nurse specialist **Control group** (no further information)
Outcomes	Medication adherence (refill rate) (primary); acceptability/satisfaction (secondary)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	Information from abstract only

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "There were no statistically significant differences between the intervention and control groups in age, sex, co-morbidities, and length of HMO enrolment."

David 2012

Methods	**Aims**: to conduct a feasibility study of self-monitoring with a pedometer administered through an IVR system and mobile phones; to examine the added benefit of a human coach **Study design**: RCT; **recruitment**: community (advert elsewhere - radio, television, newsletter) **Study duration**: 3 months; **study type**: prevention; **study subtype**: physical activity
Participants	**Inclusion criteria**: BMI of 25-40 kg/m^2, postmenopausal status, access to a mobile phone during the intervention and willingness to walk $\geq$ 30 min per day **Sample size**: 71; **mean age:** 57 years;**sex**: women - 100%; **ethnicity**: white - 93%, other - 7% **Country**: USA
Interventions	**Coach group**: participants assigned to the coach condition were introduced to the coach by the study facilitator. The coach was trained by the study team to offer a lifestyle intervention. She explained the intervention and offered the steps goal for the first week after reviewing the participant's baseline physical activity and time taken to complete the 1-mile walk. Then the coach trained the participant to use the pedometer and the IVR system and identified herself as the person who would offer support during the intervention. To receive help from the coach, participants were asked to call the IVR system and leave a message for her. After the baseline visit, the participants interacted only via the telephone and IVR system. 2 daily telephone interactions with the IVR system were scheduled. The IVR system called the participant's mobile phone between 07:00 and 17:00, during a 2-hour period identified by the participant. To minimise disruption during working hours, this call was limited to 3 questions: an assessment of whether the participant had walked or planned to walk that day, the participant's self-efficacy to achieve the steps goal for the day and a general enquiry about whether the participant was having a good or bad day. In addition, participants called the IVR system every evening to enter their daily step count from the pedometer and receive an intervention message. During the call, they provided an assessment of self-efficacy for walking the following day, an assessment of the present day and satisfaction with their walking plan for that day. Participants could use their mobile phone or a land-line for

	the evening call **The no-coach (control) group** received similar Instructions and training to the coach condition and were offered by the same individual, but with 2 exceptions: the individual did not identify herself as the coach, and participants were not informed that they had access to a coach. Participants had also access to the same technical support for problems with the IVR system or the pedometer. Thus the subjects in the no-coach condition interacted only with the IVR system
Outcomes	1-mile walk after the intervention (primary); body weight; BMI; waist and hip circumference; self-efficacy (secondary)
Funding	National Center for Research Resources: UL1RR025755
Declaration of conflict of interest	Not mentioned
Power calculations for sample size	No
Notes	Delivery of the intervention was both via mobile and landline; first call was initiated by the system (IVR); and the second one by participants themselves

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "At the end of this visit, participants were stratified by BMI and randomized to the coach or no-coach condition."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Withdrawal, attrition and retention rates were not significantly different between treatment arms."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Participants in the no-coach group had higher BMI at baseline ($P = 0.29$), but unclear whether this has introduced bias

Dedier 2014

Methods	**Aims**: to test the ability of an automated, interactive, culturally adapted telephone exercise coach to increase physical activity and lower blood pressure in urban African Americans with poorly controlled hypertension **Study design**: RCT; **Recruitment**: primary care (mail) **Study duration**: 3 months; **Study type**: management; **Study subtype**: hypertension
Participants	**Inclusion criteria**: sedentary, hypertensive, adults in primary care **Sample size**: 253; **Mean age**: 58 years;**sex**: women - 73%; men - 27% **Ethnicity**: African American - 100% **Country**: USA
Interventions	**Participants in the intervention group** received Telephone-Linked Care for Physical Activity (TLC-PA); computerised system that 'converses' with participants by telephone using pre-recorded human speech **Participants in the control group** received usual primary care and an educational brochure on hypertension
Outcomes	Change in minutes of moderate or greater physical activity from baseline to 3 months; and change in systolic blood pressure from baseline to 3 months (primary)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	Information from abstract only

Risk of bias | *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information

Other bias	Unclear risk	Participants in the control group had higher blood pressure at baseline; but unclear whether this has introduced bias

DeFrank 2009

Methods	**Aims**: to compare the efficacy of 3 types of reminders in promoting annual repeat mammography screening **Study design**: RCT; **recruitment**: other - health plan (mail and telephone) **Study duration**: 42 months; **study type**: prevention; **study subtype**: screening
Participants	**Inclusion criteria**: women residents of North Carolina aged 40-75 years; were enrolled with the State Health Plan for 2 years; had their last screening mammograms (enrolment mammograms) between September 2003 and September 2004, and had only 1 mammogram in the designated timeframe (to exclude those who had diagnostic mammograms) **Sample size**: 3547; **mean age**: > 40 years; **sex**: women - 100%; **ethnicity**: white - 88%, black - 11%, Asian, Native Hawaiian/Pacific Islander, American Indian/Alaskan Native or other - 1% **Country**: USA
Interventions	**Participants in the intervention group** received automated telephone calls by TeleVox Software, Inc, consisting of reminders 3 months prior to mammography due dates. The message was 69 seconds long and consisted of 224 words. Those who listened to ≥ 20 seconds were considered as successful contact as key message content (due for a mammogram) was delivered during this time. In total, they received 3 reminders. Call attempts were terminated after a 2-week call window or 10 unsuccessful call attempts to reach intended recipients. Message contents included: dates of women's last mammograms; information about benefits of mammography; recommended guidelines; contact information for the National Cancer Institute's Cancer Information Service; and State Health Plan coverage The **second arm received enhanced letter reminders** (the same information as the other 2 reminders with several additions; additional text, informed by the Health Belief Model, about the severity of breast cancer and breast cancer susceptibility, names and telephone numbers for the facility where recipients had their last mammograms, and stickers to remind women to make and keep their mammogram appointments) The **enhanced usual care group** received reminders (mailed letters, included dates of women's last mammograms; information about benefits of mammography; recommended guidelines; contact information for the National Cancer Institute's Cancer Information Service; and State Health Plan coverage)
Outcomes	Mammography adherence (primary)
Funding	National Cancer Institute
Declaration of conflict of interest	None
Power calculations for sample size	To provide 80% power to detect a 6% difference in effect among intervention arms, with alpha 0.05, the sample size required was 3545 participants

DeFrank 2009 (*Continued*)

Notes	This is a comparison between automated telephone reminder and enhanced usual care reminders

Risk of bias		*Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Prior to study recruitment, women were assigned randomly to one of three reminder groups"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Analyses were intent-to-treat and included all study participants (n= 3547)"
Selective reporting (reporting bias)	Low risk	Relevant outcomes were reported
Other bias	Low risk	Comment: groups were comparable across all baseline characteristics

DeMolles 2004

Methods	**Aims**: to investigate the effectiveness of totally automated telephone technology in improving adherence to prescribed continuous positive airway pressure (CPAP) therapy **Study design**: RCT; **recruitment**: other - home care company (telephone) **Study duration**: 2 months; **study type**: management; **study subtype**: obstructive sleep apnoea syndrome (OSAS)
Participants	**Inclusion criteria**: English-speaking adults, having a physician diagnosis of OSAS, and polysomnography demonstrating 15 episodes of apnoea or hypopnoea per hour of sleep **Sample size**: 30; **mean age**: 46 years; **sex**: * ; **ethnicity**: * **Country**: USA
Interventions	**Telephone-linked communications technology (TLC) CPAP** is based on patterns of CPAP adherence and side-effect proles. After receiving salutation, participants enter personal password for maintaining security and confidentiality. TLC assessed participants' frequency and duration of CPAP use during the previous week (except for the rst call, in which 3 days' use were collected). In case of non-use of the CPAP, or use for fewer than 4 h per night (on nights they used it) or fewer than 5 nights per week (or fewer than 2 nights

	in the case of the 3-day call), the system proceeded to ask a series of questions aimed at identifying the cause of CPAP non-adherence (side effects, difficulty using CPAP, lack of perceived benefit, machine malfunction). The severity of each side effect was also ascertained. For those with good adherence, TLC reinforces this behaviour. The call is initiated by participants 3 days after starting CPAP therapy (3-day call) and thereafter weekly (1-week call) for a total of 2 months. Calls could be made at any time of day that was convenient for the user. If participant failed to call TLC on a scheduled day, TLC called that person the next day, repeating calls periodically during a time period set with the user. If 2 days elapsed from the day of the scheduled call, the system administrator was notified automatically and informed the research assistants working on the project, who then would follow up with the participant to determine why the call was not made. TLC ascertains the severity of OSAS-related symptoms, including snoring, breathing pauses, and daytime sleepiness. Those with OSAS symptoms, TLC recommends follow-up with their physician as well as provide a brief counselling dialogue, focusing on appropriate CPAP use, expected benets, correct CPAP operating technique, and potential side effects and their treatment. Reinforcement of the need for regular CPAP use was provided , stressing that regular use would reduce daytime sleepiness and could also have the additional benet of reducing the risk of cardiovascular disease. Continuous reports including frequency and duration of CPAP use, side effects, and OSAS symptoms was sent to the physicians, biweekly or on a need basis **Participants in the control group** received usual care alone.
Outcomes	CPAP use (primary); sleep symptoms checklist; functional outcomes of sleep questionnaire (secondary)
Funding	VA Health Services Research and Development Service
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "At the conclusion of a baseline examination . . . eligible participants were randomised to either TLC and usual medical care or usual medical care alone."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "At baseline, intervention and usual-care participants had similar characteristics; there were no differences at P < 0. 05 level"

Derose 2009

Methods	**Aims**: to evaluate the effectiveness of automated systems to prompt patients with diabetes mellitus to obtain overdue laboratory tests **Study design**: RCT; **recruitment**: other - health plan (mail and telephone) **Study duration**: 6 months; **study type**: management; **study subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: health plan members with diabetes were passively enrolled if they met the following criteria: (1) age older than 18 years; (2) no HbA1C, low-density lipoproteins, and urinary microalbumin tests in more than 365 days; and (3) a birthday within the next 3 months **Sample size**: 13,057; **mean age**: 51 years; **sex**: men - 54%; women - 46%; **ethnicity**: other or unknown - 48%, white - 23%, Hispanic - 14%, black - 10%, Asian - 5% **Country**: USA
Interventions	The **telephone call group** received a single call beginning with a standard greeting saying that the message to follow was from Kaiser Permanente. The message was in English and informed the recipient to call a toll-free number to receive a message from his or her health plan. Members who called in used an interactive menu to select English or Spanish and retrieved the message by inputting their medical record number. Message content: "Telephone calls began with a standard greeting saying that the message to follow was from Kaiser Permanente. The message was in English and informed the recipient to call a toll-free number to receive a message from his or her health plan. Members who called in used an interactive menu to select English or Spanish and retrieved the message by inputting their medical record number." The member was informed that he or she may have diabetes and was due for laboratory tests that had already been ordered. The tests were named, and the member was directed to go to his or her local health plan laboratory for the tests. The message duration was 40 s long and consisted of 100 words **Letter group** received a single letter. **Letter + call group** received a letter followed by a telephone call at 4 weeks for non-response **Call + letter group** received a telephone call followed by a letter at 4 weeks for non-response

	Letter + call + letter group received a letter that is followed by a telephone call at 4 weeks for non-response, followed by a second letter at 8 weeks for continued non-response **Control group** received no intervention.
Outcomes	Adherence to all 3 laboratory tests (glycated haemoglobin, low-density lipoproteins, and urinary microalbumin) by 12 weeks (primary)
Funding	Merck Health Management Services
Declaration of conflict of interest	None
Power calculations for sample size	Aimed for 90% power to detect a difference between 35% (call group) and 40% (call + letter group), which required 2008 participants per group
Notes	This is a comparison between telephone call group and control

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Comment: computerised random number generator was used
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "All subjects' data were analysed according to initial randomisation whether the subject was successfully contacted or was lost to follow-up"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "Randomization resulted in small but statistically significant (P = .002) differences in the distribution of race/ethnicity across study arms. There were no significant (P < .05) differences in the distribution of other subject characteristics across study arms."

Derose 2013

Methods	**Aim**: to evaluate an automated system to decrease primary non-adherence to statins for lowering cholesterol **Study design**: RCT; **recruitment**: other - health plan (organisational referral) **Study duration**: 10 weeks; **study type**: management; **subtype**: adherence to medication/ laboratory tests
Participants	**Inclusion criteria**: $\geq$ 1 years of membership from the prescription date and no gap in enrolment more than 30 days during the past year; 24 years and older at the time of the prescription; no record of the statin prescription being filled at a health plan pharmacy after 1 to 2 weeks **Sample size**: 5216; **mean age**: 56 years; **sex**: women - 51%; men - 49% **ethnicity**: white - 28%, black - 10%, Hispanic - 30%, Asian and Pacific Islander - 7%, other - 2%, unknown - 23% **Country**: USA
Interventions	**ATCS Plus**: participants were contacted 1 to 2 weeks after the prescription date by an automated telephone call to retrieve a personalised message from the health plan. If no one answered, messages were left on answering machines directing participants to call a toll-free number to retrieve their message. Busy signals resulted in up to 2 more attempts to make telephone contact on subsequent days. Calls were made between 10 am and 8 pm. 1 week after the initiation of calls, participants who still did not fill their prescription were sent a letter. The letters were expected to arrive 9 to 11 days after the first outreach contact by telephone. More than 95% of all health plan members have a telephone number on record, and more than 99% have an address. Telephone calls began with a standard greeting saying that the message was from Kaiser Permanente. The message could be retrieved through interactive messaging during the call or by dialling a toll-free number. The personalised message conveyed that a statin drug was prescribed by their clinician and there was no record of the drug being dispensed by health plan pharmacies. The potential importance of the medication was described, and participants were encouraged to either have the prescription filled or contact the prescribing physician. The contact number of the local health plan pharmacy was provided. The telephone message was accessed in either English or Spanish and was approximately 40 seconds in duration. The letter was printed on one side in English and the other side in Spanish, and the text occupied approximately half a page. Letters were signed using the prescribing physician's name, a standard outreach practice in the health plan **Control group** received usual care (no calls)
Outcomes	Medication (statins) adherence (primary)
Funding	Merck Sharp & Dohme Corp, a subsidiary of Merck & Co Inc, Whitehouse Station, New Jersey
Declaration of conflict of interest	Ms Marrett is an employee of Merck. Dr Tunceli is an employee of Merck and owns stock in the company
Power calculations for sample size	We aimed for sufficient power to detect a 5% difference in adherence between the study arms based on a response rate of 20% in the control arm. Use of a significance level of 0.05, 90% power, a 2-sided test of proportions, and equal-sized groups required 1504 participants per group

| Notes | Quote: "Although a detailed cost analysis was not attempted, the marginal costs of the telephone calls and mailings were approximately USD 1.70 per person" |

Risk of bias		*Risk of bias*
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "A study programmer used computer-generated random numbers to sort participants into the intervention and control groups in equal proportion (day 0)."
Allocation concealment (selection bias)	Low risk	Quote:"Assignment was concealed from study investigators and analysts
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "All participants' data were analysed according to initial randomisation (intent-to-treat) whether or not the participant was successfully contacted."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	No statistically significant differences were noted between groups at baseline

Dini 1995

| Methods | **Aims**: to evaluate the effectiveness of computer generated telephone reminder calls in increasing kept appointment rates in a public health setting
Study design: quasi-RCT; **recruitment**: primary care (organisational referral)
Study duration: 1 month; **study type**: either; **subtype**: appointment reminder |
| Participants | **Inclusion criteria**: all clients with scheduled appointments for any of 4 public health programmes (immunisation, well child, or family planning) at the health clinic were eligible for participation
Sample size: 517; **mean age**: * **sex**: * **ethnicity**: *
Country: USA |

Interventions	**Computer-generated telephone reminder**: households of clients received 1 of 4 automated telephone messages specific to the programme for which the clients had an appointment. The messages were delivered between 6 pm and 9 pm on the evening preceding the scheduled appointments. Up to 9 attempts was made in order to get a successful contact **Participants in the control group** did not receive reminders (no intervention)
Outcomes	Appointment adherence (primary)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	The cost per additional appointment kept was USD 5.20 during the first full year of operation and USD 1.04 for subsequent years

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "Clients with last names beginning with the letters A through L were as signed to receive a computer-generated telephone reminder message during the evening prior to their scheduled appointment. Clients with last names beginning with the letters M through were designated as controls and did not receive a reminder message."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants were analysed
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Dini 2000

Methods	**Aims**: to assess the sustained impact of computer generated messages on immunisation coverage during the first 2 years of life **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 36 months; **study type**: prevention; **study subtype**: immunisation
Participants	**Inclusion criteria**: all children who were 60 to 90 days of age, who had received the first dose of diphtheria-tetanus-pertussis or poliovirus (PV) vaccines, and who had telephone numbers listed in the pre-existing computerised health department database **Sample size**: 1227 **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Telephone messages alone** received 1 telephone reminder message prior to the scheduled immunisation date and up to 4 telephone recall messages (1/week) over the 4-week period following the due date. Contacts were made during weekday evening hours between 6:00 pm and 9:00 pm and on Saturdays from noon to 8:00 pm (up to 5 messages) **Telephone messages + letters** (up to 5 messages and/or letters) **Letters only** (up to 5 letters) **No notification** control
Outcomes	Immunisation series completion at 24 months of age (primary); acceptability and costs (secondary)
Funding	National Immunisation Programme, CDC
Declaration of conflict of interest	NA
Power calculations for sample size	Target sample size was 1200
Notes	Costs per month (and per year) were as follows: telephone messages alone, USD 139 (USD 1672); telephone messages + letter, USD 126 (USD 1518); and letters only, USD 66 (USD 796). There were no cost-effectiveness data available for no notification control group. This is a comparison between the telephone messages alone and control groups

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Children enrolled in the evaluation were randomised to receive telephone messages followed by letters (Group A); telephone messages alone (Group B); letters only (Group C); or no notification (Group D)."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "No significant differences were noted between groups with regard to sex (p = 0.12), number of children in the household (p = 0.69), or whether children were insured by Medicaid (p = 0.72). However, significant ethnic and language differences were noted between groups." Insufficient evidence that this imbalance has introduced bias

Dubbert 2002

Methods	**Aims**: to test a hypothesis that participants who received telephone follow-up nurse counselling would report greater adherence to the walking goals than participants who received no follow-up calls, and those who received personal calls would report greater adherence than participants receiving a mixture of personal and automated calls **Study design**: RCT; **recruitment**: primary care (mail) **Study duration**: 12 months; **study type**: prevention; **subtype**: physical activity
Participants	**Inclusion criteria**: 60-80 years of age, enrolled in primary care clinic, non-institutionalised and independent in activities of daily living, stable health, willing to increase walking for exercise and attend research clinic visits, and satisfactory performance on a 6-minute walking test **Sample size**: 181; **mean age**: 69 years; **sex**: men - 99%; women - 1%; **ethnicity**: * **Country**: USA
Interventions	**20 personal phone calls** delivered by a nurse **Multimodal intervention received** 10 personal phone calls from the nurse interspersed randomly with 10 automated phone calls (P&AC) that delivered a message recorded by the nurse. Automated calls were phased in beginning with month 2. The schedule of calls was not predictable. Automated calls, designed to maintain contact and cue walking in an inexpensive and efficient manner, delivered a brief message recorded by the nurse such as, "This is your STEPS nurse reminding you to keep up your walking . . . the weather is hot now so be sure to drink plenty of water." These were delivered by a Phone Tree (Personal Communication Systems, Winston-Salem, NC) **Control** received no phone calls.
Outcomes	Self-reported (diary) walking adherence (primary); quality of life (secondary)

Funding	Department of Veterans Affairs Health Services Research and Development Service
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	This is a comparison between the **multimodal intervention** and **control.** There was no evidence of a pattern of increased risk associated with increased walking (the intervention effect)

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "After the intervention components common to all participants were completed, they were randomised to one of the three groups for different telephone follow-up interventions"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "The data collector was blinded to intervention group assignment and at the end of the trial was unable to guess individual patient group assignment better than what would be predicted by chance. The nurse was blinded to walking diary adherence data and other self-report follow-up data"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition rate; missing outcome data balanced in numbers, with similar reasons for missing data across groups. Quote: "Only 31 (15%) of the 212 randomised participants failed to complete the 12-month trial."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "BL participant characteristics were not different between any of the three treatment groups"; however participants in complex intervention arm had lower educational status; were living in rural area;

		and smoked more cigarettes than participants in the other 2 groups. There is insufficient evidence that this imbalance has introduced bias

Durant 2014

Methods	**Aims**: to develop a methodology that stratifies members by likelihood of completing a colorectal cancer screening **Study design**: RCT; **recruitment**: other - insurance company (organisational referral) **Study duration**: 3 months; **study type**: prevention; **study subtype**: screening
Participants	**Inclusion criteria**: members of an insurance plan from Horizon Blue Cross Blue Shield of New Jersey eligible for colorectal cancer screening **Sample size**: 47,097; **mean age**: 58 years;**sex**: women - 53%; men - 47%; **ethnicity**:* **Country**: USA
Interventions	**Participants in the IVR group** received 1 call with varying messaging. Depending on the number of non-adherent members and the segments' health descriptions, an outreach segment may contain ≥ 1 model segments **Participants in the control group** received no calls
Outcomes	Receipt of colorectal cancer screening at 3 months (primary); costs (secondary)
Funding	Silverlink Communications
Declaration of conflict of interest	Drs Durant and Newsom are employees of Silverlink Communications, have attended meetings and conferences for the company, and own stock options. Dr Berger is an employee of Silverlink Communications. Dr Pomerantz is an employee of Horizon Blue Cross Blue Shield of New Jersey. Ms Rubin has no financial interests to disclose
Power calculations for sample size	A power analysis was performed before the launch of the intervention to determine the minimal size needed for each segment, given an estimated effect size of 2% increase for each graded segment and an α level = .05
Notes	Authors of this study were contacted for unpublished analyses on 14 June 2015. The authors were seeking approval to share data. Communication cost per screening was USD 14.84

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Another 400 members per outreach segment were randomly assigned to a control group and received no communication."

Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	High risk	Quote: "Given that the sizes of the segmented groups were determined by the insurer's nonadherent population and not via a recruitment method, it was determined at the launch of the communication that the comparison of the completion rate of segment 4 and segment 5 was underpowered given the segment sizes and the estimated effect size"

Ershoff 1999

Methods	**Aims**: to develop and evaluate cost-effective intervention strategies for pregnant smokers with diverse demographic and smoking related characteristics **Study design**: RCT; **recruitment**: other - health plan (telephone) **Study duration**: 34 weeks; **study type**: management; **study subtype**: smoking
Participants	**Inclusion criteria**: English-speaking women 18 years of age or older who self-reported to be active smokers at their initial prenatal appointment **Sample size**: 332; **mean age**: 30 years; **sex**: women - 100%; **ethnicity**: white - 61%, black - 16%, Hispanic - 15%, other - 8% **Country**: USA
Interventions	**IVR**. Women assigned to this group were sent Living Smoke-Free and had access to a computerised interactive telephone support system developed with InfoMedics. Subjects were mailed an informational brochure and provided a unique identification number and password to gain access to the system. A subsequent 10-minute telephone call from a health educator answered questions and provided further details on use of the system. Using a touch-tone telephone, subjects could access the IVR programme with a toll-free number 7 days a week, 24 h a day. Upon calling the system, subjects were asked a series of questions about their smoking behaviour, beliefs, and readiness to change. Users provided answers through their touch-tone telephone keypad. In response, the programme provided stage-appropriate customised messages recorded by a professional

voice model. With stored data from previous calls, the programme automatically reinforced any positive changes made by a smoker over time (e.g. a reduction of > 25% in number of cigarettes smoked per day, a decision to set a quit date). Each call was designed to be approximately 5 min in length and included stage relevant interactive exercises, a summary and reinforcement of key messages and goal commitments, and advice to review Living Smoke-Free

Motivational interviewing (MI). Women assigned to the MI group were sent Living Smoke-Free and were provided telephone counselling by nurse educators trained in the techniques of MI. MI has been defined as a "directive, client-centred counselling style for helping clients explore and resolve ambivalence about behaviour change." It emerged as an alternative to direct persuasion in counselling people with addictive problems. MI conceptualises motivation as a state that fluctuates from time to time or situation to situation, rather than as an inherent character trait. Thus, motivation is perceived as open to therapeutic intervention. The dangers of prenatal smoking have been widely disseminated and pregnant women report strong belief in that harm. MI attempts to highlight and help resolve ambivalence resulting from the discrepancy between beliefs and behaviour through reflection, advice, and support. Investigators trained 17 preterm nurse educators experienced in telephone-based patient counselling in the principles and strategies of MI. The training consisted of a 6-hour session led by nationally-known experts, a 2-hour small-group meeting, and an 85-page reference manual with salary support for up to 8 h of self-study

Booklet only. Women assigned to this group only received Living Smoke-Free. The multicolour, 32-page booklet was developed by the investigators in collaboration with Krames Communications, a Division of the StayWell Co. Targeted to the lifestyle of pregnant smokers, it is printed in clear type and written at an eighth-grade reading level. Multiracial/ethnic illustrations of smokers were designed to appeal to a wide audience of pregnant women. Visual and written messages tailored to stage of readiness to change are presented through 4 different characters, each representing a different stage. The booklet includes advice about preparing to quit, setting a quit date, methods for quitting, obtaining social support, and relapse prevention strategies. Advice about exercise, diet, and stress management are also included

Outcomes	Smoking abstinence (biochemically confirmed); satisfaction with the intervention (secondary)
Funding	Robert Wood Johnson Foundation
Declaration of conflict of interest	NA
Power calculations for sample size	At alpha set at 0.05 and power at 0.80 (1-tailed test), 125 participants per group were needed to detect the 13% difference in quit rates projected for the booklet-only versus IVR comparison
Notes	This is a comparison between IVR arm and booklet arm only

Risk of bias   *Risk of bias*

Bias	**Authors' judgement**	**Support for judgement**

Ershoff 1999   *(Continued)*

Random sequence generation (selection bias)	Unclear risk	Quote: "After random assignment to one of the three intervention groups . . . subjects were mailed a copy of the self-help smoking cessation booklet, Living Smoke-Free-A Healthier Start for You and Your Baby."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "Providers were blind to study participation and group assignment"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	High risk	Only participants who remained in the intervention were included in the final analysis. Although the reasons for attrition such as abortion/miscarriage (n = 31), disenrollment from the health plan prior to delivery (n = 22), and delivery prior to the 32nd week of pregnancy (n = 5) were reported
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "No statistically significant differences were observed for any baseline measures"

Estabrooks 2008

Methods	**Aims**: to determine the feasibility and effectiveness of automated telephone support calls targeting physical activity and healthful eating as strategies for weight loss for patients with pre-diabetes **Study design**: RCT; **recruitment**: other - community (in-person during diabetes prevention classes) **Study duration**: 12 weeks; **study type**: prevention; **subtype**: weight management
Participants	**Inclusion criteria**: adults participating in diabetes prevention class, English-speaking, not pregnant during the study period, had access to a telephone, and were not concurrently enrolled in another research study involving diabetes management or weight management **Sample size**: 77; **mean age**: 59 years; **sex**: men - 39%, women - 71%; **ethnicity**: white - 68%, Hispanic - 18%, other or unknown - 7%, black - 4%, Asian - 3% **Country**: USA

Interventions	**Participants in the intervention group** received IVR calls that were designed to address and reinforce the messages delivered in the pre-diabetes class and the content of the participant action plans. Participants had the option to choose to listen to messages related to either nutrition or physical activity, followed by behaviour change techniques between goal-setting and self-monitoring. Received 7 counselling calls lasting 5-10 min while 5 calls provided either physical activity or nutrition tip, that lasted for a minute **Participants in the control group** did not receive calls (no intervention).
Outcomes	Physical activity; dietary habits; weight (percent lost) (primary); satisfaction (secondary)
Funding	Department of Prevention at Kaiser Permanente Colorado
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	ClinicalTrials.gov Identifier: NCT00384488

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization occurred at the class-level and was completed by a research assistant who chose a slip of paper with study group assignment from a hat"
Allocation concealment (selection bias)	Low risk	Study participants were not informed of the study arm until they completed the informed consent as to not influence the decision to participate
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "While research staff was unblinded to study arm designation, study participants were not informed of the study arm until they completed the informed consent as to not influence the decision to participate"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	There were no differences in dropout rate between study conditions
Selective reporting (reporting bias)	Low risk	The protocol was available, and all outcomes of interest were reported

Other bias	Low risk	Groups were balanced at baseline.

Estabrooks 2009

Methods	**Aims**: to determine the effectiveness of automated telephone counselling to support parents of overweight or at-risk children to change the home environment to foster more healthful child eating and activity behaviours, thereby reducing child BMI and BMI z-scores **Study design**: RCT; **recruitment**: * (telephone) **Study duration**: 12 months; **study type**: prevention; **subtype**: weight management
Participants	**Inclusion criteria**: children aged 8-12 years with a BMI of 85th percentile for their age who received care from Kaiser Permanente Colorado **Sample size**: 220; **mean age**: 11 years; **sex**: boys - 54%; girls - 46%; **ethnicity**: white - 63%, Hispanic - 26%, other - 11% **Country**: USA
Interventions	**The Family Connections (FC) IVR group** received 10 calls, 1st call a week after the group session, the call contents were tailored to participants responses using logic branching method. Calls can be initiated by either the system or the participant. At each call, the goals set in the previous week are assessed, and participants hear related tips and then select specific messages. Calls concluded with a goal setting procedure. The 6th IVR-counselling call provided parents with instruction on a family goal-setting procedure related to physical activity and eating based on the 5A's model. Calls 7-10 reinforced the information delivered in the initial 6 calls **FC workbook**. A 61-page workbook was developed to promote increased physical activity and the consumption of fruits and vegetables in concert with decreased sugared-drink consumption and television viewing/recreational computer time. The workbook included 2 distinct sections. Part 1 targeted 3 days of intervention, and part 2 targeted 2 days, each with specific homework assignments. The workbook encouraged parents to complete 5 days of intervention across a single week. Homework assignments were intended to encourage lasting changes in the families. All parents randomly assigned to this intervention received the workbook from study research assistants **FC group**. This intervention consisted of 2 small-group sessions (2 h each, spaced 1 week apart) held at a local clinic and delivered by a dietitian. Each session included 10-15 parents representing distinct children and utilised the Family Connections workbook. The first session focused on parents' behavioural health skills and knowledge of weight, nutrition, and physical activity. It also identified key parenting skills: limit setting, effective communication, and role modelling. This session concluded with role playing, problem-solving, and the development of an action plan. Session 2 integrated the knowledge acquired in Session 1, the experiences associated with the action plan, and strategies for restructuring the home environment. The session again concluded with parents' completing an action plan for parental behaviours, role modelling, and changes to the home environment that would facilitate healthy eating and physical activity
Outcomes	BMI z-score, physical activity; sedentary behaviour; dietary habits (primary)
Funding	Garfield Memorial Fund, Kaiser Permanente Colorado Weight Management Program

Estabrooks 2009 (*Continued*)

Declaration of conflict of interest	None
Power calculations for sample size	Sample size calculations were completed, varying the detectable effect sizes from small to medium with a power of 0.8. The result was a need for 42 participants per intervention to detect a medium effect and 64 participants to detect a small effect
Notes	This is a comparison between FC IVR group and FC group.

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Through a random-numbers table, participants were assigned randomly . . . to the FC-workbook, the FC-group, or the FC-IVR intervention."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data balanced in numbers across groups. ITT analysis was used to include all participants who received the intervention or FC workbook in the analysis
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Groups were balanced at baseline. Quote: "The intervention conditions did not differ on any demographic variables."

Farzanfar 2011

Methods	**Aims**: to test the feasibility and impact of an automated workplace mental health assessment and intervention **Study design**: RCT; **Recruitment**: primary care (advert in clinic) **Study duration**: 6 months; **study type**: management; **subtype**: mental health

Participants	**Inclusion criteria**: ability to speak and understand conversational English, 18 years of age or older, access to a touch-tone telephone, not undergoing mental health treatment or currently taking a medication prescribed for mental health treatment, and experiencing some type of emotional distress as indicated by scoring positive on the WHO-5 Well-being Index and the Functional Impairment question **Sample size**: 164; **mean age**: 39 years; **sex**: men - 24%, women - 76%; **ethnicity**: white - 56%, black/African American - 32%, other - 12% **Country**: USA
Interventions	**Telephone-Linked Communications (TLC) detect system** is an automated mental health screening and counselling programme that employees could access from any phone. The assessment is made in a hierarchical manner. Those testing positive proceed to 2nd level of more disorder-specific and in-depth screening by additional screening instruments. This provides extensive information about user's mental health problem, including its symptoms, natural history, and available treatments. It also directs the user to the referral sub-module providing disorder-specific information on both self-management and professional help appropriate to the level of its severity as determined by the system's assessment. Follow-up calls were used to check user's adherence to the system's advice and to check if they had sought professional assistance or engaged in self-help. For those who did not adhere, an intervention follow-up module provided tailored educational materials, including description of the disorder and providing treatment options. Both intervention and follow-up calls provided an option to spread out the information into multiple sessions to reduce the time burden. This also included a validation function that checked whether the health care providers agreed with the system's assessment. Each call lasted between 30-90 min. The calls used digitised voice of a female voice actor who received coaching to deliver the message appropriately **Participants in the control group** received advice only (via IVR)
Outcomes	Quality of life (physical health scale and mental health scale), total depression, perceived stress levels/score, total well-being (WHO-5) (primary); acceptability of service/satisfaction (secondary)
Funding	CDC
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "After eligibility screening, baseline data were collected from study participants, who were subsequently randomised and connected to the automated program

Farzanfar 2011 (*Continued*)

<table>
<tr><td></td><td></td><td>to receive assessment for mental health disorders (all subjects) and intervention (only experimental subjects)."</td></tr>
<tr><td>Allocation concealment (selection bias)</td><td>Unclear risk</td><td>Insufficient information</td></tr>
<tr><td>Blinding of participants and personnel (performance bias)
All outcomes</td><td>Unclear risk</td><td>Insufficient information</td></tr>
<tr><td>Blinding of outcome assessment (detection bias)
All outcomes</td><td>Unclear risk</td><td>Insufficient information</td></tr>
<tr><td>Incomplete outcome data (attrition bias)
All outcomes</td><td>Low risk</td><td>ITT analysis was used to include all participants who received the intervention or control group in the analysis</td></tr>
<tr><td>Selective reporting (reporting bias)</td><td>Unclear risk</td><td>Insufficient information</td></tr>
<tr><td>Other bias</td><td>Low risk</td><td>Quote: "There were no significant demographic differences between the two study groups at baseline"</td></tr>
</table>

Feldstein 2006

<table>
<tr><td>Methods</td><td>Aims: to evaluate interventions to improve laboratory monitoring at initiation of medication therapy
Study design: cluster RCT with 15 clusters; recruitment: other - health plan (organisational referral)
Study duration: 25 days study type: management; subtype: adherence to medication/ laboratory tests</td></tr>
<tr><td>Participants</td><td>Inclusion criteria: adults aged 18 years & above; spoke English; had continuous HMO membership for ≥ 12 months, a pharmacy benefit, and a telephone number; had received a new prescription of a study medication from their PCP; and had not had recommended baseline laboratory monitoring within 5 days after the medication dispensing
Sample size: 961; mean age: 59 years; sex: men - 47%; women - 53 %; ethnicity:*
Country: USA</td></tr>
<tr><td>Interventions</td><td>Automated telephone voice message (AVM): AVM prompted participants to seek preordered laboratory tests. A personalised message retrieved after entering a health record number and year of birth stated that the medication the participant had been dispensed required laboratory monitoring; messages referenced the actual drug dispensed and the monitoring tests required. The participant was advised that the testing had been ordered and could be completed at any health maintenance organisations laboratory
The EMR intervention consisted of a participant-specific electronic message to the PCP from the chair of the participant safety committee. The message stated that computer</td></tr>
</table>

Automated telephone communication systems for preventive healthcare and management of long-term conditions (Review)   **182**

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	records indicated that the participant had been dispensed a new medication, laboratory monitoring was recommended, and the participant had not received the test(s) between 6 months before and 5 days after the dispensing. The message referenced internal and external guideline resources, recommended specific tests, and provided a sample letter the PCP could send to the participant to request that he or she go to the laboratory **Pharmacy Team Outreach Intervention** began with a telephone call from a nurse in the pharmacy department to the participant to encourage laboratory testing. If the nurse successfully contacted the participant, a follow-up letter reminded the participant to obtain the laboratory test(s). If telephone contact was not successful, the nurse sent a letter suggesting that the participant go in for testing. If participants had questions or concerns about their medication during the contacts, a pharmacist was available for consultation **Usual care** (controls)
Outcomes	Completion of all recommended baseline laboratory tests (primary)
Funding	This project was supported by Kaiser Permanente's Garfield Memorial Fund and cooperative agreement U18 HS010391 from the Agency for Healthcare Research and Quality
Declaration of conflict of interest	None reported
Power calculations for sample size	"Using retrospective data, we estimated that 25% of the UC group would receive laboratory testing by 30 days after a new medication was dispensed. With 200 participants per group, we determined that we could detect a difference of approximately 13% between the groups with a probability of 0.80."
Notes	This is a comparison between the AVM arm versus usual care. 3 clusters (267 participants) were allocated to AVM and 4 clusters (237 participants) to usual care; remaining clusters (n = 8) were arms not considered in this review. Note that analysis did not appear to adjust for clustering; therefore a unit of analysis error exists that may result in overly precise effect estimates for this study

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The random sequence was generated by a computerized random-number generator"
Allocation concealment (selection bias)	Unclear risk	Quote: "All 15 clinics were randomised at one time; therefore, allocation concealment was not an issue."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "Patient participants were masked from the nature of the study. Because of the nature of the intervention, the study nurse conducting the interventions was not blinded to group assignment."

Feldstein 2006   (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Primary outcomes were obtained entirely from electronic records, and the study analyst was blinded to study group assignment before ascertainment of outcomes."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "No patients were lost to follow-up."
Selective reporting (reporting bias)	Low risk	Outcomes of interest reported
Other bias	Unclear risk	There was a small baseline imbalance, but it is unlikely that this influenced the results. Quote: "The other characteristics of the study groups were also similar except that the AVM group had a smaller proportion of female PCPs". There was insufficient information to judge whether selective recruitment of cluster participants may have occurred

Fiscella 2011

Methods	**Aim**: to examine the impact of a multimodal intervention on mammography and colorectal cancer screening rates in a safety-net practice caring for underserved patients **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**: 12 months; **study type**: prevention; **subtype**: screening
Participants	**Inclusion criteria**: registered patient at the practice; ($\geq$ 1 visit to the practice in the past 2 years (to ensure participants were actively receiving care at the practice); aged 40-75 years for mammography screening, and 50-75 years for colorectal cancer screening; past due for annual mammography or colorectal cancer screening (recommended intervals are 10 years for those screened through colonoscopy, 5 years for those screened with sigmoidoscopy and/or barium enema, and annually for those screened through faecal occult blood tests) **Sample size**: 469; **mean age**: *; **sex**: women - 56%; men - 44% (for colorectal cancer); **ethnicity**: white - 61%; black/African Amercian - 28%; Hispanic - 5%; Asian - 5% **Country**: USA
Interventions	**Multimodal intervention**: outreach to unscreened participants consisted of 2 personalised letters and up to 4 automated telephone reminder (ATR) calls. The automated telephone reminders were scripted, pre-recorded messages that include the participant's first name. The message identified the callers and the practices; it then informed the participants they were past due and the phone number to call to schedule a screening (mammography) or an appointment (to discuss colorectal cancer). The first letter was sent within the first week of enrolment. This was followed by 2 completed ATRs at week 2 and 6. For participants who remain unscreened, a second letter was mailed out at week 12 followed by a third ATR at week 14. For participants past due for colorectal cancer

	screening, the letter included a testing kit for faecal immunochemical testing for home use. A final ATR was made at week 26. Both the letters and ATRs provided the phone number of the outreach worker if help is needed. Using a 3-way call option, the outreach worker could link participants with mammography schedulers or with the National Breast and Cervical Cancer Early Detection Program (NBCCEP), which provides free screening for the uninsured. The intervention also included participant and physicians prompts **Participants in the control group** received usual care (chart review).
Outcomes	Chart documentation of breast cancer screening, colorectal cancer screening, or both (primary)
Funding	RSGT-08-077-01-CPHPS American Cancer Society
Declaration of conflict of interest	None declared
Power calculations for sample size	80% power to detect a difference of 18% in the mammography group and 13% in the colorectal screening group using 95% confidence intervals has been calculated
Notes	Clinicaltrials.gov Identifier: NCT00818857

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was stratified by screening type (mammography or colorectal cancer) to ensure that comparable groups of patients are randomised to each arm."
Allocation concealment (selection bias)	Low risk	Quote: "Unique ID numbers were assigned to patients that identify their intervention group."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "The statistician maintained the key; all other study personnel were blinded to the intervention group assignment."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Baseline and follow-up measures were taken by a research assistant who is blinded to group assignment
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quuote: "We adopted an intention-to-treat analysis. That is, all patients originally assigned to a group were analysed."

Selective reporting (reporting bias)	Low risk	The study protocol is available and all outcomes of interest have been reported in the pre-specified way
Other bias	Unclear risk	Quote: "There was no statistically significant baseline difference between the intervention and control groups for the mammography intervention. Race was the only characteristic that differed between participants at baseline between those in the intervention and control groups in the colorectal cancer group"

Fortuna 2014

Methods	**Aims**: to assess the relative impact of various components of the reminder, recall, and outreach (RRO) model on breast cancer and colorectal cancer screening rates within a safety net practice **Study design**: RCT; **recruitment**: primary care (mail) **Study duration**: 12 months; **study type**: prevention; **study subtype**: screening
Participants	**Inclusion criteria**: being a registered patient at the study clinic; being an active patient at the practice (having ≥ 1 visit to the practice in the last 2 years); women aged 40-74 for breast cancer screening; aged 50 to 74 for colorectal cancer screening; past due for breast cancer or colorectal cancer screening **Sample size**: 1008; **mean age**: inestimable;**sex**: women - 55%; men - 45% **ethnicity**: non-Hispanic white - 48%, non-Hispanic black - 37%, other (including Hispanic) - 15% **Country**: USA
Interventions	**Letter and automated telephone message (letter + autodial)** group received the letter plus a series of up to 5 automated telephone calls. Investigators used the participants' most current available telephone numbers from the medical record. Telephone calls were attempted for up to 2 weeks at varying times throughout the day/evening until a person or an answering machine responded. The automated message contained similar information to the letter, with instructions to call the outreach worker or the practice to arrange for screening or with questions. These calls were delivered to participants on weeks 2 and 8 following randomisation. Until there was documented screening, chart reviews were performed on weeks 12 and 26. Automated telephone messages were repeated on weeks 14, 28, and 38 for participants remaining unscreened at these time periods **Letter + autodial + prompt** group received the same intervention as above plus paper prompts delivered at the time of a participant-initiated visit. We used paper prompts because this enabled us to deliver similar prompts to participants and clinicians simultaneously, and because of doubts regarding effects of electronic prompts on clinician screening. Research staff reviewed scheduling modules weekly to check for planned acute and preventive visits by participants in this group. Prompts were delivered to the treating clinician at the point of care to remind the participant and provider about overdue screening. Prompts were provided at both acute and preventive visits. The back of each

	colorectal cancer prompt sheet summarised advantages and limitations for colorectal cancer screening modalities as a way of facilitating clinician-participant discussion. The prompt addressed both colonoscopy and faecal immunochemical tests **Letter + personal call** group received the letter plus a personal telephone call from a trained outreach worker. These telephone calls were attempted up to 3 times, at varying times of the day and varying days of the week, with a 1-week period between attempts. When/if the participant was reached, the outreach worker explained that she was calling on behalf of the practice to remind the participant that s/he was overdue for cancer screening. She used motivational interviewing principles to encourage screening and offered assistance with scheduling an appointment, as well as relevant telephone numbers and logistical assistance, including referral(s) for free mammography and faecal immunochemical test for the uninsured. Participants that did not want to undergo a colonoscopy were offered a mailed faecal immunochemical test as an alternative method of colorectal cancer screening. If a participant refused to have any screening tests done for breast cancer or colorectal cancer, it was indicated in the patient registry and interventions were stopped **Reminder letter**. A single letter from the practice using the participant's most current available home address from the medical record. The letter, with a personalised salutation, indicated to the participant that s/he was overdue for screening and included information regarding the importance of screening and how to schedule screening. The letter provided the name and telephone number of the outreach worker available to provide assistance with scheduling mammography or arranging colonoscopy referrals. The letter also indicated that free screening for uninsured/underinsured participants was available through a state sponsored programme. Letters were available in English and Spanish
Outcomes	Electronic medical records documentation of mammography screening at 52 weeks (primary)
Funding	American Cancer Society - RSGT-08-077-01-CPHPS
Declaration of conflict of interest	None declared
Power calculations for sample size	No
Notes	This is a comparison between letter + autodial group versus letter only (control)

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Comment: computerised random number generator (random number algorithm, stratified by the type of screening(s) was used
Allocation concealment (selection bias)	Low risk	Quote: "Allocation was concealed … An offsite study statistician, who was blinded to the identity of the patient, assigned participants equally into one of the four inter-

Fortuna 2014 (*Continued*)

		vention groups"
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of study personnel was ensured. Quote: "Healthcare personnel and study staff were unaware of group assignment"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT analysis was used to include all participants who received the intervention or usual care in the analysis. Quote: "All subjects were analysed in the originally assigned study group, based on intention-to-treat"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Groups were balanced at baseline. Quote: "There were no significant differences in participants at baseline between the four intervention groups"

Franzini 2000

Methods	**Aims**: to measure the efficacy of reminder/recall systems (manual postcard or a computer generated phone message) in private provider offices through collection of return visits and vaccine delivery rates **Study design**: cluster RCT with 6 clusters; **recruitment**: primary care (organisational referral) **Study duration**: *; **study type**: prevention; **subtype**: immunisation
Participants	**Inclusion criteria**: children < 12 months of age and eligible for first, second, or third diphtheria-tetanus-pertussis vaccine **Sample size**: 1138; **mean age**: *; **sex**: *; **ethnicity**: * **Country**: USA
Interventions	**Autodialer**: participants received an automated reminder message about their upcoming visits for immunisation 7 days prior to the appointment The **mailing arm** received a postcard reminder 7 days prior to the appointment **No calls** (control)
Outcomes	Immunisation status; cost-effectiveness (both primary)
Funding	Association of Teachers of Preventive Medicine, National Centers for Disease Control, National Immunisation Program

Franzini 2000 (*Continued*)

Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	This is a comparison between Autodialer and control; 295 participants in mailing arm were not included in the review. Note that analysis did not appear to adjust for clustering; therefore a unit of analysis error exists that may result in overly precise effect estimates for this study. The average cost per child in the Autodialer (intervention) group was USD 15.46 and in the control the average cost per child was USD 11.46. These do not include start-up costs

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Sites were randomly assigned to one of three arms of the study: mail, Autodialer, or control"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	There was insufficient information reported to allow an assessment of whether cluster participants were selectively recruited Baseline imbalances may have existed, quote, "With the exception of age, demographic characteristics of the sites were not uniform."

Friedman 1996

Methods	**Aims**: to assess the impact of telecommunication system on antihypertensive medication adherence and blood pressure control **Study design**: RCT; **recruitment**: community centres (mail and telephone) **Study duration**: 6 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: aged 60 years and above, be under the care of a physician for hypertension, and be prescribed antihypertensive medication **Sample size**: 267; **mean age**: 76 years; **sex**: men - 23%, women - 77%; **ethnicity**: other - 89%, black - 11%
Interventions	**The Telephone-Linked Computer (TLC)** system is an interactive computer-based telecommunications system that is totally automated and carries out telephone conversations with hypertension patients in their homes for the purpose of monitoring their blood pressure and treatment, and counselling them to be adherent to their medication regimens. TLC speaks to participants over the telephone using computer-controlled speech while the participants communicate using the touch-tone keypad on their telephones. TLC applications promoted self-efficacy by setting small incremental goals and by providing positive feedback and reinforcement regarding the users' actions. During the conversation, participants reported their blood pressure, their understanding of their prescribed antihypertensive medication regimen (medication names, dosages, and frequency of administration), their adherence to the medication regimen, and whether they had symptoms known to be side effects of their antihypertensive medications. TLC provided education and motivational counselling to improve medication adherence. At the end of the conversation, the information provided by the participant was stored in a database and was transmitted to the participant's physician on a printed report in which data was displayed over time and clinically significant information was highlighted. Calls can be initiated by either TLC or the user, and are made once weekly, each lasting for 4 min. Participants also received training to use TLC and an automated sphygmomanometer. Participants in this group continued to receive usual care **Participants in the control group** received usual care alone
Outcomes	Change in antihypertensive medication adherence (primary); systolic blood pressure and diastolic blood pressure during 6 months (primary); satisfaction (participants and physicians); cost-effectiveness (both secondary)
Funding	National Heart, Lung and Blood Institute
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	The system was cost-effective, especially for non-adherent participant users - USD 3. 69 per 1 mmHg improvement in diastolic blood pressure at 80% baseline adherence to USD 0.87 per 1 mmHg improvement at 50% adherence

Risk of bias		*Risk of bias*
Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Unclear risk	Quote: "During the home visit a trained field technician confirmed final eligibility and completed baseline measurements, after which participants were randomly assigned to either the TLC or usual care groups using a paired randomisation protocol."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blindig of personnel ensured. Quote: "All participants received a final home visit 6 months after entry into the study when all study measurements were re-administered by technicians blinded to the study assignments."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data balanced in numbers, with similar reasons for missing data across groups. Quote: "There were no significant differences in the characteristics of TLC users and nonusers who dropped out of the study"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	There was no statistically significant difference in any characteristic between individuals randomised to TLC or to usual care

Glanz 2012

Methods	**Aims**: to determine the efficacy of an automated, interactive, telephone-based health communication intervention for improving glaucoma treatment adherence among patients in 2 hospital-based eye clinics **Study design**: RCT; **recruitment**: secondary care (mail and telephone) **Study duration**:12 months; **study type**: management; **study subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: treatment for their eye condition at 1 of the 2 participating eye clinics; aged 18-80 years; white or black/African American; have a home or cellular telephone; speak and understand English; be diagnosed with glaucoma or ocular hypertension for ≥ 1 year; be prescribed daily doses of topical glaucoma treatments for at least the past year; no eye surgery within the past 3 months; have better than 20/200 vision in at least

	1 eye; and be able to read or have someone who can help them with reading printed materials. Participants also had to acknowledge non-adherence, in the past year, with medication taking, obtaining refills or clinic appointments in a screening interview **Sample size**: 312; **mean age**: 63 years;**sex**: women - 37.5%; men - 62.5% **ethnicity**: white - 9%; black/African American - 91%. **Country**: USA
Interventions	**Automated, interactive, telephone-based health communication intervention** and accompanying printed materials. The telephone intervention consisted of 12 educational telephone calls over a 9-month period: a call every 2 weeks during months 1 and 2; a call every 3 weeks during months 3, 4, and 5; and a call every 4 weeks during months 6, 7, 8, and 9. The objectives of the calls were to provide individually tailored messages to encourage adherence with medication taking, appointment keeping, and refills; provide information about glaucoma; and intervene on barriers to adherence. The telephone-based health communication intervention utilised interactive voice recognition technology to facilitate interest, participation, and interaction with call recipients and to standardise the content and delivery of the calls. Participants had the option to respond orally or use a telephone keypad. Telephone calls were primarily outbound, but participants had the option to call into the system if they missed a call. After 5 days of unsuccessful attempts to deliver a call, a reminder card was sent requesting that the participant call in to receive his or her message. Each call was structured to include a salutation; a medication regimen review; the core conversation, with tips to address barriers to adherence; general glaucoma information; and a closing **Participants in the control group** received usual care.
Outcomes	Self-reported medication adherence; self-reported refill adherence (primary)
Funding	National Institutes of Health grant R01 EY016997 and National Eye Institute Core Grant for Vision Research P30 EY 006360
Declaration of conflict of interest	None reported
Power calculations for sample size	Using a 2-group design and a planned sample size of 300 participants, there was adequate power (80%) to detect a 15-20% percentage point difference in adherence with glaucoma treatment at 12-month follow-up. Investigators used software programme Power and Precision by Borenstein et al
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Random number generator was used in Excel (Microsoft), and participants were randomised in blocks of 10."
Allocation concealment (selection bias)	Unclear risk	Insufficient information

Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "Medical providers were masked to assignment because they were not directly involved in the trial"
Blinding of outcome assessment (detection bias) All outcomes	High risk	Quote: "Research interviewers were not masked to assignment because it was necessary to determine treatment group participants' preferences for intervention delivery"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition rate (intervention = 7, control = 5). Missing outcome data balanced in numbers across groups
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Groups were balanced at baseline

Goulis 2004

Methods	**Aims**: to determine if home-centred monitoring through telemedicine has an impact on clinical characteristics, metabolic profile and quality of life in overweight and obese participants **Study design**: RCT; **recruitment**: secondary care (organisational referral) **Study duration**: 6 months; **study type**: prevention; **subtype**: weight management
Participants	**Inclusion criteria**: adults aged $\geq$ 18 years; BMI > 25 kg/m^2, and could operate regular phones and electronic microdevices. Participants were also not on any obesity pharmaceutical treatment in the past year **Sample size**: 122 ; **mean age**: 44 years; **sex**: men - 12%; women - 88 %; **ethnicity**:* **Country**: Greece
Interventions	**All participants of intervention group** (in addition to care as usual) were supplied with an electronic blood pressure monitor (Card Guard CG800BP) and an electronic weight scale (Rowenta). They were given a treatment plan, where they had to measure and transmit 3 times a week, for 6 months, their blood pressure and weight and answer 2 life style questions: 'Did you follow your diet plan during the last 2 days?' and 'Did you follow your exercise plan during the last 2 days?'. The participants chose the type of data transmission they preferred among 3 options: Automated Call Centre through a regular phone, Wireless Application Protocol (WAP) server through a cellular phone and World Wide Web (Internet) server through a personal computer. All of them chose the Automated Call Centre **Participants in the control group** received usual care, which included a regular, hospital-based, obesity treatment programme on an outpatient basis consisted of diet and physical activity guidelines

Outcomes	Clinical parameters (body weight, BMI, systolic blood pressure, diastolic blood pressure) ; laboratory parameters (plasma glucose, serum triglycerides, serum high-density lipoprotein-cholesterol and total serum cholesterol), obesity assessment (primary); Health Related Quality of Life, European Quality of Life (5 Dimensions) (secondary)
Funding	European Commission: distance Information Technologies for Home Care for Citizens' Health System (CHS), IST-1999-13352
Declaration of conflict of interest	NA
Power calculations for sample size	"Power calculation indicated that a minimum sample size of N = 100 was required, assuming 0.10 level of significance and 80 percent statistical power"
Notes	During the study, intervention group and control group participants engaged in a hospital-based, obesity treatment programme based on diet and physical activity guidelines

Risk of bias | *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Patients were randomised into intervention and control groups with a proportion of 1:2. Upon meeting the eligibility criteria and signing the consent form, all patients were allocated using central computerized randomizations. The random numbers were generated in blocks of six. Patients who received an odd number formed the intervention group, whereas patients who received an even number served as the control group"
Allocation concealment (selection bias)	Unclear risk	Quote: "all patients were allocated using central computerized randomisation"
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of key study personnel was ensured. Quote: "Both physicians and dieticians were blinded to the treatment arm of the patient"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Data were analysed in an intention-to-treat way using the LOFC procedure (last observation carried forward)."

Selective reporting (reporting bias)	Low risk	All of the study's pre-specified outcomes that are of interest in the review have been reported
Other bias	Low risk	There were no baseline differences between the groups

Graziano 2009

Methods	**Aims**: to determine the impact of a daily, automated telephone intervention on glycated haemoglobin levels; self-monitoring blood glucose (SMBG) frequency; self-reported beliefs regarding severity of diabetes, susceptibility to complications of diabetes, and the benefits of and barriers to self-management of diabetes compared with standard care in adults with type 2 diabetes mellitus **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**:12 months; **study type**: management; **subtype**: diabetes
Participants	**Inclusion criteria**: aged $\geq$ 50 years with a diagnosis of type 2 diabetes mellitus documented in the medical record for $\geq$ 12 months, glycated haemoglobin levels equal to or greater than 7.0% within the past month, speak and understand English, access to either a landline or cellular phone, ability to hear and orally respond to automated telephone voice commands, responsible for own self-care, access to reliable glucose meter that has 3-month storage capacity, and self-care regimen that includes SMBG at least daily **Sample size**: 119; **mean age**: 62 years; **sex**: men - 55%, women - 45%; **ethnicity**: white - 77%; non-white - 23% **Country**: USA
Interventions	In addition to care as usual, the **intervention group** received daily, automated, prerecorded voice message lasting less than a minute related to type 2 diabetes mellitus. A trained actor playing "Alice," a 60-year-old woman with type 2 diabetes mellitus recorded the scripted messages in a professional recording studio. The messages changed every day during the 90-day intervention period. Messages focused on the American Association of Diabetes Educators' AADE7 Self-care Behaviours including healthy eating, being active, monitoring (i.e. SMBG), taking medication, problem-solving, reducing risks, and healthy coping. The messages also focused on changing attitudes and beliefs regarding the susceptibility and severity of type 2 diabetes mellitus and reduction of barriers related to performing self-care behaviours. Participants chose the time of day they wanted to receive the automated calls and the telephone number they wanted the system to call. The system delivered up to 3 calls each day. If there was no answer or if an answering machine picked up the first call, the system called back an additional 2 times at 15-minute intervals. If the call was not received by the participant after the third attempt, the system called back the next day at the previously agreed time. No messages were left. Participants were asked to answer and respond to as many calls as possible throughout the study. After listening to the prerecorded message, participants responded to Alice's questions regarding SMBG. The responses are relayed to a website that the investigators have access to. The system was programmed to send an email alert to the investigator when a participant reported a blood glucose level equal to or greater than 400 mg/dL, equal to less than 60 mg/dL, or an answer of 'yes' to either of the final questions. The

	investigator followed up with a telephone call to the participant and to the participant's clinic if necessary **Participants in the control group** received usual care.
Outcomes	Glycated haemoglobin (primary); self-monitoring of blood glucose frequency (secondary)
Funding	Novo Nordisk
Declaration of conflict of interest	NA
Power calculations for sample size	An effect size of −0.6 glycated haemoglobin percentage points ± 1.2 percentage points was used for the power calculation. These calculations assumed a sample size of 60 per group, 80% power, and a 2-sided t-test with type 1 error set at 0.05
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A predetermined randomisation schedule from a series of permuted blocks was employed for each stratum"
Allocation concealment (selection bias)	Low risk	Quote: "Opaque randomisation envelopes that contained the randomisation assignment were labelled with participants' study numbers by a third party prior to initiation of the study."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Blinding of participants and the investigator was not possible because of the nature of the intervention. An attempt was made to avoid drawing attention to the randomisation assignment when providers were present"
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Laboratory personnel who ran the HbA1c assays were unaware of the patients' study status."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition (intervention n = 2, control n = 4). Missing outcome data balanced in numbers, with similar reasons for missing data across groups. Quote: "One participant in the study died shortly after being allocated to the treatment group and another participant in that group did not comply

Graziano 2009 (*Continued*)

		with study follow-up procedures. 2 participants in the comparison group were lost to follow-up, and 2 participants did not comply with study follow-up procedures"
Selective reporting (reporting bias)	Low risk	Outcomes of interest reported
Other bias	Low risk	Groups were balanced at baseline; no significant differences were found (P < 0.05)

Green 2011

Methods	**Aims**: to evaluate the effectiveness of an automated telephone system reminding participants with hypertension to obtain overdue antihypertensive medication refills **Study design**: RCT; **recruitment**: other - health plan (*) **Study duration**: *; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: participants aged $\geq$ 18 years with hypertension identified from a case-identification database **Sample size**: 8306; **mean age**: *; **sex**: *; **ethnicity**: * **Country**: USA
Interventions	**Intervention group**: the outreach consisted of an automated telephone call that instructed the member to order a refill for their overdue prescription by calling the number on their medication bottle or by using the Kaiser Permanente online refill system **Participants in the control group** received usual care.
Outcomes	Refill rate at 2 weeks (primary)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	Information from abstract only

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Greist 2002

Methods	**Aims**: to compare the value of computer-guided behaviour therapy value with that of a clinician-guided behaviour therapy and systematic relaxation as a control treatment **Study design**: RCT; **recruitment**: primary care (adverts in radio, newspapers and articles, health professional referrals) **Study duration**: 3 months; **study type**: management; **subtype**: mental health
Participants	**Inclusion criteria**: participants aged $\geq$ 14 years with a primary diagnosis of obsessive compulsive disorder for $\geq$ 2 years on the Structured Clinical Interview for DSM-IV **Sample size**: 218; **mean age**: 39 years; **sex**: men - 58%; women - 42%; **ethnicity**: white - 93%, other - 7% **Country**: USA
Interventions	**Computer-based behaviour therapy**. BT STEPS is a 9-step, computer-driven IVR system that allows participants with obsessive compulsive disorder to telephone from home and progress through a self-paced workbook **Clinician-guided behaviour therapy** consisted of 11 weekly 1-hour (or longer) sessions to negotiate self-exposure homework to be done for $\geq$ 1 hour daily between sessions and recorded in daily diaries. Sessions were audiotaped and rated blindly by an expert behaviour therapist for quality of instructions **Relaxation therapy**. Participants receiving relaxation therapy were asked to perform progressive relaxation exercises for $\geq$ 1 hour daily and to keep daily relaxation diaries for 10 weeks
Outcomes	Yale-Brown obsessive compulsive scale (primary); Clinical and Patient's Global Impressions; depression (Hamilton Rating for Depression Scale); satisfaction (secondary)
Funding	Pfizer, Inc
Declaration of conflict of interest	Drs Greist and Kobak, Mr Wenzel, and Ms Hirsch are employees of Healthcare Technology Systems (HTS), Madison, Wisconson. Ms Mantle was employed at HTS during this study and is currently self-employed in Boise, Idaho. Mr Wenzel and Ms Hirsch

		own stock in HTS. Drs Marks and Baer receive royalties from BT STEPS. BT STEPS is a trademark of HTS. Dr Clary is an employee of Pfizer, Inc
Power calculations for sample size		"Sample size aimed for a power of 0.90, using estimates of means and standard deviations from a meta-analysis of multicenter obsessive compulsive disorder trials."
Notes		This is a comparison between computer-based behaviour therapy and relaxation therapy

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "After screening by a clinician, patients were randomly assigned to 10 weeks of behavior therapy treatment guided by (1) a computer accessed by telephone and a user workbook or (2) a behavior therapist or (3) systematic relaxation guided by an audiotape and manual."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "Sessions [clinician-guided therapy] were audiotaped and rated blindly by an expert behaviour therapist for quality of instructions." Comment: insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "In an intent-to-treat analysis, the last available post randomisation rating was input to endpoint for subjects who stopped prematurely."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Griffin 2011

Methods	**Aims**: to assess the equivalence of theory-based phone messages and education provided by an IVR system and by nurse-delivered calls (NDCs) in promoting appointment attendance and adherence to preparation instructions for flexible sigmoidoscopy (FS) and colonoscopy, to compare the effect of the timing of IVR messages delivered 3 days versus 7 days before the scheduled appointment, and to evaluate any differences in patient satisfaction between IVR messages and NDCs **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration:** 6 weeks; **study type**: either; **subtype**: appointment reminders
Participants	**Inclusion criteria**: patients with upcoming FS or colonoscopy appointments scheduled in 2 gastrointestinal (GI) endoscopic procedure clinics at the Minneapolis Veterans Affairs Medical Center. Participants included those being screened and those having follow-up appointments after receipt of abnormal test results **Sample size**: 3610; **mean age**: 63 years; **sex**: men - 95% , women - 5%; **ethnicity**: white - 83%, non-white - 3%, other or > 1 race or unknown - 14% **Country**: USA
Interventions	**Arm a**: **IVR-3** **Arm b**: **IVR-7** Participants in the IVR study arms (IVR7 and IVR3) were mailed appointment information and preparation instructions and materials identical to those mailed in the NDC arm. Phone calls were programmed to start in the morning. If an answering machine picked up on the initial call, the IVR system left a general message about the purpose of the call. The system was programmed to call again in the afternoon and then again in the evening until the participant answered. Messages were left only on the first attempt. If the IVR call was not completed that day, the process was repeated the following day. Participants who answered the call had the option to have the system call back at a later time. An IVR call was considered complete if the participant answered and confirmed his or her appointment. The IVR system allowed participants to verify and confirm their appointment, respond to instructions about logistics, request additional preparation materials, answer queries about their current health, listen to preparation instructions, have any information repeated, ask for a summary of instructions, or leave a message for a nurse who would call back within 24 h. Embedded in these messages was the educational information about susceptibility and severity of colorectal cancer, as well as motivational messages that addressed risks, benefits, barriers, and self-efficacy associated with preparation and procedures. At any time during the call, the participant could request to be transferred to the clinic to leave a message for a nurse **Nurse delivered calls (arm c)**. A recovery room nurse attempted to call to remind participants of the appointment and review preparation instructions 7 days before the appointment
Outcomes	Appointment non-attendance and preparation non-adherence for FS (primary); perceptions about the call (secondary)
Funding	Department of Veterans Affairs, Veterans Health Administration
Declaration of conflict of interest	None declared

Griffin 2011 (*Continued*)

Power calculations for sample size	"Using an equivalence boundary of 0.10, a sample size of 743 subjects per group provided 90% power for the study with a level of .05 divided by 3 and an underlying 65% baseline completion rate."
Notes	ClinicalTrials.gov Identifier: NCT00310362. Non-attendance was defined as cancelling the appointment or not attending the appointment. Appointments cancelled by the clinic were not considered as non-attendance. Preparation non-adherence assessed whether participants had adequately prepared to complete the procedure. Procedure notes was used to determine if the participant was adequately prepared or if the physician was unable to evaluate the quality of the preparation, attitudes and beliefs. This is a comparison between IVR-3 and NDC 7 days before the procedure

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote:" Clinic procedure nurses and physicians were blinded to the randomised conditions."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Comment: groups were balanced with no significant baseline differences

Halpin 2009

Methods	**Aims**: to assess whether the health forecasting system can predict periods of higher risk and to assess the effect of the service on the frequency and severity of COPD exacerbations **Study design**: RCT; **recruitment**: primary care (*) **Study duration**: 4 months; **study type**: management; **subtype**: chronic obstructive pulmonary disease
Participants	**Inclusion criteria**: all people aged > 40 with a diagnosis of chronic obstructive pulmonary disease confirmed with spirometry (forced expiratory volume in 1 second < 80% predicted, forced expiratory volume in 1 second/forced vital capacity ratio < 0.7) at 3

	general practices in Devon, UK **Sample size**: 79; **mean age**: 69 years; **sex**: men - 74%, women - 26%; **ethnicity**:* **Country**: UK
Interventions	**Alert calls** were made to the participant's normal telephone as occurs in the Healthy Outlook Service. The BlackBerry Smart Phones had their phone capabilities disabled and were only used for data collection and not to contact participants. The script for the alert call was successfully used in 2 pilot studies and as part of the routine health forecasting service since 2007. Automated calls were made on Tuesday evenings, with up to 2 repeat calls if the first was not answered **Participants in the control group** received no calls.
Outcomes	Frequency of exacerbations and proportion of participants experiencing ≥ 1 exacerbations (primary); changes in health status (secondary)
Funding	AstraZeneca
Declaration of conflict of interest	"The authors (JMG, EMH, SWV, DN, EMH, SN, ABS, AB, MVR) report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article"
Power calculations for sample size	"The study was powered to identify a 30% reduction in the proportion of patients experiencing an exacerbation, assuming (on the basis of previous studies) that 90% of patients in the control group would exacerbate over the winter."
Notes	75% of participants were on short-acting β 2-agonists

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computerised random number generator
Allocation concealment (selection bias)	Low risk	Quote: "An independent researcher who was not part of the study team used a list of binomial random numbers generated in block sizes of four to randomly allocate the participants"
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "The investigators were unaware of which patients were allocated to receive the forecast and patients were not informed of their allocation"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information

Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition (intervention n = 1, control n = 1). Missing outcome data balanced in numbers across groups. Quote: "Two patients did not complete the trial"
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes of interest to the review have been reported
Other bias	Low risk	Groups were balanced at baseline. Quote: "The two groups were generally well matched; however, more patients in the group receiving alert calls had attended a chronic obstructive pulmonary disease education or exercise/rehabilitation programme and more controls were receiving inhaled corticosteroids/LABA therapy."

Harrison 2013

Methods	**Aims**: to evaluate the effectiveness of a telephonic outreach programme to improve blood pressure control among participants with hypertension **Study design**: RCT; **recruitment**: other - health plan (organisational referral) **Study duration**: 4 weeks; **study type**: management; **subtype**: hypertension
Participants	**Inclusion criteria**: Kaiser Permanente Southern California members > 18 years identified in a hypertension registry **Sample size**: 64,773; **mean age**: 61 years **sex**: men - 46%, women - 54%; **ethnicity**: white - 41%, black - 17%, Hispanic - 25%, other/unknown - 9%, Asian - 8% **Country**: USA
Interventions	**Outreach** occurred 9-16 August 2010, using an automated telephone messaging system. If the telephone call was answered by a live person or by a voicemail system, the automated message was delivered. Failed call attempts (i.e. busy signal or no answer) resulted in a maximum of 2 additional call attempts on the same day. Telephone calls were made between 10 am and 8 pm. The content of the automated message was developed by the KPSC outreach team. The message included a greeting stating the call was from Kaiser Permanente, an invitation to have a blood pressure measurement at a KPSC medical centre, and the hours of operation of the medical centre. The automated message was played by default in English with an option to listen to the message in Spanish **Participants in the control group** received usual care.
Outcomes	Blood pressure (primary)
Funding	Southern California Permanente Medical Group
Declaration of conflict of interest	None declared

Power calculations for sample size	NA
Notes	-

Risk of bias *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "We randomised the eligible members on August 2, 2010, to a usual care arm (n=33,154) and an intervention arm (n=33,150) and subsequently excluded 1531 individuals (4.8%): 1528 did not have a valid telephone number and 3 were on a "do not call" list."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Groups were balanced at baseline. Quote: "There were no statistically significant differences between patients in the intervention arm compared with those in the usual care arm"

Hasin 2013

Methods	**Aims**: to test the efficacy of motivational interviewing (MI) only and MI + HealthCall for drinking reduction among HIV primary care patients **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**:12 months; **study type**: management; **study subtype**: alcohol consumption
Participants	**Inclusion criteria**: ≥ 4 US drinks of alcohol at least once, in the prior 30 days; HIV-positive; English- or Spanish-speaking; aged 18 years; and treated at the clinic **Sample size**: 254; **mean age**:46 years;**sex**: women - 22%; men - 78% **ethnicity**: African

	American - 49%, Hispanic - 45%, other - 6% **Country**: USA
Interventions	**In MI + Health Call** group, participants accessed the system via a toll-free number for daily 1-3 min calls, answering pre-recorded questions about 'yesterday' (morning, afternoon, evening) to ensure consistent reporting periods regardless of the hour called. Brief self-monitoring questions covered alcohol consumption (e.g. 'How many beers did you drink yesterday?') and reasons for drinking or not drinking. Additional questions covered mood, medication adherence and well-being **MI only.** At baseline, counsellors administered a 20-25 min individual MI using standard techniques to motivate reduced drinking, encouraging participants to set a drinking-reduction goal. Counsellors then provided the pamphlet and watch. At 30 and 60 days, counsellor and participant met for 10-15 min, discussed the participant's drinking during the past month, evaluated the drinking goal and set a new goal if participants wished **Participants in the control group** received advice/education
Outcomes	Number of drinks per drinking day in the last 30 days (primary)
Funding	CDC: R01AA014323, K05AA014223 and the New York State Psychiatric Institute
Declaration of conflict of interest	None declared
Power calculations for sample size	N = 90 per group would provide 80% power at alpha = 0.05 to detect a moderate treatment effect on number of drinks per drinking day (d = 0.4)
Notes	This is a comparison between MI + HealthCall versus advice/education

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "In a parallel three-arm individually randomised design (1:1:1 allocation ratio), 258 participants were assigned to advice/education control, MI-only or MI+HealthCall between August 2007 and May 2010, with groups balanced on depression, drug abuse, unstable housing and hepatitis using urn randomisation"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Counselors and patients were not blinded to treatments after assignment"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information

Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition - 94.5% of participants provided end-of-treatment data. Quote: "We conducted three sensitivity analyses to understand the robustness of our NumDD findings. Two involved multiple imputation"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "Treatment groups did not differ on these or other (e.g. demographic) variables."

Helzer 2008

Methods	**Aims**: to facilitate participant self-monitoring and provide personalised feedback after a brief alcohol intervention by a primary care provider **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**: 6 months; **study type**: management; **Study subtype**: alcohol consumption
Participants	**Inclusion criteria**: adults aged ≥ 21 who reported a pre-BI average alcohol consumption exceeding NIAAA recommended guidelines of 7 and 14 standard drinks per week for women and men, respectively; who met the heavy drinking criterion of 4/5 drinks in a single day (NIAAA, 2005); or who endorsed ≥ 1 CAGE items **Sample size**: 338; **mean age**: 46 years; **sex**: men - 64%, women - 36% **ethnicity**: white - 97% **Country**: USA
Interventions	**IVR + feedback**: 6 months of daily calls plus monthly feedback in the form of a mailed, printed graph showing daily consumption reported to the IVR in comparison to participant's stated drinking goal, with each mailing including a personalised note from Dr Helzer to heighten the saliency of the graphs **IVR + feedback + compensation**: daily calls and monthly feedback (graph and personal note) as described above plus a financial incentive based on frequency of the participant's daily calls. The incentive amounted to about USD 13 per week for a perfect calling record **IVR**: daily phone calls for 6 months to the automated IVR system to report alcohol consumption and other items for the past 24 h **No IVR**: BI and standard follow-up treatment only, no calls to the IVR system
Outcomes	Weekly alcohol consumption (primary)
Funding	National Institute on Alcohol Abuse and Alcoholism grants AA 11954 and AA 14270
Declaration of conflict of interest	NA
Power calculations for sample size	NA

Notes	This is a comparison between IVR + feedback and no IVR.

Risk of bias		Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "Patients who satisfied all inclusion/exclusion criteria and signed the informed consent were randomised to one of four study conditions"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Follow-up data were obtained for 284 subjects at 3 months (84%) and 273 at 6 months (81%). Of the 54 (16%) participants who did not complete a follow-up assessment, 32 were lost to follow-up and 22 declined to participate after randomisation."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "There were no significant differences between participants in the four randomised groups on any of the measured subject characteristics"

Hendren 2014

Methods	**Aim**: to assess an intervention to increase cancer screening among participants in a safety-net primary care practice **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**: 12 months; **study type**: prevention; **subtype**: screening
Participants	**Inclusion criteria**: overdue for the targeted cancer screening and average-risk for the cancer by EHR review. Age criteria were age 40-74 years for mammography (women) or 50-74 years for colorectal cancer (men and women) on the date of randomisation **Sample size**: 366; **mean age**: *; **sex**: *; **ethnicity**: non-Hispanic white - 50%, non-Hispanic black - 41%, other race including Hispanic - 9%

	Country: USA
Interventions	**Multimodal intervention** consisted of letters, automated telephone calls, a point-of-care prompt and mailing of a home testing kit to colorectal cancer screening participants. An automated telephone reminder system (Televox system) was utilised to deliver automated calls to the telephone number in the practice database for each intervention participant. The automated phone calls contained similar information to the letters, but in a brief form (approximately 25 s), with a phone number to call to arrange for screening. The automated calls were made on weeks 2 and 6 of the intervention period and repeated on weeks 14 and 25 for participants remaining unscreened on EHR review performed on week 11 **Participants in the control group** received usual care (blinded chart review).
Outcomes	Breast cancer or colorectal cancer screening uptake at 12 months (primary)
Funding	American Cancer Society (RSGT-08-077-01-CPHPS)
Declaration of conflict of interest	None declared
Power calculations for sample size	NA
Notes	The total cost for the automated calls was about USD 0.92, including the preparation of each list of call recipients from the database and the monitoring of post-call status

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "An offsite study statistician randomised participants to intervention or control groups using a random number algorithm stratified by the type of screening required (breast cancer, colorectal cancer or both)."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "Healthcare and data abstraction personnel were blinded to group assignment."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "a research assistant blinded to treatment assignment abstracted data from the EHR"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "An intention-to-treat analysis was performed; that is, all patient originally assigned to a group were analysed."

Selective reporting (reporting bias)	Low risk	The study protocol is available and all pre-defined outcomes have been reported
Other bias	Unclear risk	Quote: "There were no significant differences in participants at baseline between those in the intervention and control groups in the colorectal cancer group". However, there were borderline significant differences in household income and age

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Hess 2013

Methods	**Aims**: to measure the impact of an automated outbound telephone messaging system on herpes zoster (HZ) vaccinations among older adults in the community pharmacy setting **Study design**: cluster RCT; **recruitment**: primary care (organisational referral) **Study duration**: 3 months; **study type**: prevention; **study subtype**: immunisation
Participants	**Inclusion criteria**: > 60 years of age, who had filled ≥ 1 prescription at a study pharmacy location during December 2006 **Sample size**: 16 pharmacies with a total of 11,982 participants; **mean age**: 72 years;**sex**: * **ethnicity**: * **Country**: USA
Interventions	**Automated outbound telephone messaging system** in which the scripts were recorded and sent as an incoming automated telephone call to households using cNotify (Cintech, Mason, OH), which is an outbound messaging tool. Two 30-second scripts were created to educate participants about their risk for developing HZ and invite them to speak to their pharmacist about vaccination opportunities **Participants in the control group** received no calls.
Outcomes	The number of HZ vaccines administered (primary)
Funding	APhA Foundation Incentive Grant
Declaration of conflict of interest	Potential declared
Power calculations for sample size	No
Notes	The intervention was delivered to 9650 "households" due to duplicated phone numbers being deleted to rule out back to back messages being delivered to the same number for different people Cluster RCT with 16 clusters randomised. Of these, 8 (5599 participants) were allocated to intervention and 8 (6383 participants) were allocated to control Note clustering was unadjusted for in the paper: to calculate effective sample size in Hess 2013 study, we used the Fleiss-Cuzick estimator (see Appendix 14 for calculations).

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "16 pharmacies were randomised by a simple randomisation process into two cluster groups of 8 pharmacies each"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of key study personnel was ensured. Quote: "The results of the randomisation were not disclosed to pharmacists"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "Because of the nature of the intervention, complete blinding was not possible"
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	High risk	Participants in the intervention group were significantly older than control group participants (P < 0.001); not possible to judge selective recruitment of cluster participants based on the information reported

Heyworth 2014

Methods	**Aims**: to examine whether telephonic IVR or participant mailing could increase rates of bone mineral density testing in high risk, menopausal women **Study design**: quasi-RCT; **recruitment**: other - health plan (*) **Study duration**:12 months; **study type**: prevention; **study subtype**: osteoporosis
Participants	**Inclusion criteria**: women between the ages of 50 and 64 years who, in addition to age, had ≥ 1 risk factor for osteoporosis as follows: recent discontinuation of hormone replacement therapy; exposure to oral corticosteroids, anti-seizure medication, or tobacco use; history of fracture; or bilateral oophorectomy without evidence of hormone replacement therapy or oral contraceptive use. Sample limited to women who had no evidence of bone mineral density screening in the 2 years prior to the randomisation and who did not have a diagnosis of osteoporosis and were not known to be taking any FDA-approved treatment for osteoporosis **Sample size**: 4685; **mean age**:57 years;**sex**: women - 100%; **ethnicity**: * **Country**: USA
Interventions	In addition to usual care, the **IVR intervention** was a single call lasting approximately 4-5 min. Each IVR call began with identification of the participant and proceeded if identification was correctly confirmed. A script was designed for the call that included

	a branching algorithm to calculate a fracture-risk score, as well as the opportunity for women to indicate whether or not they had undergone bone mineral density testing, and whether or not they planned to follow up with their physician to discuss osteoporosis The **participant mailing** was a packet that included 5 illustrated pamphlets on osteoporosis, calcium and vitamin D, bone mineral density testing, osteoporosis risk assessment, and information about bone health and osteoporosis prevention + usual care **Usual care** group
Outcomes	Bone mineral density screening within 12 months (primary)
Funding	Merck, West Point, PA
Declaration of conflict of interest	None declared
Power calculations for sample size	No information
Notes	This is a comparison of IVR (intervention) versus UC (control)

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "Within each triplet, a pseudo-random number generator assigned the patient panels of each primary care physician to a single treatment arm"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Because this study was non-blinded, it is possible that patients in the usual care group became aware of the interventions to increase osteoporosis screening through communication with patients in the intervention groups, thus reducing the effect of the interventions"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Groups were balanced at baseline. Quote: "Clinical and demographic characteristics of the study participants were similar across

	the three study groups at baseline"

Ho 2014

Methods	**Aims**: to test a multifaceted intervention to improve adherence to cardiac medications **Study design**: RCT; **recruitment**: primary care (*) **Study duration**: 12 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: all patients who were admitted with acute coronary syndrome (ACS) as the primary reason for hospital admission and who used the VA for their usual source of care were screened for eligibility to participate **Sample size**: 241; **mean age**: 64 years; **sex**: men - 98%, women - 2%; **ethnicity**: white - 78% **Country**: USA
Interventions	**Participants in the multimodal intervention group** received: medication reconciliation and tailoring; patient education; collaborative care between pharmacists and providers (PCPs or cardiologists); and voice messaging reminders (educational and medication refill reminder calls). The voice messaging system contacts participants at regularly scheduled intervals. There are 2 types of calls: medication reminder and medication refill calls. The medication reminder calls occurred monthly. The medication refill calls were synchronised to when a medication refill was due. The calls occurred 14 days prior to the refill due date, 7 days prior to the refill due date, and on the due date. During months 2 through 6 of the intervention, participants received both medication reminder (monthly) and medication refill calls (timed to refill due dates) for the 4 medications of interest. During months 7 through 12 of the intervention, participants only received medication refill calls **Participants in the control group** received usual care (standard hospital discharge instructions e.g. numbers to call, follow-up appointments, diet and exercise advice, a discharge medication list, and educational information about cardiac medications)
Outcomes	The proportion of participants who are adherent with cardioprotective medications (β-blockers, statins, clopidogrel, and ACE inhibitors) (primary); achievement of blood pressure and LDL cholesterol level targets (secondary)
Funding	Veterans Health Administration Health Service Research & Development (HSR&D) Investigator Initiated Award (grant IIR 08-302); Research Career Scientist Award VA HSR&D 08-027
Declaration of conflict of interest	None declared
Power calculations for sample size	We planned to recruit 280 participants over an 18-month period and to follow participants for 12 months to have 80% power to detect a difference of 15% in the proportion of participants who were adherent to their cardioprotective medications
Notes	ClinicalTrials.gov Identifier:NCT00520988. The annual incremental programme cost of the multifaceted intervention was USD 360 per participant

Risk of bias		Risk of bias
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Eligible patients with ACS were randomised using blocked randomisation stratified by study site in a 1:1 ratio to INT or UC"
Allocation concealment (selection bias)	Low risk	Quote: "The allocation sequence was concealed until a patient consented to participate and was generated centrally using the graphical user interface implemented for the study."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "At this visit, three blood pressure measurements were taken in standard fashion by someone blinded to study group assignment (eg, after 5 minutes of rest and 2 minutes apart between measurements)" Comment: insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "We used an intent-to-treat approach for all analyses"
Selective reporting (reporting bias)	Low risk	The study protocol is available and all pre-specified outcomes have been reported in the pre-specified way
Other bias	Unclear risk	Quote: "Baseline characteristics of the patients were comparable . . . Usual care patients were more likely to undergo coronary artery bypass graft surgery (17.1% vs 6.7%; P = .02)." Insufficient evidence to judge that this imbalance has introduced bias

Homko 2012

Methods	**Aims**: to examine the impact of an enhanced telemedicine system on glucose control and pregnancy outcomes in women with gestational diabetes mellitus **Study design**: RCT; **recruitment**: secondary care (organisational referral) **Study duration**: 26 months; **study type**: management; **subtype**: gestational diabetes
Participants	**Inclusion criteria**: women aged 18-45 years with a documented diagnosis of gestational diabetes mellitus on a 3-h oral glucose tolerance test, using the criteria of Carpenter and Coustan. Women were required to be at $\leq$ 33 weeks of gestation at study entry **Sample size**: 80; **mean age**: 30 years; **sex**: men - 0%; women - 100%; **ethnicity**: white - 41%, African American - 34%, Latino/Hispanic - 18 %, Asian and other - 7% **Country**: USA
Interventions	**ITSMyHealthrecord**: the IVR system can be accessed from any phone over a dedicated toll-free number and includes asynchronous phone messaging between clinicians and participants as well as automated reminders for participants to transmit data. Participants were prompted to input clinical data (i.e. blood glucose readings, changes in medication, and episodes of hypoglycaemia) and identify the day and time using the phone's keypad. They were provided feedback, emotional support, and reinforcement regarding diabetes self-management with each transmission. In addition, women received a brief educational message/tip each time they accessed the system either by phone or Internet. Both systems allow women to append a message or ask a question (the IVR is set to accept 45 s of speaking, while the Internet-based method allows virtually unlimited text input) after transmitting their health data. The data and messages are then queued for the clinician to respond to when he or she accesses the clinician portal of the system in which the participant data reside **Participants in the control group** received usual care.
Outcomes	Maternal glucose control and infant birth weight (primary)
Funding	National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health
Declaration of conflict of interest	"CJH, LD, KR, WM, DM, and JG have nothing to disclose. WPS has stock ownership in Insight Telehealth Systems. A.A.B. is a consultant for Insight Telehealth Systems."
Power calculations for sample size	NA
Notes	Mean BMI: 34.1 kg/m^2; participants in both groups monitor their blood glucose levels daily (before breakfast and 2 h after each meal), perform foetal movement counting 3 times a day, and also record insulin doses and episodes of hypoglycaemia

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Women were randomised into one of two groups: telemedicine or control (usual care)."

Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition (intervention n = 4, control n = 2). Missing outcome data balanced in numbers, with similar reasons for missing data across groups. Quote: "Data were available for 38 women in the control group and 36 in the intervention group"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "There were no significant differences at baseline between the two groups"

Houlihan 2013

Methods	**Aims**: to evaluate the efficacy of a novel telehealth intervention, CareCall, on reducing pressure ulcers and depression and enhancing the use of appropriate health care in persons with spinal cord dysfunction **Study design**: RCT; **recruitment**: other - community disability organisations, rehabilitation medicine outpatient clinics and inpatient services (*) **Study duration**: 6 months; **study type**: management; **subtype**: spinal cord dysfunction
Participants	**Inclusion criteria**: wheelchair users $\geq$ 6 h/day during normal waking hours, more or equal to 18 years of age, report of physician confirmed diagnosis of multiple sclerosis or spinal cord injury, absence of cognitive impairment on the Telephone Interview of Cognitive Status-Modified (TICS-M), score more or equal to 20, able to give written, informed consent, able to speak and understand conversational English, health insurance or pending health insurance (any kind), available for the full 6 months of the study, able to complete CareCall Training Call, living in a private residence of any kind **Sample size**: 142; **mean age**: 48 years; **sex**: men - 61%, women - 39%; **ethnicity**: white - 80% (inclusive of Hispanic or Latino - 7%), African American - 11%, other - 9%
Interventions	**Participants in the intervention group** received weekly automated calls from the **CareCall** for 6 months and could call into CareCall any time. The CareCall scripts were organised into modules, integrating content relevant to: skin care, depression and wellness, and healthcare utilisation. The system also included relevant prerecorded vignettes from people with spinal cord dysfunction, and relevant recorded comments from healthcare professionals. These modules used branching logic based on personalised information and participants' responses during calls to tailor content throughout

	Participants in the control group received usual care (current standard of care). They also received a CareCall resource book developed by clinical experts, containing information and local resources
Outcomes	Prevalence of pressure ulcers; depression severity; healthcare utilisation (all primary)
Funding	CDC, Grant no. 5R01DD000155, the Department of Health and Human Services; and the National Institute of Disability and Rehabilitation Research, Grant nos. H133N060024, H133N110019, and H133N120002, the Department of Education
Declaration of conflict of interest	Dr Friedman had stock ownership and a consulting agreement with Infomedics, the company that owns commercial rights to the TLC technology used in the computerised intervention. He is also a member of its board of directors. The remaining authors declared no conflict of interest
Power calculations for sample size	No
Notes	-

Risk of bias

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "We allocated participants to study groups using a stratified block randomization method to ensure balance by recruitment site"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "All study staff collecting data were masked as to study group assignment."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition (intervention n = 4, control n = 3). Missing outcome data balanced in numbers. ITT analysis was used to include all participants who received the intervention or usual care in the analysis
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "At baseline, there were no statistically significant study group differences in the prevalence of pressure ulcers, mean

		severity of depression or the percentage reporting issues with health-care availability. However, the intervention group reported more emergency room visits and hospitalizations compared with control group subjects."

Hyman 1996

Methods	**Aims**: to evaluate the effectiveness of an automated telephone system as a relapse intervention in participants who completed a 4 week class based cholesterol lowering diet protocol **Study design**: RCT; **recruitment**: primary care (*) **Study duration**: 6 months; **study type**: management; **subtype**: hypercholesterolemia
Participants	**Inclusion criteria**: participants who completed a 4-week class based on cholesterol lowering diet protocol **Sample size**: 115; **mean age**: 48 years; **sex**: men - 25%; women - 75%; **ethnicity**: non-Hispanic Caucasian - 87%, other - 13% **Country**: USA
Interventions	**Computer-phone system**: asks participants 2-4 prerecorded questions about recent eating behaviour, low-fat nutrition knowledge, behavioural or maintenance skills, or expectations that may influence maintenance of cholesterol lowering behaviours. Participants responded by pressing the appropriate number on their touch-tone phone. Based on this information, they received tailored feedback. Those failing to call the system in the first week received a reminder during the second week. Participants could leave a message for research staff who would then provide their response **Participants in the control group** received usual care.
Outcomes	Total cholesterol reduction (primary); acceptability of the system (secondary)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	High risk	Complete case analysis. Quote: "A total of 16 participants dropped out and their measures were not used in the final analysis. Comparison of drop-outs with completers showed no significant difference for age, BMI, baseline cholesterol, ethnicity, sex, smoking habits or education."
Selective reporting (reporting bias)	High risk	Weight outcomes at follow-up were not provided
Other bias	Low risk	There were no significant differences at baseline between the 2 groups

Hyman 1998

Methods	**Aims**: to test the feasibility and effectiveness of a diet intervention (consisting of interactive mailings, computer-generated phone calls, and classes) in hypercholesteraemic low-income public clinic patients **Study design**: RCT; **recruitment**: primary care (telephone) **Study duration**: 6 months; **study type**: management; **subtype**: hypercholesterolemia
Participants	**Inclusion criteria**: aged 18-65 years, have a past TC measurement, have a total cholesterol > 200 mg/dL, be English-speaking, not require insulin, not be over 200% ideal body weight, not have cancer other than skin cancer, not have triglycerides over 400 mg/dL, plan to remain in the area ≥ 6 months, and not be on lipid-lowering drugs **Sample size**: 123; **mean age**: 57 years; **sex**: men -25 %; women - 75%; **ethnicity**: African American - 77%, other - 23% **Country**: USA
Interventions	**IVR arm**: participants continued to receive usual care but were offered and encouraged to use all 3 components of the system: mailed diet questionnaires with individualised mailed feedback, computer-interactive phone calls, and a programme of 4 hour-long classes. Intervention development was guided by social cognitive theory so that calls could provide opportunities for modelling, feedback and reinforcement, increasing self-efficacy for change. The intervention also sought to increase practical skills such as reading labels, eating out, modifying recipes, and self-monitoring. The intervention components were developed to reduce participant burden while utilising behavioural approaches to lifestyle change and to maintain sufficient contact, monitoring, and feedback, yet be practical for primary care

Hyman 1998 *(Continued)*

	Participants in the control group received usual care. Physicians in general provide very brief dietary counselling and prescribe lipid-lowering drugs as deemed appropriate. Hypercholesterolaemic patients may be referred to clinic registered dietitians. After the trial the UC subjects were offered the series of classes
Outcomes	Total cholesterol reduction (primary); self-efficacy; dietary knowledge; fat intake scale (secondary)
Funding	American Heart Association Texas Afliate 91R-172
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Blocked randomisation. Quote: "Allocated to treatment in a 1:1 ratio using a xed randomisation scheme with blocks of size four."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	High risk	High attrition rate. Quote: "Of the 123 subjects, 80.5% (99) completed follow-up cholesterol measurements."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "The 123 subjects randomised into the two study groups were generally comparable although the special intervention group had more African Americans ($P = 0.04$) and were younger at 54.6 versus 58.7 years of age ($P = 0.03$)". Comment: intervention group had significantly more African-Americans and

		young participants compared to the control group. There is insufficient evidence that this imbalance has introduced bias

Jarvis 1997

Methods	**Aims**: to evaluate the effectiveness of telecommunications technology to underpin an intervention that would be effective, easy to use, convenient, inexpensive, require little time commitment, and amenable to widespread distribution **Study design**: RCT; **recruitment**: primary care (mail and telephone) **Study duration**: 3 months; **study type**: prevention; **subtype**: physical activity
Participants	**Inclusion criteria**: aged ≥ 60 years, English-speaking, had to be sedentary (defined as participating in < 60 min of physical activity per week, with a minimum of 20 min of exercise per time and a minimum of 3 times per week), and also needed to have touch-tone telephone service **Sample size**: 85; **mean age**: 67 years; **sex**: men - 24%; women - 76%; **ethnicity**: other - 70%, African American - 30% **Country**: USA
Interventions	**The Telephone-Linked Communication (TLC) System** is an interactive computer-based telecommunication system that converses with participants in their homes over their telephone to motivate and improve health-related behaviours. TLC 'speaks' to users over the telephone using computer-controlled speech generation. Users communicate with TLC by using their telephone touch-tone keypad. TLC functions as a monitor or 'counsellor' that provides positive feedback to reinforce or change the individual's health behaviour. TLC stores the user's response in a database. The information provided by the person controls the direction of the conservation. This information is also forwarded to the person's physician on a report, similar to a laboratory report, in which medical problems are highlighted **Participants in the control group** received usual care.
Outcomes	Minutes walked per week (primary); satisfaction (secondary)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement

Random sequence generation (selection bias)	Unclear risk	Quote: "Then subjects were randomised to use TLC-ACT, or to a usual medical care control group."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "'Research staff and subjects were blinded to the study assignment until the baseline questionnaire was completed."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	High risk	Complete case analysis. Quote: " The analysis was performed on the 68 subjects who completed the study"
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes of interest to the review were reported
Other bias	Low risk	Quote: "There were no significant differences between the groups based on age, number of co-morbidities, Stage of Adoption of Physical Activity, and minutes walked over the 4 recall days at baseline."

Katalenich 2015

Methods	**Aims**: to assess the utility and cost-effectiveness of an automated Diabetes Remote Monitoring and Management System (DRMS) in glycaemic control versus usual care **Study design**: RCT; **recruitment**: primary care (*) **Study duration**: 6 months; **study type**: management; **subtype**: diabetes
Participants	**Inclusion criteria**: patients with an glycated haemoglobin between 7.0% and 9.0%, aged ≥ 18 years, and currently taking or starting insulin **Sample size**: 98; **mean age**: 59 years; **sex**: men - 40%; women - 60%; **ethnicity**: black - 65%; white - 30%; Hispanic - 1%; Asian - 1%; other - 3% **Country**: USA
Interventions	Participants in **Diabetes Remote Monitoring and Management System (DRMS)** were contacted daily, either through text messaging or automated voice. From these messages, participants could either respond by submitting their blood glucose levels or respond at a later time. If a participant did not submit his or her blood glucose level at the initial contact, the DRMS would text or call again that same day to remind the participant to check his or her blood glucose. However, if a participant submitted a reading before the reminder, the system would not contact the participant on that day. Providers could

	monitor the progress of their patients through a web-based, secure portal, and information could also be downloaded directly into electronic medical records **Participants in the control group** received usual care.
Outcomes	Glycated haemoglobin; medication adherence; quality of life; cost-effectiveness (all primary)
Funding	Eli Lilly, National Institute of General Medical Sciences, National Institutes of Health
Declaration of conflict of interest	Potential declared
Power calculations for sample size	NA
Notes	60% of participants used phone calls to report into the system, and 40% used text messages exclusively

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Participants were randomised, after informed consent was obtained, to either the intervention (DRMS) group or the control group by using a random-number table"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "All statistical analysis used intent-to-treat methodology"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	There were some baseline differences between the groups in demographics; unclear whether those introduced bias

Khanna 2014 *(Continued)*

Methods	**Aims**: to determine if automated telephone nutrition support counselling could help patients improve glycaemic control by duplicating a successful pilot in Mexico in a Spanish-speaking population **Study design**: RCT; **recruitment**: primary care (telephone) **Study duration**: 3 months; **study type**: management; **subtype**: diabetes	
Participants	**Inclusion criteria**: ≥ 2 visits to the clinic in the last 1 year and a glycated haemoglobin level of > 8.0% on most recent visit, and any insulin status **Sample size**: 75; **mean age**: 52 years; **sex**: men - 59%, women - 41%; **ethnicity**: Hispanic (Spanish-speaking) - 100%	
Interventions	**The system** was designed and implemented using a Dialogic telephone card installed in a desktop computer and connected to a landline, programmed using Telesage software (Boston, MA). The system was designed to create a 'summary' estimate of high-glycaemic index food consumption on survey conclusion that was then provided to participants at the conclusion of the call. If the sum of all high glycaemic index foods in the previous 24-hour period was 2 or fewer servings, the message was one of congratulations and positive feedback; if 3-4 servings, the message was more cautious and provided some education about appropriate low-glycaemic index foods; and if ≥ 5 servings, then it provided a more educational message regarding high and low-glycaemic index foods **Participants in the control group** received usual care.	
Outcomes	Glycated haemoglobin (primary); systolic blood pressure; diastolic blood pressure; BMI; waist circumference; total cholesterol; triglycerides; serum high-density lipoproteins; serum Low density lipoproteins (secondary)	
Funding	National Institute of Diabetes and Digestive and Kidney Diseases for Diabetes Translational Research (CDTR) at Kaiser Permanente and University of California, San Francisco (P30DK092924)	
Declaration of conflict of interest	None declared	
Power calculations for sample size	An 80% power to detect a difference in glycated haemoglobin of approximately 1.2% ± 1.5% between groups, and assuming 15% loss to follow-up, investigators aimed to enrol 80 total participants into the study	
Notes	-	

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer random number generator. Quote: "Patients were selected into one arm or the other of the study using a random number generator"
Allocation concealment (selection bias)	Unclear risk	Insufficient information

Khanna 2014 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "We conducted a prospective, randomised, open-label trial (ClinicalTrials.gov #NCT01040676) with blinded end-point assessment"
Incomplete outcome data (attrition bias) All outcomes	High risk	High attrition. Quote: "There was significant loss to follow-up despite several attempts to reach patients"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "Patients in the intervention arm were broadly similar to those in the control arm but trended toward being more likely to be men (P = 0.12), having a larger waist circumference (P = 0.053), and being on a different number of diabetes medications (P = .07)"

Kim 2014

Methods	**Aims**: to enhance engagement in low-income adults with poorly controlled diabetes (glycated haemoglobin > 9%) **Study design**: RCT; **recruitment**: primary care (*) **Study duration**: 12 months; **study type**: management; **subtype**: diabetes
Participants	**Inclusion criteria**: English- and Spanish-speaking patients with telephone access who receive primary care at San Francisco General Hospital; glycated haemoglobin > 9% **Sample size**: 100; **mean age**: *; **sex**: *; **ethnicity**: *
Interventions	**Participants in the intervention group** received weekly, 10-min, automated phone calls, which delivered educational vignettes and detected triggers such as diabetes-related adverse events or requests for medical appointments, medication assistance or a callback from a healthcare provider. Triggers were addressed with a follow-up call from a diabetes specialist (NP, MD or CDE) within 48 h **Participants in the control group** received usual care
Outcomes	Glycated haemoglobin (primary)
Funding	McKesson Foundation
Declaration of conflict of interest	NA

Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "patients with telephone access who receive primary care at San Francisco General Hospital were randomly selected to receive calls."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

King 2007

Methods	**Aims**: to evaluate the effectiveness of telephone-based physical activity guidance and support delivered via a trained health educator or an automated system across an extended period of 12 months **Study design**: RCT; **recruitment**: primary care and community (advert elsewhere - promotion in local media outlets, flyers and brochures in health clinics, pharmacies, senior centres, and other community settings) **study duration**: 12 months; **study type**: prevention; **subtype**: physical activity
Participants	**Inclusion criteria**: aged ≥ 55 years, English-speaking, not currently engaging in more than 60 min/week of moderate or vigorous intensity physical activity, free of any medical condition, BMI $\leq 40 \, \text{kg/m}^2$, alcohol intake ≤ 3 drinks/day, able to speak and understand English, and access to a touch-tone phone **Sample size**: 218; **mean age**: 61 years; **sex**: men - 31%; women - 69%; **ethnicity**: white - 90 %, other - 10% **Country**: USA

Interventions	**Automated advice (IVR) arm**: the system spoke to participants using computer-controlled speech generation; participats communicated using the touch-tone keypad of their telephones. The contents included physical activity assessment (type, frequency, duration, steps accumulated on the pedometer), progress evaluation, individualised problem-solving, goal-setting, feedback, and delivery of positive support and tailored advice. Each call lasted 10-15 min and occurred bi-weekly then weekly. Quality control was implemented through semi-weekly evaluation of the technical performance of the automated system via TLC's automatic contact summarisation database, as well as daily monitoring of the automated system's telephone helpline that was used by participants to report any problems while using the TLC system
	Human advice arm: this arm consisted primarily of telephone-assisted physical activity counselling by a trained health educator. Individuals received an initial in-person 30-40 min health educator-led instructional session, including development of an individualised plan emphasising a gradual progression of activity frequency, duration, and intensity towards a goal of $\geq$ 30 min of moderate-intensity endurance exercise (primarily brisk walking) on most days of the week. The remaining intervention contacts occurred via brief (i.e. 10-15 min) structured counsellor-initiated telephone calls that occurred on a bi-weekly, then monthly basis. Each participant was scheduled to receive approximately 15 contacts during the study year during which they received individualised information, support, and problem-solving around physical activity barriers
	Attention-control arm: individuals randomised to this arm were offered weekly health education classes that focused on a variety of non-physical activity topics of interest to middle- and older aged adults such as nutrition and home safety, and they were asked not to change their usual physical activity patterns during the 12-month study period. At the end of 12 months, people in this arm were offered a 6-month health educator-delivered telephone based exercise programme
Outcomes	Minutes of moderate to vigorous physical activity (primary); physical functioning and well-being (secondary)
Funding	National Institute on Aging
Declaration of conflict of interest	NA
Power calculations for sample size	"A sample size of approximately 61 participants completing per group was judged to be adequate for detecting a 30 minute per week across 7 days as measured by the physical activity recall in moderate or vigorous physical activity at 90% power with 2-sided alpha set at 0.05."
Notes	This is a comparison between the IVR arm and the health education (attention-control) classes. This study had a follow-up of 18 months reported in King 2014 but no comparisons were made between these arms at that point

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement

Random sequence generation (selection bias)	Low risk	Quote: "Randomly assigned using a computerized version of the Efron procedure."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "All study assessment staff were blinded to participant study arm assignments."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data balanced in numbers, with similar reasons for missing data across groups. Quote: "Of the 218 individuals enrolled in CHAT, 189 (86.7%) had 6- and 12-month 7-Day physical activity recall data. The retention rates were not significantly different across the three study arms."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "Participants were similar across the three study arms on the major baseline variables of interest."

Kroenke 2010

Methods	**Aims**: to determine whether centralised telephone-based care management coupled with automated symptom monitoring can improve depression and pain in cancer patients **Study design**: RCT; **recruitment**: primary care (healthcare professional referral) **Study duration**: 12 months; **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria**: patients presenting for oncology clinic visits; depression with PHQ-8 score of 10 or greater, with depressed mood and/or anhedonia; pain - at least moderate in severity, defined as a Brief Pain Inventory worst score in the past week of 6 or greater, persistent despite a patient's having tried $\geq$ 1 different analgesic medication and cancer related **Sample size**: 405; **mean age**: 59 years; **sex**: men - 32%, women - 68%; **ethnicity**: white - 80%, black - 18%, other - 2% **Country**: USA
Interventions	**Multimodal intervention** (automated symptom monitoring (ASM)) was performed using either interactive voice-recorded telephone calls or Web-based surveys based on participant preference. The 21-item survey included the PHQ-9 depression scale, 8 pain items from the Brief Pain Inventory (3 severity and 5 interference), and a single question

	for each of the following: medication adherence, adverse effects, global improvement, and whether the participant wanted a nurse care manager call. The monitoring survey was administered twice a week for the first 3 weeks, then weekly during weeks 4 through 11, twice a month during months 3 through 6, and once a month during months 7 through 12. However, more frequent administration could be reinstituted for participants who underwent treatment changes. Those not completing their scheduled assessment were contacted by telephone by the nurse care manager. In addition to ASM, participants also received telephone care management (delivered by nurse) and medication management (delivered by oncologist) **Participants in the control group** received usual care.
Outcomes	Depression severity; pain severity (primary); health-related quality of life; disability; healthcare use (outpatient physician visits); and co-interventions (depression treatments) (secondary)
Funding	National Cancer Institute, National Institutes of Health
Declaration of conflict of interest	Dr Kroenke reported receiving research funding from Eli Lilly and Pfizer, and honoraria as a speaker, consultant, or advisory board member from Eli Lilly, Pfizer, and Forest Laboratories. No other authors reported disclosures
Power calculations for sample size	The study was powered to detect clinically significant improvement in depression (HSCL-20) and pain (Brief Pain Inventory). It was determined that 97 participants per symptom group would provide 80% power to detect a 20% absolute difference in response rates with 2-tailed alpha < 0.05
Notes	"Symptom-specific disability was high, with participants reporting an average of 16.8 of the past 28 days (i.e. 60% of their days in the past 4 weeks) during which they either were confined to bed (5.6 days) or had to reduce their usual activities by 50% (11.2 days) due to pain or depression. Moreover, 176 (43%) reported being unable to work due to health-related reasons." Correspondence with the author: "The majority of patients did the symptom monitoring by IVR (89.3% by IVR; only 10.7% by web)"

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was computer-generated in randomly varying block sizes of 4, 8 and 12 and stratified by symptom type (pain only, depression only, or both pain and depression)"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "All five assessments (baseline, 1, 3, 6, and 12 months) were administered by telephone interview and conducted by research assistants blinded to treatment arm."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data balanced in numbers, with similar reasons for missing data across groups. ITT analysis was used to include all participants who received the intervention or usual care in the analysis. Quote: "Analyses were based on intention-to-treat in all randomised participants"
Selective reporting (reporting bias)	Low risk	The study protocol is available and all of the study's pre-specified outcomes of interest have been reported
Other bias	Unclear risk	There were no significant differences between the intervention and usual-care groups except for marginally significant differences for sex (P = 0.0512) and marital status (P = 0.0527). There is insufficient evidence that this imbalance has introduced bias

Kroenke 2014

Methods	**Aims**: to determine the effectiveness of a telecare intervention for chronic pain **Study design**: RCT; **recruitment**: primary care (mail and telephone) **Study duration**: 36 months; **study type**: management; **subtype**: chronic pain
Participants	**Inclusion criteria**: participants aged 18-65 years were eligible if they had pain that was musculoskeletal, defined as regional (joints, limbs, back, neck) or more generalised (fibromyalgia or chronic widespread pain); moderately severe, defined as a pain intensity item score of 5 or higher for either 'average' or 'worst' pain in the past week; and persistent (i.e. 3 months) despite trying $\geq$ 1 analgesic medication **Sample size**: 250; **mean age**: 55 years; **sex**: men - 83%, women - 17%; **ethnicity**: white race - 77 % **Country**: USA
Interventions	**Multimodal intervention (automated symptom monitoring (ASM))**, either by interactive voice recorded telephone calls or by Internet, depending on their preferences. Reports from ASM were scheduled weekly for the first month, every other week for months 2 and 3, and monthly for months 4 through 12. The 15-item ASM measure included 7 symptom items: 3 pain items from the PEG instrument, 2 anxiety items from the 2-Item Generalized Anxiety Disorder Questionnaire, and 2 depression items from the Patient Health Questionnaire 2. The other 8 items asked about how difficult pain made it to

	carry out usual activities; degree of relief from pain medications; global change in pain (worse, same, better) and, if better, the degree of improvement; analgesic adverse effects, adherence, and whether a medication change was desired; and a request for the nurse to call. Participants in this group also received optimised analgesic management by a team consisting of a nurse care manager and physician pain specialist Participants randomised to **usual care** continued to receive care for their chronic musculoskeletal pain from their primary care physician
Outcomes	Pain intensity (primary); difference in response rates: mean Brief Pain Inventory interference; and pain severity scale scores (secondary)
Funding	Department of Veterans Affairs (VA) Health Services Research and Development (VA HSR&D) Merit Review award to Dr Kroenke (IIR 07-119) and a VA Career Development Award to Dr Krebs (CDA 07-215)
Declaration of conflict of interest	Dr Kroenke reported receiving honoraria from Eli Lilly outside the submitted work. No other authors reported disclosures
Power calculations for sample size	Investigators determined that 100 participants were needed per group to detect a between-group treatment difference of 0.4 SD in the Brief Pain Inventory total score (representing a small to moderate treatment effect), presuming a 2-sided alpha < 0.05 and 80% power. Allowing for up to 20% attrition, the enrolment target was set at 250 participants
Notes	Correspondence with the author: "In a second more recent trial of ours (SCOPE) that also used IVR vs. web, we found 51% used IVR and 49% used web. Although we did not report results differently, we did a multivariable model on the primary pain outcome, and found that mode of symptom monitoring (IVR vs. web) did NOT make a difference in the treatment effect."

Risk of bias *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was stratified by patient opioid medication use at baseline (yes or no). To maintain allocation concealment, assignment to treatment group was determined by a computer-generated randomisation list with randomly varying block sizes of 4 and 8."
Allocation concealment (selection bias)	Low risk	Quote: "To maintain allocation concealment, assignment to treatment group was determined by a computer-generated randomisation list with randomly varying block sizes of 4 and 8."

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Blinding of outcome assessment was ensured. Quote: "Research assistants responsible for outcome assessments were blinded to treatment group assignment."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low drop-out rate. Missing data have been imputed using appropriate methods. Quote: "As a sensitivity analysis, multiple imputation analysis was also performed."
Selective reporting (reporting bias)	Low risk	The study protocol is available and all pre-specified outcomes have been reported in the pre-defined way
Other bias	Low risk	Groups were balanced in terms of baseline characteristics

Krum 2013

Methods	**Aims**: to determine whether an automated telephone support system would improve quality of life and reduce death and hospital admissions for rural and remote heart failure patients **Study design**: cluster RCT; **recruitment**: primary care (*) **Study duration**: 12 months; **study type**: management; **study subtype**: heart failure
Participants	**Inclusion criteria**: New York Heart Association (NYHA) class II-IV heart failure, left ventricular ejection fraction < 40% on echocardiogram, or echocardiographic features of diastolic dysfunction with impaired ventricular relaxation reported with no other diagnostic explanation for chronic heart failure-type symptoms such as chronic obstructive airways disease and bronchial asthma; a recent primary hospital discharge diagnosis of heart failure within the previous 5 years; touch-tone telephone access and the ability to operate this system **Sample size**: 405; **median age**: 73 years;**sex**: women - 37%; men - 63%; **ethnicity**: * **Country**: Australia
Interventions	The **TeleWatchTM system** is a telephone-based automated telemedicine system developed by Johns Hopkins Biomedical Engineering in conjunction with their clinical heart failure group. This telemedicine system was required to be dialled into by the participant on an at least a monthly basis at which time questions were asked with regard to heart failure clinical status, medical management of their condition, and social questions relevant to their heart failure status **Participants in the control group** received usual care (standard general practice management of heart failure)

Outcomes	Packer clinical composite score (death, hospital admission for heart failure, withdrawal from study due to worsening heart failure, 7-point global health assessment questionnaire) (primary); hospitalisation for any cause; death or hospitalisation; and heart failure hospitalisation (secondary)
Funding	National Health and Medical Research Council, National Heart Foundation of Australia, and Medical Benefits Fund
Declaration of conflict of interest	None declared
Power calculations for sample size	Calculations indicated that a shift of approximately 11% (to 37%, 47%, 16% in the intervention arm) corresponding to an odds ratio of 1.78 was able to be detected with 80% power using this sample size
Notes	Cluster RCT; analyses appropriately adjusted for clustering at practice level by using a robust variance estimator Cluster RCT with 143 GPs (127 GP clusters) GPs recruiting 434 patients, of whom 405 were enrolled into the study

Risk of bias *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The study involved cluster randomisation at the level of the general practitioner (1:1, usual care, usual care plus intervention, stratified by rural, remote and outer metropolitan area [RRMA] classification). This was to minimize contamination across the two interventions to which patients were randomised."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "All patients regardless of treatment allocation were followed up by an independent reviewer, blinded to treatment allocation, and asked to complete a telephone survey at baseline and at 6 and 12 months."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Intention-to-treat analyses were performed for all endpoints."

Krum 2013 *(Continued)*

Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "Patients were well matched at baseline for disease severity, co-morbidities, haemodynamic parameters, and concomitant medications" Insufficient information reported to judge whether or not selective recruitment of clusters may have introduced bias

Kurtz 2011

Methods	**Aims**: to assess the effect on cardiovascular death or re-hospitalisation for heart failure of 3 different clinical management strategies: standard heart failure care, management in a cardiology clinic and home telephone self-monitoring **Study design**: quasi-RCT; **recruitment**: * (*) **Study duration**: 12 months; **study type**: management; **subtype**: heart failure
Participants	**Inclusion criteria**: patients with left ventricular systolic dysfunction (LVEF 45%), recently discharged from hospital or diagnosed with acute or worsening heart failure up to 3 months before the study, between January 2007 and January 2008 **Sample size**: 138; **mean age**: 68 years; **sex**: men - 79%, women - 21%; **ethnicity**: * **Country**: France
Interventions	**Automated home telephone self-monitoring (Telecard)**: participants were asked to call an automated system once a week, to listen to the voice questions and to answer using the telephone keypad. Guide Vocal-Web (Guide Vocal-Web, France Telecom, Orange Business Service, France) is software for specifying interactive voice dialogues between human and telephone. Briefly, using a computer linked to an Orange business website service, 3 heart failure-related questions displayed in a tree manner with nodes were edited. Questions were about weight change, dyspnoea and general health. The text was then converted into a synthetic voice message. Participants were able to listen to audio advice, inviting them to repeat their call after a week (stable), after 3 days (minor worsening heart failure), to proceed to a medical visit (suspected worsening heart failure), or they were directly connected to cardiology clinic care giver (high risk of hospitalisation according to the algorithm) **Cardiology clinic**. A multidisciplinary team approach during visits to the heart failure clinic **Usual care**
Outcomes	Cardiovascular deaths, hospitalisation for heart failure (classified together as adverse events)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA

Kurtz 2011 *(Continued)*

Notes	Most of the participants received beta-blockers, ACE/AT2 inhibitors and diuretics. Cardiac re-synchronisation therapy was delivered in 27% of participants This is a comparison between the Telecard arm and the UC arm

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "Patients were allocated to three different groups for heart failure monitoring in a non-randomised fashion"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "All groups were similar in their clinical characteristics at inclusion"

LeBaron 2004

Methods	**Aims**: to evaluate the impact of large-scale, registry-based reminder-recall interventions on low immunisation rates in an inner-city population **Study design**: RCT; **recruitment**: other - public health clinics, community health centres, hospitals, outpatient departments, private practices (organisational referral) **Study duration**: 24 months; **study type**: prevention; **subtype**: immunisation
Participants	**Inclusion criteria**: residing in Fulton County, receiving care through its health department clinics or the public hospital health system, and were born between 1 July 1995, and 6 August 1996 **Sample size**: 3050; **median age**: 9 months; **sex**: boys - 49%, girls - 51%; **ethnicity**: black, non-Hispanic - 76%, Hispanic - 14%, white, non-Hispanic - 7%, other, non-Hispanic - 3% **Country**: USA

Interventions	**Autodialer** (automated telephone or mail reminder recall). 7 days before a dose was due, a computer connected to a telephone delivered a recorded message to the family. Content: child should be taken to his or her health care provider for the needed dose. If there was no answer or a busy signal, the call was repeated every 30-60 min. If these efforts failed to reach a person or an answering machine or if the telephone number was non-working or not present in the database, an automated postcard with the same message was mailed to the family no later than 5 days before the due date. If 6 days after the due date the needed dose was not present in the registry, a computerised telephone message (or postcard in the absence of a working telephone) was sent to the family indicating that the child was behind in his or her immunisations. Unless the registry recorded the immunisation, the telephone message was repeated on days 11, 17, and 23. If these efforts failed, a computerised postcard was sent on day 28. All telephone calls were made between 5:30 and 9:00 pm. At the start of each message, an option for a Spanish-language version was presented, and postcards contained the message in both Spanish and English **Outreach** (in-person telephone, mail, or home visit recall). Within 7 days of a child failing to receive a dose by the due date, the outreach worker attempted to contact the family by telephone or postcard in the absence of a working telephone. If 7 days later the dose was still not in the registry, a postcard was sent. If 30 days later the dose was still missing, a home visit was attempted, with continued monthly efforts until contact was made. At the home visit, the outreach worker attempted to determine what was needed to assist the family in obtaining immunisation for the child. The principal outreach worker was a college-educated, African American woman who had been raised in inner-city Atlanta. For Hispanic families, outreach was provided by a bilingual, college-educated, Hispanic worker. The outreach workers and other study functions were supervised by a person with a doctorate in community psychology and extensive experience in conducting inner-city studies **Combination** (Autodialer with outreach backup) **Usual care** (no interventions beyond normal clinic procedure, which in certain cases involved non-automated postcard recall systems)
Outcomes	Completion by the age of 24 months of the 4-3-1-3 vaccination series
Funding	National Immunisation Program, CDC, and the Georgia Department of Human Resources, Atlanta
Declaration of conflict of interest	NA
Power calculations for sample size	The study population of 3050 provided 80% power for detection of 5% differences in immunisation rates among groups
Notes	This is a comparison between Autodialer arm and usual care arm

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement

LeBaron 2004 *(Continued)*

Random sequence generation (selection bias)	Low risk	Computer random number generator. Quote: "At study initiation, participants were assigned by computer generated random numbers to 1 of 4 groups"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and study staff were not blinded. Quote: "We did not attempt blinding"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data have been imputed using appropriate methods. ITT analysis was used to include all participants who received the intervention or usual care in the analysis. Quote: "All analyses were based on intention to treat"
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review were reported
Other bias	Low risk	No significant difference between the intervention and control groups for any demographic or vaccination characteristic

Leirer 1991

Methods	**Aims**: to investigate whether inexpensive telephone voice mail technology be used to improve medication adherence **Study design**: RCT; **recruitment**: community centre (advert in clinic) **Study duration**: 2 weeks; **study type**: management; **subtype**: adherence to medication/ laboratory tests
Participants	**Inclusion criteria**: elders with no debilitating illness, depression, significant cognitive impairment, or medication schedules involving ≥ 2 drugs **Sample size**: 16; **mean age**: 71 years; **sex**: men - 31%; women - 69%; **ethnicity**: * **Country**: USA
Interventions	**Intervention group received TeleMinder,** a computer hardware and software system that makes it possible for health care providers to enter elders' names, addresses, phone numbers, medication schedules, and other relevant information into a database. The health care provider also speaks the elders' names and a set of voice message segments that can later be merged in different combinations to make personalised voice messages for

Automated telephone communication systems for preventive healthcare and management of long-term conditions (Review) 236

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	all or any subset of elders in the data base. TeleMinder message included the following: it asked them to verify that it had reached the correct person, it reminded them which medications they were supposed to scan, and it gave them 6 choices. These choices were hearing: the medication reminder again, a joke of the day, a health care tip of the day, the famous birthdays of the day, the big band 'name-that-tune' quiz, or they could hang up the phone. If they listened to 1 of the 4 messages, it was followed by a repeat of the medication reminder message, a brief goodbye message, and finally the phone line would disconnect **Participants in the control group** received no calls.
Outcomes	Medication non-adherence; cognitive assessment (primary)
Funding	SBIR grants #1 R44 AC06957-02 and #R44AC06753-02 from the National Institute on Aging
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	This study has a very small sample size.

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "After selecting 16 subjects for phase one of the experiment, eight subjects were randomly assigned to the voice mail condition and eight to the control condition."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	No baseline data provided. Insufficient evidence to judge whether this has introduced bias

Lieu 1998

Methods	**Aims**: to evaluate the effectiveness and cost-effectiveness of sending letters, automated telephone messages, or both to families of under-immunised 20-month-olds in an HMO **Study design**: RCT; **recruitment**: other - health plan (organisational referral) **Study duration**: 4 months; **study type**: prevention; **subtype**: immunisations
Participants	**Inclusion criteria**: under-immunised 20-month-olds living in the residence areas of 10 northern California medical centres of the Kaiser Permanente Medical Care Program of Northern California, a non-profit, group-model health maintenance organisation **Sample size**: 752; **mean age**: 20 m; **sex**: * ; **ethnicity**:* **Country**: USA
Interventions	**An automated telephone message (IVR) alone**. A prerecorded message approximately 1-min long was sent to each family, stating that the child was overdue for immunisations and providing the telephone numbers of the advice/appointment lines at the nearest Kaiser Permanente clinics. The message was personalised to the extent that the child's first name was spoken by software that generated the name from text. The system prompted the listener to choose the language in which the message was to be delivered (English, Spanish, or Cantonese), asked him or her to confirm that the correct family had been reached, and also enabled him to replay the message if desired. The system kept records of the results of each call. Messages were sent on Tuesdays between 5 pm and 9 pm by the Customer-Activated Appointment Processing Services (CAAPS), an automated telephone message system. Telephone numbers that could not be reached because there was no answer either by a person or an answering machine were called again the following evening, up to 6 attempts **An automated telephone message followed by a letter 1 week later** **A letter followed by an automated telephone message 1 week later** **Letter alone**. The letters were personalised; printed in English, Spanish, and Cantonese; and included a list of which immunisations were needed by 24 months of age *Quote: "The current study did not randomise patients to no intervention because a previous randomised controlled trial in our setting had found that letters increased immunisation relative to no intervention. However, to estimate the proportion of under-immunised 20-month-olds who would receive immunisations with no intervention, we evaluated a comparison group of similar patients who turned 20 months old during January 1996."
Outcomes	Immunisation status by 24 months of age (primary); costs; acceptability (secondary)
Funding	Northern California Kaiser Permanente and CDC
Declaration of conflict of interest	NA
Power calculations for sample size	The sample size of 160 children to each intervention group was expected to have 80% power to detect a 16% difference in the percentage of children receiving any immunisation during the 4 months after their families were sent the message
Notes	This is a comparison between the IVR alone arm and the letter alone arm. Costs of using automated telephone messages alone were USD 9.80, and USD 10.50 using letters alone

Risk of bias *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Families of under immunized children were equally randomised to receive one of four interventions"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data have been imputed using appropriate methods. ITT analysis was used to include all participants who received the intervention or usual care in the analysis. Quote: "The primary analysis classified patients on the basis of intention-to-treat, i.e. , a family assigned to receive an automated telephone message or letter was analysed as part of the assigned group regardless of whether our record indicated they received a completed message or letter"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Lim 2013

Methods	**Aim**: to determine whether multiple interventions influence adherence to glaucoma medication and to study the relationship between personality type and adherence **Study design**: RCT; **recruitment**: tertiary care (*) **Study duration**: 5 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: controlled disease (intraocular pressure at target level) on monotherapy with a topical prostaglandin agent; 18 years or older **Sample size**: 80; **mean age**: 66;**sex**: men - 49%, women - 51%; **ethnicity**: white - 62%, African American - 10%, Hispanic/Latino - 9%, Asian - 9%, East Indian - 6% **Country**: USA

Interventions	**Participants in the intervention group** received a programmed automated telephone call (SmartTalk, Televox Inc., Mobile, AL) once per month reminding them to take their eye drop medication. At the 3-month visit, they participated in a scripted, interactive educational session with the research coordinator. The educational session, which lasted approximately 20-30 min, reviewed the definition of glaucoma and its ability to cause blindness; the importance of using eye medications to control glaucoma; tips on using eye drop medication; and demonstration of how to instil eye drops into the eye **The control group** was seen at the baseline visit and received a standard 5-month follow-up visit at the time of study completion. Although this group was also instructed in and monitored using the medication event monitoring system (MEMS) system, they did not receive any additional patient education materials or telephone reminders regarding glaucoma. The control group did not receive an attention placebo
Outcomes	Adherence rate; therapeutic coverage (both primary)
Funding	Allergan Incorporated and Research to Prevent Blindness, New York, NY
Declaration of conflict of interest	None declared
Power calculations for sample size	A sample size of 127 per group to achieve a power of 80% was calculated. However, medication dosing is different in our study (once daily dosing) than in Kass' prior studies and this may greatly alter the true sample size. In addition, investigators were also looking for a difference in adherence rates based on physician intervention and automated monthly telephone reminders, which is different than in the Kass studies. Therefore, 1/3 of the calculated sample size was chosen as a pilot study
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Subjects were prospectively randomised to either an intervention or a non-intervention group using a random number table."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	High risk	Quote: "Informed consent, interviews collecting demographic data and medical history, and testing sessions were administered by trained research assistants who were not masked to diagnosis"

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Missing outcome data were balanced in numbers, with similar reasons for missing data across groups. However, insufficient information to judge if missing data have been imputed using appropriate methods
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "No statistically significant difference existed between patients in the intervention and nonintervention groups in terms of age, sex, self-reported ethnicity, glaucoma diagnosis, average length of diagnosis, number of systemic medications, number of medical problems, vision, intraocular pressure, highest level of education reported, and highest level of income reported" (Table 2)

Linkins 1994

Methods	**Aims**: to assess the effectiveness of computer-generated telephone reminder and recall messages in increasing preschool immunisation visits **Study design**: quasi-RCT; **recruitment**: other - county health departments (organisational referral) **Study duration**: 5 months; **study type**: prevention; **subtype**: immunisation
Participants	**Inclusion criteria**: any child younger than 2 years if his or her computerised immunisation record contained a telephone number and if the child was due or late for immunisation(s) at any time during the 4-month enrolment period **Sample size**: 8002; **mean age**: < 2 years; **sex**: boys - 51%, girls - 49%; **ethnicity**: black - 50%, white - 45%, other - 5% (including Hispanic, Asian, and unknown) **Country**: USA
Interventions	**Intervention**: before each calling session, children whose households were scheduled to receive a message were identified by the computer; telephone numbers and immunisation categories of these children were then downloaded to the automated dialing machine (System 606, Telecorp Systems Inc, Roswell, GA). For each calling session, the automated dialing machine recorded household-specific information on the number of attempted contacts made and whether a successful contact had occurred. Following each calling session, this information was uploaded and merged with the study file. The households of children in the intervention group were called by the automated dialling machine twice daily for 7 days until successful telephone contact was established. To maximize the probability of reaching a parent, all weekday telephone attempts were made during evening hours. For children who were due for an immunisation, attempts at telephone contact began the day before the child was due. For children who were late for an immunisation, attempts at telephone contact began immediately after randomisation. Immunisation visits were immediately recorded in each health department's immuni-

Linkins 1994 (*Continued*)

	sation database when any child arrived for an immunisation. All children randomised to receive a telephone message received a second message if no immunisation visit was made in the week following the first successful telephone contact **Control group** received no calls.
Outcomes	Immunisation status at 1 month
Funding	CDC
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Sequence generated in a non-random way (odd or even numbers). Quote: "Children were allocated to an intervention group if their telephone numbers were assigned to an odd number; all other children were assigned to the non-intervention group."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	High risk	Data on the differences between the groups by county, type of residence, ethnicity, sex, or age were not reported
Other bias	Unclear risk	Insufficient information

Litt 2009

Methods	**Aims**: to explore whether an individualised assessment and treatment programme (via IVR) could be devised that would train adaptive coping skills to alcoholic patients more effectively than current manual-based coping skills treatments **Study design**: RCT; **recruitment**: primary care (advert elsewhere - newspaper and radio, other research programmes) **Study duration**: 16 weeks; **study type**: management; **subtype**: alcohol consumption
Participants	**Inclusion criteria**: to be eligible individuals had to be $\geq$ 18 years old, meet DSM-IV criteria for alcohol abuse or dependence, and be willing to accept random assignment to either of the 2 treatment conditions **Sample size**: 110; **mean age**: 49 years; **sex**: men - 58%, women - 42%; **ethnicity**: white - 86%, black - 9%, Hispanic - 3%, other - 2% **Country**: USA
Interventions	**The Individualized Assessment and Treatment Program (IATP)** employed a functional analysis of participants' behaviour as assessed by the IVR system during the 2-week pretreatment experience-sampling period. The situations that each participant encountered during experience sampling monitoring were reconstructed from the monitoring data, along with accompanying mood states, cognitive appraisals and coping actions taken. A functional analysis chart with this information was prepared by a research assistant and delivered to the therapist prior to the first IATP treatment session. IATP sessions focused on training 4 basic coping skills sets in each situation: avoidance, escape, environmental modification, and personal coping. Sessions 1 to 3 were devoted to analysing the high-risk situations shown in the personalised functional analysis chart. Coping skills training initially addressed identification and avoidance of the participant's specific high-risk situations. For situations that could not be avoided, training included skills such as environmental modification, drink refusal and assertiveness specifically tailored for dealing with the identified high-risk situations, escape from high-risk situations, and 'personal coping'. Homework was individualised, and built on information revealed in the functional analysis chart, as well as other situations recalled by the participant **Packaged Cognitive-Behavioural Therapy** was based on cognitive-behavioural principles and designed to remediate deficits in skills for coping with interpersonal and intrapersonal antecedents to drinking. The treatment, based on manuals developed for previous clinical research and for Project MATCH, provided a structured experience using didactic presentations, behavioural rehearsal, and homework practice exercises. Homework was prescribed after every session, and was relevant to the material covered in that session
Outcomes	Proportion of days abstinent; proportion of heavy drinking days; continuous abstinence; drinking problems; coping problems (all primary)
Funding	R21-AA014202 from the National Institute on Alcohol Abuse and Alcoholism, and General Clinical Research Center grant M01-RR06192 from the National Institutes of Health
Declaration of conflict of interest	NA
Power calculations for sample size	A sample size of 50 per cell was determined to be sufficient to test most hypotheses with a power of 0.80 and alpha set at 0.05 based on effect sizes derived from previous studies of coping skills measures and outcomes

Notes	ClinicalTrials.gov Identifier:NCT00298792. This is a comparison of 2 different interventions delivered via IVR

Risk of bias		*Risk of bias*
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Participants were assigned to treatment using an urn randomisation procedure that balanced the two groups for sex, age, baseline readiness to change, self-efficacy and Coping Strategies Scale Total score"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "the failure to blind research assistants to treatment assignment must be considered a weakness"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review have been reported
Other bias	Unclear risk	Insufficient information

Lorig 2008

Methods	**Aims**: to determine whether Spanish Diabetes Self-Management Program (SDSMP) participants receiving monthly automated telephone reinforcement would maintain improvements in health status, health behaviours, and self-efficacy at 18 months better than those not receiving reinforcement **Study design**: RCT;**recruitment**: other - community (word of mouth, announcements in churches, clinics, and Spanish language mass media) **Study duration**:18 months; **study type**: management; **subtype**: diabetes
Participants	**Inclusion criteria**: participants were ≥ 18 years, not pregnant or in care for cancer, and had type 2 diabetes. They were enrolled in the SDSMP trial. Also included the control participants who had subsequently taken the SDSMP **Sample size**: 417; **mean age**: 53 years; **sex**: men - 38%, women - 62%; **ethnicity**: Hispanic (Spanish-speaking) - 100% (73% born in Mexico)

	Country: USA
Interventions	**Participants received automated telephone reinforcement** once a month. They were greeted and asked to rate their diabetes self-efficacy in the next month; had option to listen to two, 90-s vignettes about various aspects of diabetes, and each of 15 vignettes was offered twice over 15 months-participants might hear about how Alexandra solved problems eating with her family or how Jose talked to his doctor about impotence; participants could leave a message. If necessary, a staff member responded to these messages **Participants in the control group** received usual care.
Outcomes	Glycated haemoglobin; health distress; global health; hypoglycaemia; hyperglycaemia; activity limitation; fatigue; glucose monitoring; self-efficacy; healthcare utilisation (all primary)
Funding	National Institutes of Health/National Institutes of Nursing Research Grant, Michigan Diabetes Research and Training Center
Declaration of conflict of interest	KL receives royalties from Bull Publications for *Tomando Control de su Salud*, the book used by course participants
Power calculations for sample size	NA
Notes	The SDSMP is a 6-week programme offered 2.5 h weekly by 2 peer leaders. Programmes were held in community settings in 6 San Francisco Bay Area counties. Class sizes ranged from 10 to 15 including participants' family and friends. Spanish-speaking peer leaders (N = 43) came from the same communities as the participants. Most had type 2 diabetes and were not health professionals. They received 4 days of training

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Following baseline data collection, most study participants were randomised to three groups"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	High risk	Complete case analysis

Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Comment: groups were comparable across all baseline characteristics but sex (control group had significantly more women participants compared with intervention, i.e. 67.2% vs 57.1%); however it is unclear if this imbalance has introduced bias

Magid 2011

Methods	**Aims**: to determine if a multimodal intervention composed of patient education, home blood pressure monitoring, blood pressure measurement reporting to an IVR phone system, and clinical pharmacist follow-up improves blood pressure control compared with usual care **Study design**: RCT;**recruitment**: primary care (telephone) **Study duration**: 6 months; **study type**: management; **subtype**: hypertension
Participants	**Inclusion criteria**: patients with hypertension who were taking ≤ 4 antihypertensive medications and who had elevations in 2 of the 3 most recent electronic blood pressure measurements **Sample size**: 283; **mean age**: 65 years; **sex**: men - 65%, women - 35%; **ethnicity**: white - 65%, other - 18%, Hispanic - 17% **Country**: USA
Interventions	**Multimodal intervention** included the following components: patient education, home blood pressure monitoring, home blood pressure measurement reporting to an IVR phone system, and clinical pharmacist management of hypertension with physician oversight. Participants input their systolic and diastolic blood pressure reading using the touch-tone keypad of their phone during the weekly IVR calls. IVR, after calculating the average, provided feedback on whether their blood pressure measurements were at goal. They also had an opportunity to listen to educational messages or to request a call from the clinical pharmacist to answer questions. The blood pressure measurements were also reviewed by clinical pharmacists and participants received appropriate counselling. Those who did not enter any blood pressure measurements into the IVR system after 10 days received an automated reminder call, followed by a call from the pharmacist 4 days later **Participants in the control group** received usual care.
Outcomes	Change in systolic and diastolic blood pressure (primary); medication adherence (secondary)
Funding	American Heart Association and Colorado Department of Public Health and Environment
Declaration of conflict of interest	"Dr Ho reports serving as a consultant for Wellpoint, Inc. The other authors (DJM, KLO, DWB, LKW, KES, ACLK, MEP, EPH) report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this

		article."
Power calculations for sample size	NA	
Notes	ClinicalTrials.gov Identifier: NCT01162759	

Risk of bias		*Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A block randomisation design was used to ensure balance within healthcare systems A random allocation sequence was computer generated using stratified randomisation with an allocation ratio of 1:1"
Allocation concealment (selection bias)	Low risk	Quote: "The sequence was concealed until the intervention and usual care groups were assigned at the baseline visit."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "The research assistant who obtained the blood pressure measurements was blinded to patient study group assignment."
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Quote: "Of 338 patients enrolled in the study, 283 (84%) completed the 6-month visit . . . Our primary analyses applied intent-to-treat principles to patients who completed the end-of-study visit . . .Patients who did not complete the study had higher baseline systolic and diastolic blood pressure"
Selective reporting (reporting bias)	Low risk	Comment: the protocol is available; and all of the study's pre-specified outcomes that are relevant to the review have been reported
Other bias	High risk	Baseline imbalance. The intervention had significantly higher systolic blood pressure compared with the control group. Quote: "At baseline, the mean (SD) blood pressures were significantly higher for 138 in-

		tervention patients vs 145 usual care patients"

Mahoney 2003

Methods	**Aims**: to assess the effects of computer-mediated automated IVR intervention designed to assist family caregivers managing persons with disruptive behaviours related to Alzheimer's disease (AD) **Study design**: RCT; **recruitment**: primary care and community (organisational referral and media adverts) **Study duration**: 18 months; **study type**: management; **subtype**: stress management
Participants	**Inclusion criteria**: over the age of 21, provided ≥ 4 h per day of assistance or supervision for a minimum of 6 months to a family member with AD who had ≥ 2 impairments of instrumental activities of daily living (e.g. driving, shopping, or managing money) or 1 activity of daily living (e.g. toileting, bathing, eating), and exhibited ≥ 1 AD-related disturbing behaviour **Sample size**: 1100 dyads; **mean age**: 63 years; **sex**: men - 22%, women - 78%; **ethnicity**: white - 79%, black or African American - 16%, Hispanic - 2%, other - 2% **Country**: USA
Interventions	**Telephone-Linked Care (REACH for TLC)**: participants chose the type of component, frequency, duration, and timing of the usage. The automated IVR conversation monitored the caregiver's stress levels and provided information on how to manage the care recipient's behavioural problems. Personal mailbox allowed caregivers to anonymously send and receive confidential communications through voice mail among themselves or to communicate with a clinical nurse specialist who directly answered or triaged questions to a multidisciplinary professional panel of AD experts. Bulletin board users anonymously posted messages and received responses back from other users. Activity-respite conversation provided personalised pleasant conversation to engage the listener in a safe, comforting, and non-demanding activity **Participants in the control group** received usual care.
Outcomes	Caregiver's appraisal of the bothersome nature of care-giving; anxiety; depression (primary)
Funding	National Institutes of Health (NIH) National Institute on Aging
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias | | | *Risk of bias*

Bias	**Authors' judgement**	**Support for judgement**

Mahoney 2003 *(Continued)*

Random sequence generation (selection bias)	Low risk	Quote: "Two separate computer-generated random assignment lists, one for men and one for women, were generated for each recruitment site, ensuring that each intervention and control group was balanced by sex and site."
Allocation concealment (selection bias)	Low risk	Quote: "After the completion of the baseline data, the interviewer opened an envelope that contained the group assignment."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "All participants were subsequently interviewed at time points of 6, 12, and 18 months by different telephone interviewers who were blind to the study assignments except for the user satisfaction survey at the completion of the intervention period"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data balanced in numbers, with similar reasons for missing data across groups. "There was no significant difference in the frequency of missing data between intervention and control groups for the outcome measures (p > 0.05)"
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review were reported
Other bias	Low risk	Quote: "The intervention and control groups did not differ significantly for any of the outcome dimensions at baseline."

Maxwell 2001

Methods	**Aims**: to determine the impact of reminder systems on appointment non-adherence rates in an low-income inner city clinic population **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 2 months; **study type**: either; **subtype**: appointment reminders
Participants	**Inclusion criteria**: patients due for an initial/annual gynaecology visit or initial prenatal intake visit in the women's health department over a period of 2 months **Sample size**: 2304; **mean age**: 29 years; **sex**: women - 100%; **ethinicty**: Hispanic - 66%,

	black - 19%, white - 13%, other - 2% **Country**: USA
Interventions	**Automated telephone reminder** of their appointment the day prior to the actual appointment **Postcard reminder** **No reminder** (control group)
Outcomes	Attendance rate
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	The criterion for significance (alpha) was set at 0.05 (2-tailed). To determine whether the sample size was sufficient to test our hypothesis, power was calculated using historical Hartford Hospital data and data reported previously in the literature. With the given effect size, a sample size of 1140 would have a power of 90 percent to yield a statistically significant result using a 3 x 2 Chi^2 contingency test.
Notes	This is a comparison between automated telephone and no reminder. The other intervention included postcard reminder

Risk of bias

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "patients who verbally consented to participate in the study were randomly assigned to receive a phone reminder, mailed reminder, or no reminder (control group)"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of study personnel was ensured. Quote: "Group assignment was unknown to those administering health care"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information

Maxwell 2001   *(Continued)*

Other bias	Low risk	Quote: "There were no significant differences in characteristics between the control and intervention groups for either the caregivers or the care recipients enrolled in the study"

McNaughton 2013

Methods	**Aims**: to test whether IVR telephony may decrease the relapse rate after smoking cessation **Study design**: RCT; **recruitment**: other - community (newspaper advert) **Study duration**: 24 months; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: smoking ≥ 35 cigarettes per week or ≥ 5 cigarettes per day for ≥ 2 years with no period of abstinence longer than 3 months **Sample size**: 44; **mean age**: 53 years; **sex**: men - 67%; women - 33%; **ethnicity**: * **Country**: Canada
Interventions	After 12 weeks, the **intervention group** continued to receive IVR calls every 2 weeks from weeks 13-52. The IVR intervention consisted of 2 parts: establishing it is speaking to the study participant and the main data collection section. As instructed at the beginning of the call, the participant answers 'yes' or 'no' to all questions except when asked about their level of confidence and their side effects. The IVR asks if they have had a cigarette since their quit date, if they have smoked a cigarette, even a puff, if they have used varenicline in the last 14 days, have they experienced any side effects, how confident they are that they will remain a non-smoker, and would they like to have a study nurse call them to help prevent relapse or provide advice about varenicline. Finally, there is a positive reinforcing message thanking and congratulating them followed by "remaining smoke-free is the single most important thing you can do for your health". The calls are 3-5 min long, depending on their answers and which part of the algorithm they are directed to. The IVR made a call on their quit day, then on day 3, 8, and 11, and every 2 weeks thereafter **The control group** received no further IVR calls (no intervention)
Outcomes	Self-reported abstinence; biochemically confirmed smoking abstinence (both primary)
Funding	Pfizer (Canada)
Declaration of conflict of interest	Jiri Frohlich was a member of Pfizer (Canada) Medical Advisory Board and received speaking honoraria. He also participated in several clinical trials and received grants for investigator initiated studies
Power calculations for sample size	NA
Notes	In phase 1 of the study, participants also received a 12-week supply of varenicline: 0.5 mg to be taken on days 1-3, 0.5 mg twice a day on days 4-7, and 1 mg twice a day until the end of week 12

Risk of bias		Risk of bias
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Participants who had quit smoking at 12 weeks were randomised into 2 groups matched by their level of motivation and level of addiction as per psychometric questionnaire at baseline. This was a stratified randomisation whereby participants were categorized by motivation and addiction."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Participants in the intervention smoked mean (SD) no. of cigarettes per day at baseline: 18.5 (6.6) versus 17.3 (8.6) in control. Insufficient evidence to judge whether this has introduced bias

Migneault 2012

Methods	**Aims**: to evaluate a culturally adapted, automated telephone system to help hypertensive, urban African American adults improve their adherence to their antihypertensive medication regimen and to evidence-based guidelines for dietary behaviour and physical activity **Study design**: RCT; **recruitment**: primary care (mail and telephone) **Study duration**: 12 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: self-identification as African American; a diagnosis of hypertension on the active problem list of the patient's medical chart; a current prescription for ≥ 1 antihypertensive medications; ≥ 1 primary care office visits in the previous 2 months; 2 elevated clinic blood pressure readings in the previous 6 months (systolic blood pressure

	≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg among non-diabetic patients, and ≥ 130/80 among diabetic patients); and age ≥ 35 years **Sample size**: 337; **Mean age**:57 years; **sex**: men - 30 %; women - 70 %; **ethnicity**: African American - 100 % **Country**: USA
Interventions	**Telephone-Linked Care for Hypertension**: at the onset, participants received a 75-page resource manual that described hypertension, listed dietary recommendations, heart healthy food recipes, and local resources for exercise, and provided information to support antihypertensive medication adherence. Based on the manual, they received a 20-min education session, and were given a pedometer and a digital weight scale. Participants in the intervention group also received a digital home blood pressure monitor. The automated telephone intervention delivered 1 call per week for 32 weeks. The first 3 calls introduced the 3 targeted behaviours and their role in blood pressure control. Subsequent calls were arranged as modules on medication adherence, physical activity, and diet, and were delivered in the order chosen by the participant. Each call consisted of an introduction, a section for reporting health information collected on study-issued home measurement devices (pedometers, sphygmomanometers, weight scales), and theory-based interactive education and counselling on the targeted behaviour. Physical activity module consisted of 12 calls to increase levels of moderate-or-greater intensity physical activity. The diet module consisted of 9 calls - 1 overview call and 2 calls for each of 4 topics: fruits and vegetables, fibre, sodium, and fat. The content of these calls was designed to promote the DASH diet. The medication adherence module consisted of 8 calls. Study staff monitored participant use of the system and contacted those who did not call to assist or re-engage them with the system **Participants in the control group** received usual care (education-only).
Outcomes	Medication adherence (primary); diet; physical activity; blood pressure (secondary)
Funding	National Heart, Lung, and Blood Institute
Declaration of conflict of interest	"Dr. Friedman has stock ownership and a consulting agreement with InfoMedics, the company that owns commercial rights to the TLC technology used in the computerized intervention. He is also a member of its Board of Directors. None of the other authors has any potential conflicts of interest to disclose."
Power calculations for sample size	"Based on power analyses and projected attrition, we sought to randomise 360 patients expecting 300 to complete the 8-month study assessment thus providing sufficient power to analyse the three primary behavioral outcomes."
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was accomplished using a random number generator to assign subjects to one of the two groups"

Allocation concealment (selection bias)	Low risk	Quote: "Neither participants nor research assistants knew the group assignment until after baseline assessments were complete."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Missing data were imputed using the last value carried forward. For cases where data were available at time points before and after the missing value, the mean of these two values was used."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	High risk	Quote: "Intervention group participants reported more moderate-or-greater physical activity per week than controls (162.4 min. vs. 126.3 min., p=0.04), and a greater percentage of the intervention group met national moderate-or-greater physical activity recommendations (38.5% vs. 26.2%, p<0.02). In addition, more intervention group participants than controls reported a history of stroke (11.2% vs. 4.2%, p<0.02)." Comment: groups were not comparable with significant baseline differences in physical activity (one of the study's primary outcomes) and stroke history

Mooney 2014

Methods	**Aims**: to enable oncology providers to receive and act on alert reports from patients about unrelieved symptoms during chemotherapy treatment **Study design**: RCT; **recruitment**: community centres and clinics (in-person at the clinic) **Study duration**: 45 days; **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria**: eligible patients were to receive ≥ 3 chemotherapy cycles, were ≥ 18 years, had daily access to a touch-tone telephone, understood English or Spanish, were physically and mentally able to participate, and reported ≥ 1 symptom of moderate or greater intensity during their first chemotherapy cycle **Sample size**: 250; **mean age**: 55.5 years; **sex**: men - 24%; women - 76%; **ethnicity**: Caucasian - 91%, other - 9%

	Country: USA
Interventions	**Automated monitoring system** to report daily on 10 symptoms-pain, fatigue, nausea/vomiting, fever, trouble sleeping, anxiety, depressed mood, sore mouth, diarrhoea, and constipation. The symptoms were selected from the literature and confirmed in our pilot study as most frequently reported by patients receiving chemotherapy. Participants were queried if symptoms were present in the past 24 h and, if present, they rated severity and distress on a 1-10 scale. The 1-10 numeric scale is commonly used clinically and is an accepted standard in the measurement of symptoms; questions could be stated easily on the phone and answered numerically with the touch-tone keypad. If fever was reported, the highest temperature was entered numerically; in addition, distress but not severity was measured for fever. For the treatment group, at completion of the phone call, the system immediately faxed or emailed (based on provider preference) symptom alert reports to the participant's oncologist and oncology nurse. Alert thresholds varied by symptom; they were initially established by an expert panel and then revised based on pilot work. 2 thresholds were set: a simple alert when severity or distress was > 5 or 7 (depending on the symptom) on the 10-point scale and trend alerts based on a pattern of moderate severity over several days. For example, pain generated an alert when pain was rated at 5 or greater, whereas fatigue generated an alert at 7 or a trend alert based on a pattern of 3 out of the past 7 days reported at moderate levels (4-6). The report included not only severity and distress but a symptom profile including answers to drill-down questions such as the number of vomiting episodes, oral intake, dizziness, and use of antiemetics for nausea. Reports also included graphs of symptom patterns since the first day of chemotherapy. On every call, all participants, regardless of group, were advised to call their oncology providers if they had concerns about their symptoms. In all of the participating provider teams, normal usual care procedure for unrelieved symptoms was to instruct participants to call the clinic office for symptom concerns **Attention control group** received equivalent contact time with the automated system including identical voice and assessment questions. They understood that the data they submitted were for research purposes only and were not available for clinical action. On every call, all participants, regardless of group, were advised to call their oncology providers if they had concerns about their symptoms. In all of the participating provider teams, normal usual care procedure for unrelieved symptoms was to instruct participants to call the clinic office for symptom concerns
Outcomes	Symptom severity, and distress (primary); system usability and acceptability (secondary)
Funding	National Institutes of Health, National Cancer Institute (R01 CA89474)
Declaration of conflict of interest	None reported
Power calculations for sample size	A post hoc sensitivity analysis was conducted with G*Power to access available statistical power. With a sample size of 223 participants, investigators had sufficient power (1 −B) =0.91 to detect a small effect size Cohen's d = 0.10 and alpha = 0.05
Notes	Similar ATCS interventions were compared with each other.

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Patients were stratified by provider team to ensure equivalency of the treatment and control groups within teams and then randomly assigned to treatment or attentional control. Random assignments in blocks of ten were generated for each provider stratification group."
Allocation concealment (selection bias)	Low risk	Quote: "Research staff and patients did not know assignment until after informed consent."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Providers were not informed of random assignment but could not be blinded as they would only receive alert reports about treatment group patients."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Quote: "Twenty-seven participants dropped from the treatment group (21%) and 31 from the control group (26%), a non-significant difference (p>0.05)." Comment: insufficient information whether this drop-out rate introduced bias
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review were reported
Other bias	Unclear risk	The intervention had significantly more women and breast cancer diagnosed participants compared with the control, but there is insufficient evidence that this imbalance has introduced bias. Quote: "Comparisons of group equivalence at baseline indicated that the treatment group was over-represented by women (chi-square 4. 89; p=0.027) and breast cancer diagnosis (chi-square=9.56; p=0.023)."

Moore 2013

Methods	**Aims**: to evaluate feasibility, acceptability, and initial efficacy of a therapeutic IVR system for opioid dependent patients receiving methadone maintenance who were continuing to use illicit drugs while enrolled in treatment **Study design**: RCT; **recruitment**: primary care (clinic posters and flyers, brochures provided to counsellors, and word-of-mouth) **Study duration**: 1 month; **study type**: management; **subtype**: illicit drugs addiction
Participants	**Inclusion criteria**: no current suicide or homicide risk; lack of a DSM-IV current psychotic or bipolar disorder; not involved in another treatment study; ability to read or understand English; and lack of a life-threatening or unstable medical problem **Sample size**: 36; **mean age**: 41 years; **sex**: men - 58%; women - 42%; **ethnicity**: white - 58%, black - 28%, other - 14% **Country**: USA
Interventions	**The Recovery Line** plus treatment-as-usual involved a therapeutic IVR orientation session, 4 weeks of 24-h access to the system, a participant notebook with summary Recovery Line information, and a weekly reminder from staff to use the system. The Recovery Line system was developed for participants to use in their own environment and obtain immediate assistance, training, and support for improved coping. Modules were designed to be brief (< 15 min) and easy to understand. System components included self-monitoring, coping with urges and cravings, identifying/avoiding risky situations, and managing moods and stress. For self-monitoring, a daily questionnaire of 3 items was included immediately upon system log in ("How are you doing?" "Have you taken your methadone today?" "Have you used illicit drugs since your last call?") **Participants in the control group** received usual care. The proposed system was meant to serve as an enhancement of current services being delivered, which included the requirement to attend 1 individual session per month and encouragement to attend open access groups (with ≥ 10 typically available Monday-Friday) covering a range of topics, including introduction to methadone, weekend planning, overdose planning, and spirituality. These are the services provided in the standard care comparison condition
Outcomes	Patient interest; perceived efficacy; treatment satisfaction; drug consumption (self-reported use); methadone counselling; ease of use; coping skills (all primary)
Funding	National Institute on Drug Abuse Grants and through the State of Connecticut, Department of Mental Health and Addiction Services support of the Connecticut Mental Health Center
Declaration of conflict of interest	NA
Power calculations for sample size	None
Notes	ClinicalTrials.gov Identifier: NCT01315184

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement

Moore 2013 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	Quote: "Patients were randomised (N=36) to 4 weeks of treatment-as-usual (TAU) or Recovery Line plus TAU."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "There were no statistically significant differences between the two treatment conditions, but several trends were controlled through covariance adjustments." There is insufficient evidence that these covariates have introduced bias

Morey 2009

Methods	**Aims**: to determine the effects of multicomponent physical activity counselling (PAC) promoting physical activity guidelines on gait speed and related measures of physical activity and function in older veterans **Study design**: RCT; **recruitment**: primary care (mail and telephone) **Study duration**: 12 months; **study type**: prevention; **subtype**: physical activity
Participants	**Inclusion criteria**: patients were eligible for the study if they could walk 30 feet without human assistance and did not engage in regular physical activity **Sample size**: 398; **mean age**: 78 years; **sex**: men - 100%; **ethnicity**: white - 77% **Country**: USA
Interventions	**Multimodal intervention group** received: baseline in-person and biweekly then monthly telephone counselling by a lifestyle counsellor, onetime clinical endorsement of physical activity and monthly automated telephone messaging by primary care provider, and quarterly tailored mailings of progress in physical activity **Participants in the control group** received usual care.
Outcomes	Gait speed (usual and rapid); self-reported physical activity; function and disability (all primary); change in min of moderate/vigorous physical activity per week (secondary)

Funding	Veterans Affairs Rehabilitation Research and Development # E3386R and NIH grant AG028716
Declaration of conflict of interest	NA
Power calculations for sample size	Quote: "We powered the sample size for this study to be able to detect a between group difference of 0.10 m/sec in both usual and rapid gait speeds."
Notes	1 participant died in the intervention group; 6 died in the control group

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation was computer generated by a statistician"
Allocation concealment (selection bias)	Low risk	Quote: "Randomisation was . . . sealed envelopes stored in the Veterans LIFE Study office until randomisation."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "The study was unblinded and patients were aware of the study objectives."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "All assessments were made at baseline, three, six, and 12 months by individuals blinded to randomisation status"
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Quote: "Return for follow-up was similar for both groups with slightly more withdrawals in the PAC group [16 (8%)] than in the UC group [11 (5.5%)]. There were no differences between dropouts and individuals completing the trial except for usual gait speed which was significantly lower in the drop outs (-0.9 m/sec, p = 0.016)." Insufficient evidence to judge whether this introduced bias
Selective reporting (reporting bias)	Low risk	The study protocol is available and all pre-specified outcomes have been reported accordingly
Other bias	Low risk	Baseline characteristics were similar between the 2 groups.

Morey 2012

Methods	**Aims**: to determine whether a home-based multi-component physical activity counselling (PAC) intervention is effective in reducing glycaemic measures in older prediabetic outpatients
	Study design: RCT; **recruitment**: primary care (mail and telephone)
	Study duration: 12 months; **study type**: prevention; **subtype**: physical activity
Participants	**Inclusion criteria**: impaired glucose tolerance defined as a fasting glucose between 100-125 mg/dL, free from a diagnosis of diabetes, have a glycated haemoglobin below 7%, and not be on diabetes medications. A BMI between 25 and 45 kg/m^2 was required
	Sample size: 302; **mean age**: 67 years; **sex**: men - 97%, women - 3%; **ethnicity**: white race - 70%
	Country: USA
Interventions	**Multimodal intervention group** received: 1 in-person baseline counselling session, regular telephone counselling, physician endorsement in clinic with monthly automated (telephone calls) encouragement, and tailored mailed materials, plus a consult to a Veterans Affairs (VA) weight management programme
	Participants in the control group received usual care plus MOVE programme
Outcomes	Fasting insulin and glucose levels measured with homeostasis model assessment of insulin resistance (HOMA-IR); glycated haemoglobin; anthropometric measures; self-reported physical activity; health-related QOL; physical function
Funding	VA Health Services Research and Development grant IIR-06-252-3; National Institute on Aging grant AG028716; VA Rehabilitation Research Service grants (RRD-E2756R, RRD-E3386R) and National Cancer Institute grant CA106919; Department of Veterans Affairs Health Services Research and Development Career Scientist Award (RCS 08-027)
Declaration of conflict of interest	None declared
Power calculations for sample size	Power estimates were calculated using data from the STRRIDE study in which a group receiving a low dose of moderate exercise, equivalent to the dose of moderate exercise advocated for the Enhanced Fitness Study, reduced fasting insulin by 1.3 units while the control group experienced an increase in fasting insulin of 0.92 units with a pooled standard deviation of 3.9. With correction for multiple comparisons between adaptive strategies and a projected 12.5% attrition rate based on our previous experience, our sample size was 80% powered to detect a standardised difference of 0.39 in fasting insulin for a 2-tailed test
Notes	2 participants died in the intervention group; 1 died in the control group

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Adaptive randomisation will allow us to mimic primary care by altering treatment based upon patient compliance".

		Insufficient information to judge whether this introduced bias
Allocation concealment (selection bias)	Low risk	Quote: "A statistician with no participant contact delivered sealed randomisation assignments to the project coordinator. These were kept in a locked cabinet until randomisation occurred."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "All of the outcomes were assessed at baseline, three months and 12 months by individuals blinded to intervention status"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Analyses were performed under the intent-to-treat criteria"
Selective reporting (reporting bias)	Low risk	The study protocol is available and all pre-specified outcomes have been reported accordingly
Other bias	Low risk	Quote: "Sensitivity analyses revealed no baseline differences between groups for age, race, number of symptoms, general health and physical function"

Mosen 2010

Methods	**Aims**: to determine the effect of an automated telephone intervention on completion of faecal occult blood testing **Study design**: RCT; **recruitment**: other - health plan (organisational referral) **Study duration**: 6 months; **study type**: prevention; **subtype**: screening
Participants	**Inlcusion criteria**: eligible participants were due for routine colorectal cancer screening (and in whom stool occult blood testing was a clinically appropriate option) and who met other criteria such as: those due for colorectal cancer screening who have not had any of the following: colonoscopy within 10 years, flexible sigmoidoscopy or double-contrast barium enema within 5 years, faecal occult blood testing screening within past 12 months, or order for faecal occult blood testing/double-contrast barium enema in past 3 months **Sample size**: 6000; **mean age**: 60 years; **sex**: men - 50%, women - 50%; **ethnicity**: white - 92%, non-white - 7%, unknown - 1% **Country**: USA

Interventions	**Automated Telephone Contact Intervention** group received up to three 1-min automated telephone calls providing a brief overview, including information about the benefits of colorectal cancer screening, and encouraged faecal occult blood testing as a relatively simple and low-risk method of cancer screening. Recipients could request faecal occult blood testing cards by pressing a number via touch-tone telephone. If a live person did not answer, callers heard a detailed message with a telephone number they could call to request cards. Participants who did not complete faecal occult blood testing screening received up to 2 reminder calls, 6 weeks apart. Call content was identical to the rst automated telephone call. 1 additional reminder call was targeted to intervention participants who had requested an faecal occult blood testing kit but did not return the completed faecal occult blood testing cards within 4 to 5 weeks from the date of request. The call to non-returners (call type 2) emphasised the benefits of colorectal cancer screening and reminded participants to return completed faecal occult blood testing cards. Participants were given the opportunity to request additional faecal occult blood testing cards if needed **Participants in the control group** received usual care. Participants randomised to UC did not receive the telephone contact intervention but may have been referred for colorectal cancer screening by their clinicians during normal care processes
Outcomes	Completion of faecal occult blood testing during the 6 months after call initiation; screening through any the US Preventive Services Task Force recommended colorectal cancer screening modality during the RCT and included receipt of faecal occult blood test, colonoscopy, flexible sigmoidoscopy, or double-contrast barium enema
Funding	National Cancer Institute
Declaration of conflict of interest	NA
Power calculations for sample size	We had 80% power to detect an absolute difference of 2.8% (relative difference of 28. 6%), assuming the faecal occult blood test return rate was 9.7% in UC versus 12.5% in the intervention group
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The 6000 patients were randomly assigned either to receive usual care (UC; n=3000) or automated telephone contacts (n=3000), using a stratified randomisation approach, balancing on age, sex, and prior colorectal cancer screening."
Allocation concealment (selection bias)	Unclear risk	Insufficient information

Mosen 2010 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attritions were small (< 2% in both groups) and unlikely to introduce bias
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Groups were similar at baseline. Quote: "No statistically significant differences were found between the 2 populations for any of the baseline characteristics."

Mu 2013

Methods	**Aims**: to evaluate the impact of an automated telephone reminder system on patients' on-time maintenance medications refills **Study design**: RCT; **recruitment**: population level **Study duration**: 1 month; **study type**: prevention; **subtype**: adherence to medication/ laboratory tests
Participants	**Inlcusion criteria**: participants due for medication refills **Sample size**: 4,237,821; **mean age**: 56 years; **sex**: men - 38.5%; women - 61.5%; **ethnicity**: * **Country**: USA
Interventions	**Participants on maintenance prescription received automated IVR calls**, 3 days before their refill was due, as a reminder. If participants had multiple medications due on a single day, only 1 call for all medications was made. A maximum of 2 attempts was made for unanswered calls. If both attempts fail and a participant's voicemail was available, a message was left with phone number to call back. Messages did not identify the medication by name or any other form of protected health information. Upon answering a call, participants were required to authenticate with their date of birth. After the participants agreed to refill, their maintenance medications were automatically processed for pickup. Participants received calls every time they have medication to refill **Participants in the control group** received no calls.
Outcomes	Daily and cumulative refill rates (the percentage of prescriptions refilled on or by a specific date around the expected refill date)
Funding	Correspondence with the authors: "Yes, the study was funded internally by Walgreens Co."

Automated telephone communication systems for preventive healthcare and management of long-term conditions (Review)   263

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Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	Information from abstract only

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Correspondence with the authors: "Yes, this was a simple randomised study. On the first day that a patient qualified for the study, the campaign management system would assign the patient to a test or control group based on the random number. The random numbers were generated by the system based on random seed that was changed every month."
Allocation concealment (selection bias)	Low risk	Correspondence with the authors: "Yes, the randomisation was automated without researcher involvement"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Correspondence with the authors: "No."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Mundt 2006

Methods	**Aims**: to evaluate the feasibility of a computer automated IVR system to reduce relapse following discharge from residential treatment **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**: 6 months; **study type**: management; **subtype**: alcohol consumption

Participants	**Inclusion criteria**: men and women, aged 20-61 years, treated for alcohol dependence at the Herrington Recovery Center, a residential treatment facility of the Rogers Memorial Hospital **Sample size**: 60; **mean age**: 42 years; **sex**: men - 55%, women - 45%; **ethnicity**: Caucasian - 95%, African American - 5% **Country**: USA
Interventions	**Daily IVR reporting with personal follow-up** on non-compliant callers. The study coordinator/counsellor was instructed to make a personal telephone call to participants any time they failed to make a daily call to the IVR system for 2 consecutive days. If participants did not begin using the system thereafter, the coordinator/counsellor continued calling them daily for ≥ 10 days. After 10 consecutive days of prompting non-compliant participants to use the system without success, the coordinator/counsellor continued to call the participants at least twice each week until system use began or they withdrew consent for study participation **Daily IVR** reporting without follow-up; participants had access to the same daily IVR reporting system but were not contacted or prompted to use it if they did not make daily calls to the system **No IVR reporting** (control group)
Outcomes	Self-reported drinking days, heavy drinking days and total drinks
Funding	1R43AA12366 from the NIAAA
Declaration of conflict of interest	NA
Power calculations for sample size	"The relatively small sample sizes would provide inadequate statistical power to support clinical efficacy of any treatment effect that was not extremely large and that even modest study dropout rates would diminish the limited statistical power even further."
Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Volunteers to participate in the study were randomly assigned to one of three treatment groups"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias)	Unclear risk	Insufficient information

All outcomes		
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition reduced the already small sample size by 20%. Missing data have not been imputed using appropriate methods
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Groups were similar at baseline. Quote: "No significant difference was evident between the randomised groups regarding sex, age, and length of stay in residential treatment"

Nassar 2014

Methods	**Aims**: to test the efficacy of a new automated call-monitoring system for second and third trimester predominantly Medicaid-eligible pregnant women in an urban free standing birth centre to promptly detect symptoms of influenza and assure rapid treatment to prevent adverse outcomes from influenza **Study design**: RCT; **recruitment**: primary care (*) **Study duration**: 2 months; **study type**: prevention; **subtype**: immunisation
Participants	**Inclusion criteria**: pregnant for $\geq$ 12 weeks but not yet 38 weeks pregnant, attending Family Health and Birth Center for prenatal care (FHBC is the urban free-standing birth centre, within Developing Families Center), able to speak English, operate a cell phone and agree to attend prenatal care visits **Sample size**: 50; **mean age**: 24 years; **sex**: men - 0%; women - 100%; **ethnicity**: African American - 86%, white - 14 % **Country**: USA
Interventions	**Automated telephone system** called the automated call group participants every day at the time selected by the participant and asked questions about whether she had developed $\geq$ 1 of the specific influenza symptoms mentioned in the call in the past 24 h. If the participant answered 'yes', then the recording stated that she should speak immediately to the nurse midwife on call **Participants in the control group** received health information
Outcomes	Immunisation rate; satisfaction
Funding	National Institute of Child Health and Human Development
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias		Risk of bias
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "The random number generator in Excel was used to generate random numbers"
Allocation concealment (selection bias)	Low risk	Quote: "Random numbers were put into sealed envelopes and were opened at time of enrolment"
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "None of the differences between experimental and control group were statistically significant at alpha of 0.05"

Naylor 2008

Methods	**Aims**: to assess the effectiveness of therapeutic IVR intervention in increasing treatment compliance and adherence in chronic pain patients and improving outcome at follow-up **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 4 months; **study type**: management; **subtype**: chronic pain
Participants	**Inclusion criteria**: at least 6 months of musculoskeletal pain (such as back pain, osteoarthritis, or bromyalgia); met study threshold for severity of pain "over the past four weeks" of ≥ 4 on a 10-point scale measured at baseline on the McGill Pain Questionnaire short form; able to perform usual self-care; had ongoing health care from a physician; aged ≥ 18, owned a touch-tone phone **Sample size**: 55; **mean age**: 46 years; **sex**: men - 14%, women - 86%; **ethnicity**: white/Caucasian - 96%, other 4% **Country**: USA

Interventions	**The intervention group received IVR calls.** The system included the following: • Daily self-monitoring questionnaire: this is a 21-item questionnaire the participant is asked to complete each day by calling our toll-free number. A recorded voice asks a series of questions to assess daily coping, daily perceived pain control, and daily mood used in our prior research. It also includes items asking about medication use and stress. With a few practice sessions, this part of the call takes approximately 2-3 min to complete. • Didactic review of skills: participants are able to access a verbal review of 8 different pain management skills they learned during the 11 weeks of CBT (relaxation response, diaphragmatic breathing, positive self-talk, cognitive restructuring, activity-rest pacing, distraction techniques, reappraisal of pain, and defusing catastrophising). Each review is approximately 3 min in length. The didactic review messages are recorded in the voice of an experienced therapist with a soothing telephone voice. • Guided behavioural rehearsal of pain coping skills (practice sessions): participants can access guided behavioural rehearsals of 8 of the coping skills taught during CBT. For example, a participant who is feeling very tense or cannot fall asleep can call the TIVR to access a 10-minute relaxation message. The guided behavioural rehearsal messages are recorded in the same voice as the skills reviews. • Monthly therapist feedback message: once a month the group therapist analyses computer-collated participant-specific data and calls the TIVR to record a personalised message for each participant. These messages contain a summary of that participant's daily reports to the IVR for the past month; insight into possible relationships between use of coping skills, mood, stress and pain levels based on these daily data; suggestions for other pain management tactics; and verbal encouragement. This group also had free access to treatment-as usual. **Participants in the control group** received usual care
Outcomes	Pain (total pain experience, pain intensity); Function/disability; Coping
Funding	National Institute of Drug Addiction (NIDA), National Institute of Arthritis, Musculoskeletal and Skin Diseases (NIAMS), National Institute on Alcohol Abuse and Alcoholism (NIAAA)
Declaration of conflict of interest	NA
Power calculations for sample size	"The study was powered to detect an effect size of 0.5 using ANCOVA for the endpoint comparisons between the two groups."
Notes	Only those participants who successfully completed 11 weeks of group CBT were recruited in the study

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Consenting subjects were stratified by level of pain and by sex, and then randomised to one of the two study groups"

Allocation concealment (selection bias)	Unclear risk	Quote: "Randomization was done after group therapy was completed in order to avoid the risk of differential CBT exposure based on group assignment."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "All participants who successfully completed CBT and who agreed to be randomised were retained for the primary analyses. For 3 cases with missing data at the second or third follow-ups the average of the scores from the prior and following time points was used. Two participants from the TIVR group who were missing the nal set of questionnaires were assumed to have regressed to the baseline."
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review were reported
Other bias	Unclear risk	Insufficient information

Ownby 2012

Methods	**Aim**: to evaluate the effect of 2 distinct interventions on medication adherence in elders treated for memory problems while taking factors such as depression and cognitive status into account **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**: 24 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: clinically judged to have a memory problem and were being treated with 1 of the approved cholinesterase inhibitor medications (donepezil, rivastigmine, or galantamine) or memantine and judged to be able to give informed consent for their participation **Sample size**: 27; **mean age**: 80; **sex**: * **ethnicity**: * **Country**: USA

Interventions	**Automated reminding**: participants in this condition participated in regular study visits and assessments, but also received automated daily phone calls consisting of a recorded message from the investigator reminding the participant to take their medication. The message consisted of a recording of the first author stating that he was calling the participant to remind them to take their medication, either in Spanish or English **Tailored information**: participants in this condition at the second study visit received a 20-min tailored information intervention that consisted of completing a questionnaire about information they wanted to receive about memory disorders and their treatment **Participants in the control group** received no intervention
Outcomes	Medication adherence
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	Quote: "Given the small sample size employed in this study, it is possible that we simply did not have adequate statistical power to detect a relation that may have been present."
Notes	This is a comparison between automated reminding and control arms

Risk of bias *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Participants were recruited during routine clinical visits at the memory disorders clinic or from contact information available because they had participated in other research studies at the clinic and randomised to one of the three conditions after written informed consent was obtained."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information

Other bias	Unclear risk	Insufficient information

Parikh 2010

Methods	**Aims**: to compare the no-show rates of an automated appointment reminder system, clinic staff reminder, or no system at all **Study deign**: RCT; **recruitment**: tertiary care (health professional referral) **Study duration**: 4 months; **study type**: either; **subtype**: appointment reminder
Participants	**Inclusion criteria**: patients in ≥ 1 of 10 specialty outpatient practices of the University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School: heart transplantation, rheumatology, pulmonary, nephrology, haematology, general internal medicine, gastroenterology, endocrinology, cardiology, and allergy/infectious disease **Sample size**: 12,092; **mean age**: 56 years; **sex**: men - 43%, women - 57%; **ethnicity**:*
Interventions	**Automated appointment reminder** system attempted to reach the participant each night for 3 nights before the appointment. As determined by each specialty, a prac-tice-customised computerised or live voice recording was played after a phone call was answered. The recipient of the call had the option of confirming the appointment or cancelling the appointment. After 3 attempts if an appointment was not confirmed, the participant remained registered for the appointment **Staff reminder** **No reminder**
Outcomes	Non-attendance rate; satisfaction
Funding	None
Declaration of conflict of interest	None declared
Power calculations for sample size	A sample size (per group) of 1059 was calculated to be sufficient to detect a change from 8% to 5% (638 for 9% to 5%) with a power of 80% (beta)
Notes	This is a comparison between automated system and no reminder. Additional group consists of clinical staff reminder group (STAFF)

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Patients were then randomised by a computer-generated allocation sequence into 1 of the 3 groups"
Allocation concealment (selection bias)	Low risk	Quote: "The allocation sequence was con-cealed from the investigators and clinic staff."

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "Clinic staff were not blinded to the patients they were instructed to call; however, they were unaware to which group (ie, AUTO or NONE) the remaining scheduled patients were assigned." Comment: insufficient information whether blinding was achieved
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data balanced in numbers, with similar reasons for missing data across groups. Quote: "Analysis of the no-shows was performed by intention to treat""
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "Baseline characteristics of the 4 groups were similar"

Patel 2007

Methods	**Aims**: to evaluate the ability of interactive voice recognition (IVR) technology to improve statin adherence in a cohort of new start patients **Study design**: RCT; **recruitment**: * (organisational referral) **Study duration**: 6 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: adults continuously enrolled in the health plan for 2 years, and new users of statin therapy (no statin prescription for past 12 months) **Sample size**: 15,051; **mean age**: *; **sex**: * **ethnicity**:* **Country**: USA
Interventions	**Participants in the intervention group** received 3 automated phone calls; call 1 provided disease state education, call 2 was a refill reminder, and call 3 addressed the importance of physician follow-up. The programme provided customised interaction based on participant response, primary vs secondary cardiovascular disease prevention, and refill behaviour **Participants in the control group** received usual care (control)
Outcomes	Medication adherence
Funding	NA
Declaration of conflict of interest	NA

Power calculations for sample size	NA
Notes	Information from abstract only

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "a total of 6833 members were ran-domised to the intervention group"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Peng 2013

Methods	**Aims**: to evaluate the effectiveness of a web-phone intervention in changing smoking behaviour **Study design**: RCT; **recruitment**: other - university (military officer referral) **Study duration**: 9 weeks; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: smoking university students **Sample size**: 116; **mean age**: 20 years; **sex**: men - 92%; women - 8%; **ethnicity**: Asian - 100% **Country**: Taiwan
Interventions	**The automated web-phone intervention (WPI)** delivered phone calls that assessed participants' smoking status and based on their responses, delivered motivational and educational recorded messages. The messages covered themes that were most frequently covered in the Taiwan Smokers Helpline counselling sessions based on the participant's stage of change. The question "Have you quit smoking cigarettes?" with the time frame modified for the current week of the 9-week WPI was asked via a WPI automated phone call. The answers and scoring were 'No, and I do not intend to quit in the next 3 months', 'No, but I intend to quit in the next 3 months', 'No, but I intend to quit in the next 30

	days', 'Yes, I quit less than 3 months ago'; and 'Yes, I quit more than 3 months ago' **The control group** received the observation call in weeks 1 and 9 along with 2 assessments per week for 3 weeks, 1 assessment for 3 weeks, and 1 assessment for the last 3 weeks
Outcomes	Stage of change; self-efficacy; decisional balance
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	Similar ATCS components were evaluated Correspondence with the author: "The intervention was based on automated IVR system which was consisted of reminders and questions and options."

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "After the recruiting procedure, the 116 participants were assigned a unique number and randomly assigned using a systematic numbering system into one of the three groups"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "The double-blind principle was applied so neither the researcher nor the participants knew which group participants were in"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	High risk	No description of drop-outs; imbalance in numbers and reasons for missing data
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Phillips 2015

Methods	**Aims**: to compare the effectiveness of personalised letters, automated telephone calls, and both on breast cancer and colorectal cancer screening **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 36 weeks; **study type**: prevention; **subtype**: screening
Participants	**Inclusion criteria**: registered patient at the study clinic; having ≥ 1 visit to the practice in the past 2 years; 50-74 years old; and past due for mammography or colorectal cancer screening based on medical record documentation **Sample size**: 685; **mean age**: 58 years; **sex**: men - 38%, women - 62%; **ethnicity**: non-Hispanic white - 78%, non-Hispanic black - 13%, other (e.g. Hispanic) - 9% **Country**: USA
Interventions	**Automated telephone calls (IVR)** in up to 3 waves through a commercial vendor. IVR calls were attempted at varying times (up to 5 times) until a person or an answering machine responded during the first wave (week 1). These calls were repeated during the second wave (week 5). Participants who remained unscreened following a reassessment of screening (week 10) received a third wave (weeks 12 to 14). The automated messages contained content similar to that in the letter, including a number to call if they wanted a faecal immunochemical test to be mailed **Personalised letter**, signed by the participant's physician, explaining that the participant was past due for cancer screening; the importance of cancer screening; how to schedule the screening; the name and telephone number of the outreach worker available to assist participants with arranging screening; and the availability of free mammography and colorectal cancer screening **IVR + personalised letter**. Women eligible for both interventions received 1 letter indicating they were past due for both screenings and/or 2 separate automated calls indicating they were past due for mammography and colorectal cancer screening
Outcomes	Completed mammogram or colorectal cancer screening within 36 weeks of randomisation (documented)(primary)
Funding	American Cancer Society (RSGT-08-077-01-CPHPS) and the Agency for Healthcare Research and Quality (1 K18 HS022440-01)
Declaration of conflict of interest	None declared
Power calculations for sample size	NA
Notes	This is a comparison between the IVR alone arm and arm personalised letter alone arm. Costs: IVR: USD 0.92 per participant; Letter: USD 7.17 per participant/mailing; IVR + letter: USD 3.28/participant for breast cancer screening; and USD 8.09/participant for colorectal cancer screening

Risk of bias   *Risk of bias*

Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Low risk	Quote: "A statistician, who was offsite and blinded to the patients' identities, assigned participants equally to 1 of the 3 intervention groups using a computer-generated random number algorithm. Randomization was stratified by the type of screening (s) for which the participants were past due (breast cancer, colorectal cancer, or both)"
Allocation concealment (selection bias)	Unclear risk	Quote: "After confirming eligibility through medical record abstraction, each participant was assigned a unique study identification number"
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of study personnel was ensured. Quote: "The office clinicians and study staff were blinded to group assignment."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Blinding of outcome assessment was ensured. Quote: "Research assistants, who were blinded to the intervention, abstracted data (screening date and results available by week 36)."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "All participants were analysed in the originally assigned study group based on intention to treat."
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review have been reported
Other bias	Low risk	Groups were balanced at baseline with no statistically significant differences

Piette 2000

Methods	**Aims**: to assess the impact of automated telephone disease management (ATDM) calls with telephone nurse follow-up as a strategy for improving outcomes such as mental health, self-efficacy, satisfaction with care, and health-related quality of life (HRQL) among low-income patients with diabetes mellitus **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 12 months; **study type**: management; **subtype**: diabetes mellitus
Participants	**Inclusion criteria**: adults with a diagnosis of diabetes or an active prescription for a hypoglycaemic agent **Sample size**: 248; **mean age**: 55 years; **sex**: men - 41%, women - 59%; **ethnicity**: Hispanic - 50%, white - 29%, other - 21%

	Country: USA
Interventions	**Automated telephone disease management calls** consisted of hierarchically structured messages composed of statements and queries recorded in a human voice. Each message began with an introductory script in which the nature of the call was explained to whoever was the initial call recipient. Biweekly ATDM assessment calls - to check for blood glucose testing in the prior week. Those who had, were asked to indicate the time of their last self- monitored blood glucose (SMBG) reading and report the SMBG test result in milligrams per decilitre. Each assessment also included questions about intervention participants' perceptions of their glycaemic control; symptoms of poor control, foot problems, chest pain, and breathing problems; and self-care issues related to SMBG and foot care. At a later stage, they were offered additional automated self-care education calls that focused on glucose self-monitoring, foot care, and medication adherence. Here, participants reported specific barriers to self-care and received tailored education and advice. Within the medication adherence segment of the calls, participants were asked about their adherence to insulin, oral hypoglycaemic medications, antihypertensive medications, and antilipaemic medications. Compliant received positive feedback and reinforcement while those reporting sub-optimal adherence were asked about specific barriers and were given advice about overcoming each barrier. The calls also asked whether the participant had a retinal examination in the prior year. At the end of each call, participants were instructed to call the study nurse if they had health problems or questions not covered in the assessment. Participants also had periodic telephone contact with a registered nurse who addressed their ATDM-reported problems. The nurse was located outside the medical centre and had neither face-to-face contact with participants or ready access to their records. Her information base was limited to medical record data abstracted during the enrolment process, ATDM problem reports, and her notes from prior telephone contacts. Each interaction takes between 5-8 min. All calls were outbound and were placed at times that the participant indicated were convenient. A small number of contacts were initiated by the participants themselves using the study's toll-free telephone number, which was provided at baseline and during each ATDM call **Participants in the control group** received usual care. They had no contact with the system for clinical assessments, participant education, appointment reminders, or follow-up data collection
Outcomes	Depression; anxiety; days in bed because of illness; days cut down on activities because of illness (all primary); diabetes-specific HRQL; self-efficacy (secondary)
Funding	American Diabetes Association, Department of Veterans Affairs
Declaration of conflict of interest	NA
Power calculations for sample size	Target sample size for this study was defined to have sufficient statistical power to detect a 1% between-group difference in glycated haemoglobin (i.e. 9% versus 8%)
Notes	-

Risk of bias   *Risk of bias*

Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Low risk	Quote: "Randomization was based on a table of randomly permuted numbers"
Allocation concealment (selection bias)	Low risk	Quote: "Neither providers, research staff, nor prospective participants had knowledge of group assignment until the patient had consented to participate."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data have been imputed using appropriate methods. ITT analysis was used to include all participants who received the intervention or usual care in the analysis. Quote: "Outcome analyses were conducted on an intent-to-treat basis"
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review were reported
Other bias	Low risk	Quote: "Baseline characteristics of intervention and usual care patients were similar, although patients in the intervention group were slightly older (P=0.072) and more likely to use insulin (P=0.035). There were no significant differences between the 2 groups in any baseline measures of patient-centred outcomes."

Piette 2001

Methods	**Aims**: to evaluate automated telephone disease management (ATDM) with telephone nurse follow-up as a strategy for improving diabetes treatment processes and outcomes in Department of Veterans Affairs (VA) clinics **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 12 months; **study type**: management; **subtype**: diabetes mellitus
Participants	**Inclusion criteria**: adults with a diagnosis of diabetes or an active prescription for a hypoglycaemic agent **Sample size**: 272; **mean age**: 61 years; **sex**: men - 97%, women - 3%; **ethnicity**: white - 60%, black -18%, Hispanic - 12%, other - 10%

	Country: USA
Interventions	**Automated telephone calls.** The automated calls consisted of hierarchically structured messages composed of statements and queries recorded in a human voice. All calls were outbound (i.e. participants received the calls), and each assessment lasted 5-8 min. During each ATDM assessment, participants used their touch-tone keypad to report information about their self-monitored blood glucose (SMBG) readings, other self-care activities, perceived glycaemic control, symptoms, and use of guideline-recommended medical care. At the end of each assessment, participants were given the option of listening to health promotion messages **Participants in the control group** received usual care.
Outcomes	Glycated haemoglobin; self-monitoring of blood glucose; self-monitoring of feet; self-monitoring of diet; medication use; diabetic symptoms (all); satisfaction with care (all primary); speciality outpatient services use (secondary)
Funding	Health Services Research and Development Service, Mental Health Strategic Health Care Group, Quality Enhancement Research Initiative, American Diabetes Association, Department of Veterans Affairs
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Patients were randomised using sealed envelopes containing group assignments and a sequence generated using a table of random numbers"
Allocation concealment (selection bias)	Low risk	Quote: "Patients were randomised using sealed envelopes containing group assignments and a sequence generated using a table of random numbers"
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "HbA1c and serum glucose levels were measured at baseline and 12 months in one laboratory by staff who were blinded to patients' experimental condition."

Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data have been imputed using appropriate methods. ITT analysis was used to include all participants who received the intervention or usual care in the analysis. Quote: "All analyses of intervention effects were conducted on an intent-to-treat basis"
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review were reported
Other bias	Unclear risk	Quote: "Intervention and control groups had similar characteristics at baseline. However, intervention patients were more likely than control patients to be white and have somewhat more complications." Unclear whether this has introduced bias

Piette 2012

Methods	**Aims**: to evaluate the feasibility of utilising an IVR system to supplement hypertension self-management for patients in underdeveloped regions in Mexico and Honduras **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 6 weeks; **study type**: management; **subtype**: hypertension
Participants	**Inclusion criteria**: participants having access and were able to use a telephone, and had a systolic blood pressure suggesting hypertension (i.e. systolic blood pressure ≥ 130 mmHg if diabetic or ≥ 140 mmHg if non-diabetic) **Sample size**: 200; **mean age**: 58 years; **sex**: men - 33%, women - 67%; **ethnicity**:* **Country**: Honduras; Mexico
Interventions	**Participants in intervention group** received a series of weekly automated monitoring and behaviour change calls, as a reminder to check their blood pressure regularly and were asked about: recent systolic values above and below the normal range, medication adherence, and intake of salty foods. Based on this information, participants received additional self-care information during the call and prompts to seek medical attention or medication refills to address unacceptably high or low blood pressure. Structured email alerts for health workers were generated automatically when participants reported that at least half the time in the prior week they had a systolic blood pressure > 140 mm Hg (non-diabetic participants), > 130 mm Hg (diabetic participants), or systolic blood pressure < 100 mmHg (all participants). Alerts also were generated if the participant reported rarely or never taking their blood pressure medication or less than a 2-week supply. Participants also had the option of enrolling with a family member or friend, who received a brief automated telephone update regarding the participant's self-reported health status each week, including information about the participant's hypertension self-care and how that caregiver could help the participant self-manage more effectively. The intervention focused mainly on providing information and self-management education to participants. At the onset, participants were given an electronic home blood pressure

	monitor and were instructed how to measure their blood pressure and keep a written record of the results. Whenever possible, an automated phone call was placed during enrolment to familiarise the participant with the call content and how to respond using their touch-tone phone. The telecommunications infrastructure for the automated calls was maintained on a US server and interfaced with local telephone systems via session initiation protocol (SIP) lines and VoIP technology **Participants in the control group** received usual care and information
Outcomes	Blood pressure (primary); health status; depression, satisfaction, medication-related problems (secondary)
Funding	University of Michigan (UM), OMRON TM
Declaration of conflict of interest	None declared
Power calculations for sample size	NA
Notes	ClinicalTrials.gov Identifier: NCT01484782

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "After completing informed consent, participants were randomised to the intervention or usual care group based on a computer-generated series of numbers that ensured balance between experimental groups within each country"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Given the nature of the intervention, it was not possible to blind patients or their clinicians to their experimental assignment."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "Baseline characteristics were similar for intervention and control patients in the analytic sample. However, interven-

		tion and control patients differed at baseline in the percentage reporting use of antihypertensive medication. This variable was included as an additional control for confounding in multivariate models." Unclear whether this has introduced bias

Pinto 2002

Methods	**Aims**: to examine the effects of a totally automated physical activity counselling system on self-reported physical activity among sedentary adults **Study design**: RCT; **recruitment**: primary care (mail and telephone) **Study duration**: 6 months; **study type**: prevention; **subtype**: physical activity
Participants	**Inclusion criteria**: > 25 years; sedentary (otherwise healthy individuals) with a suboptimal diet; not engaged in regular moderate to vigorous intensity physical activity **Sample size**: 298; **mean age**: 46 years; **sex**: men - 28%, women - 72%; **ethnicity**: white - 45%; black - 45%; other - 10% **Country**: USA
Interventions	**The telephone-linked communication-physical activity** promoted moderate-intensity physical activity based on the transtheoretical model of behaviour change and social cognitive theory. At the beginning of each conversation, the system inquired about the user's current level of moderate-intensity-physical activity, defined as the number of days during the previous week the person engaged in such activities and the average number of minutes per day. The system also asks users to enter the value of a daily pedometer reading taken the day before the call. For users not yet engaging in any moderate-intensity physical activity, the system assesses their intention to do so, to determine their motivational readiness. For users who engage in moderate-intensity-physical activity, the system determines whether they are at the goal level, as defined by CDC and the American College of Sports Medicine guidelines **Participants in the control group (TLC-Eat)** received an automated intervention promoting healthy eating, which was also delivered via telephone
Outcomes	Energy expenditure; proportion of participants who met recommendations for moderate-vigorous intensity physical activity; motivational readiness for physical activity (all primary)
Funding	National Heart, Lung and Blood Institute (HL55664) and the Harvard Pilgrim Health Care Foundation
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	This is a comparison of 2 similar ATCS interventions.

Risk of bias
Risk of bias

Pinto 2002 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "At the home visit, we obtained informed consent, randomised participants to one of the study arms, and trained them to use the TLC system."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data have been imputed using appropriate methods. Quote: "Secondary analyses were performed using multiple imputation to account for the potential impact of subject dropout"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Groups were similar across all baseline characteristics

Reekie 1998

Methods	**Aims**: to test the effectiveness of different systems of reminding patients about their appointments in order to reduce the rate of failed attendance **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 6 weeks; **study type**: either; **subtype**: appointment reminder
Participants	**Inclusion criteria**: participants with dental appointments **Sample size**: 1000; **mean age**:* ; **sex**: men - 33%, women - 67%; **ethnicity**:* **Country**: UK
Interventions	**Automated telephone call** **Automated telephone + postal reminders + manual telephone** **Manual telephone call** **Postal reminder** **No reminder (controls)**
Outcomes	Appointment non-attendance (primary)
Funding	NA

Declaration of conflict of interest	NA
Power calculations for sample size	For a 5% difference in response rate between intervention and control, with a significant level of 0.05, 500 participants per group were required
Notes	This is a comparison between the automated telephone call arm and control. All reminder methods provided a net cost saving to the practice during the operation of the study (4-5 weeks). The savings were: postal, GBP 201; manual telephone, GBP 280; automated telephone, GBP 198; and automated telephone + postal reminders + manual telephone, GBP 296

Risk of bias *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Regan 2011

Methods	**Aims**: to assess the feasibility of replacing a live telephone follow-up call to recently hospitalised smokers with an automated IVR system and test whether the system could be used to connect patients to postdischarge counselling **Study design**: RCT; **recruitment**: secondary care (in-person at the end of inpatient counselling sessions) **Study duration**: 12 weeks; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: patients were eligible for enrolment if they were identified on admission as having smoked cigarettes in the past year, received bedside counselling from the Massachusetts General Hospital (MGH) Tobacco Treatment Service (TTS) during their hospital stay, were discharged to home, and had not been enrolled at a previous

	admission during the study period **Sample size**: 731; **mean age:** 52 years; **sex**: men - 56%, women - 44%; **ethnicity**:* **Country**: USA
Interventions	**IVR + call back (CB).** Participants received a series of 4 calls from the IVR system, at 3, 7, 14, and 30 days after discharge. The day 7 and day 30 calls were cancelled if the participant had indicated in a previous call that he or she did not want to stop smoking but the day 14 call was always made to assess smoking status outcomes. In addition to the assessment made for the other groups, participants in this group were offered a CB from a counsellor ("Would you like to have your smoking cessation counsellor contact you to help create a quit plan or provide advice about medications?"). To focus counselling efforts on those most likely to benefit from them, CB offers were made only to those who either had not smoked in the past 7 days or wanted to quit within the next 2 weeks. CB was offered within 48 h, with counsellors making 3 attempts to call, and spent about 10 min addressing participant's concerns. Participants who did not respond to the IVR at Day 14 were called by staff **Participants in the control group** received a call from the IVR system 14 days after discharge, at which smoking status ("Have you smoked a cigarette, even a puff, in the past 7 days?") and cessation medication use since discharge (nicotine replacement therapy, bupropion, and varenicline) were assessed. The IVR system made up to 8 attempts to reach a participant over 48 h. Participants who were not reached by the IVR system were called by a research assistant who attempted to complete the outcome assessment
Outcomes	Self-reported abstinence rates; self-reported cessation medication use (primary)
Funding	National Heart Lung and Blood Institute
Declaration of conflict of interest	"Dr. Rigotti has received research grant funding from Pfizer, Sanofi-Aventis, and Nabi Biopharmaceuticals for the study of investigational and/or marketed smoking cessation products. She is an unpaid consultant for Pfizer and Free & Clear, Inc."
Power calculations for sample size	NA
Notes	This study compares IVR + call back, i.e. ATCS Plus with IVR only

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Participants were randomised by the counsellor immediately after giving consent. Group assignment was stratified by tobacco counsellor in balanced blocks of 4 randomly ordered assignments."
Allocation concealment (selection bias)	Low risk	Quote: "Each counsellor carried a set of sealed, sequentially numbered manila envelopes, each containing an individual as-

		signment, along with an information sheet for the patient describing the corresponding IVR call protocol."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "After obtaining consent, the counsellor randomised the patient by opening the next envelope and reviewing the information sheet with the patient. In this way, the counsellors remained blind to the group assignment until after the patient had been counselled and enrolled."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Outcome assessment was conducted by the IVR system. Those who did not respond were contacted by the research assistant. However, it is unclear whether the research assistant was blinded. Quote: "Participants who were not reached by the IVR system were called by a research assistant who attempted to complete the outcome assessment"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was small (n=3 in each group). Missing outcome data balanced in numbers across groups
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review have been reported
Other bias	Low risk	Quote: "There were no significant differences between the arms for age, sex, cigarettes/day before admission, intention to remain quit after discharge, or the percent admitted to a cardiac service."

Reid 2007

Methods	**Aims**: to determine the feasibility and potential efficacy of an IVR monitoring and follow-up system to support smoking cessation in smokers hospitalised with coronary heart disease **Study design**: RCT; **recruitment**: tertiary care (organisational referral) **Study duration**: 12 months; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: participants were current smokers ($\geq$ 5 cigarettes per day) over the age of 18 years, hospitalised at UOHI (University of Ottawa Heart Institute) for acute coronary syndrome (ACS), elective PCI or diagnostic catheterisation related to coronary heart disease **Sample size**: 100; **mean age**: 54 years; **sex**: men - 68%, women - 32%; **ethnicity**:*

	Country: Canada
Interventions	**The IVR group** received automated telephone follow-up calls 3, 14, and 30 days after discharge inquiring about their smoking status and confidence in remaining smoke-free. When deemed necessary, they were offered additional counselling. The IVR system posed a series of questions concerning current smoking status, confidence in staying smoke-free over the time period until the next planned call, and the use of pharmacotherapy, self-help materials and other forms of cessation support. If participants admitted that they had resumed smoking but wanted to make another quit attempt soon or indicated that their confidence in remaining smoke-free was low (less than 7 on a 10-point scale), the IVR system flagged the participant in the software interface in order to ensure that they would be contacted by the nurse-specialist, who then provided additional assistance consisting of counsellor-led telephone sessions. Telephone counselling consisted of up to three 20-min telephone counselling sessions over an 8-week period. For participants who had returned to smoking but wished to make another quit attempt, the nurse-specialist provided encouragement, reviewed problems encountered during the initial quit attempt, and helped identify possible solutions. They also assisted participants to set a new quit date, make preparations for quitting, access pharmacotherapy (if necessary), and recruit social support. For participants who were not smoking but whose confidence in remaining smoke-free was low, the nurse-specialist provided encouragement and assisted them in identifying tempting situations that were undermining confidence. The nurse-specialist and the participant then worked to develop strategies to deal with these situations using cue control, healthful alternatives, pharmacotherapy and/or social support **Participants in the control group** received usual care. Usual care participants received no further treatment after discharge, but were free to avail themselves of the outpatient smoking cessation programme and any other community resources they chose to access
Outcomes	Self-reported abstinence rate at 52 weeks (primary)
Funding	Canadian Tobacco Control Research Initiative
Declaration of conflict of interest	NA
Power calculations for sample size	Feasibility study; power calculation was not performed
Notes	All participants received the same UOHI standard in-hospital treatment, which consisted of: personalised advice to quit smoking; access to nicotine replacement therapy during hospitalisation (if necessary); brief bedside counselling with a nurse-specialist; a self-help guide; and the provision of information about the UOHI outpatient smoking cessation programme and other community programmes. This treatment is consistent with current clinical practice guidelines for hospitalised smokers

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Participants were randomly assigned to either a usual care (UC) control group or an IVR experimental group.

		Group assignment was mediated through the Clinical Epidemiology Unit's data centre, using a computer generated randomisation list. The randomisation was made in blocks of six"
Allocation concealment (selection bias)	Unclear risk	Insufficient information. Quote: "Research staff were unaware of the treatment allocation prior to randomizations"
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Loss to follow up was relatively low; it did not differ significantly between groups. There was no significant difference between the UC and IVR groups as to the proportion of participants completing follow-up measures at 12 weeks (100% versus 96.0%) or 52 weeks (83.7% versus 86.0%). One patient in the UC group died during the follow-up period and was not included in analysis" Comment: low attrition (n = 1), unlikely to introduce bias
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Comment: groups were similar across all baseline characteristics but education level (participants in the UC group were more likely to have completed some postsecondary education); however, it is unclear whether this has introduced bias

Reid 2011

Methods	**Aims**: to determine if continuous abstinence from smoking would be higher 26 and 52 weeks after discharge in smokers who received interactive voice-response (IVR) mediated telephone follow-up and triage to nurse counselling compared to those receiving standard care **Study design**: RCT; **recruitment**: secondary care (*) **Study duration**: 12 months; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: smokers (≥ 5 cigarettes/day) aged ≥ 18, diagnosed with coronary heart disease, and recently hospitalised at the University of Ottawa Heart Institute (UOHI) **Sample size**: 440; **mean age**: * **sex**: * **ethnicity**: * **Country**: Canada
Interventions	**ATCS Plus**: participants received automated telephone calls 3, 14, 30, 60, 90, 120, 150, and 180 days after discharge. The calls posed a series of questions concerning smoking status, confidence in staying smoke-free, and use of cessation medications. If the participant identified that they had resumed smoking or indicated that their confidence in remaining smoke-free was low, they were contacted by a nurse-counsellor who provided additional assistance **Participants in the control group** received usual care that included: in-hospital nurse counselling; nicotine replacement therapy (NRT) during hospitalisation; and a recommendation for ongoing NRT following discharge
Outcomes	Self-reported continuous abstinence, 26 and 52 weeks after hospital discharge (primary)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	Information from abstract only

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "A total of 440 smokers (5 cigarettes/d) hospitalised with coronary heart disease at the University of Ottawa Heart Institute were randomised to either standard care (SC) or IVR"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Reynolds 2011

Methods	**Aims**: to test the effectiveness of an automated telephone reminder intervention to improve adherence to medications to lower cholesterol among adults with cardiovascular disease in a large, diverse integrated healthcare system **Study design**: RCT; **recruitment**: other - health system (organisational referral) **Study duration**: 3 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: participants aged 18 years and older identified from a cardiovascular disease case-identification database. Participants had a prescription for a cholesterol-lowering agent overdue for refill between 2 weeks and 6 weeks **Sample size**: 30,610; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Automated telephone outreach**: an automated telephone call instructs participants to order a refill for their overdue prescription by calling the number on their medication bottle or by using an online refill system **Participants in the control group** received usual care.
Outcomes	Refill rate at 2 weeks
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	Data extraction based on abstract only

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "participants were randomly assigned to either an automated telephone outreach or a control

		group (usual care)."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Rigotti 2014

Methods	**Aims**: to determine whether an intervention to sustain tobacco treatment after hospital discharge increases smoking cessation rates compared with standard care **Study design**: RCT; **recruitment**: secondary care (health professional referral) **Study duration**: 6 months; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: current smokers (smoked ≥1 cigarette/day during the month before admission), received smoking cessation counselling in the hospital, stated that they planned to try to quit smoking after discharge **Sample size**: 397; **mean age**: 53 years; **sex**: men - 48%, women - 52%; **ethnicity**: white, non-Hispanic - 81%, Hispanic - 6%, black, non-Hispanic - 4%, other or unknown - 4%, Native American - 3%, Asian/Pacific Islander - 2.5% **Country**: USA
Interventions	**Intervention group** received extended care: provision of 3 months of free medication of the participant's choice at discharge (nicotine replacement, bupropion, or varenicline); 5 automated outbound IVR phone calls at 2, 14, 30, 60, and 90 days after discharge; advice and support messages that prompted smokers to stay quit, encouraged proper use and adherence to cessation medication, offered medication refills, and triaged smokers to a return telephone call from a live counsellor for additional support. The automated telephone script encouraged participants to request a callback from a counsellor if they had low confidence in their ability to stay quit, had resumed smoking but still wanted to quit, needed a medication refill, had problems with a medication, or had stopped using any medication. A trained counsellor made the return telephone calls using a standardised protocol. A fax sent to the primary care clinician of each participant informed him/her of the treatment programme **Participants in the control group** received usual care, which included advice to contact a free telephone quit line and use smoking cessation medication after discharge

Outcomes	Biochemically confirmed tobacco abstinence at 6 months (primary); self-reported tobacco abstinence; costs (secondary)
Funding	RC1 HL099668 and K24 HL004440 from the National Institutes of Health/National Heart, Lung, and Blood Institute; the National Cancer Institute, the National Institute on Drug Abuse, and the National Institutes of Health Office of Behavioral and Social Science Research; 1IK2CX000918- 01A1 (Dr Japuntich) from the US Department of Veterans Affairs Clinical Sciences Research and Development Service
Declaration of conflict of interest	Dr Rigotti reported being an unpaid consultant for Pfizer Inc and AlereWellbeing Inc regarding smoking cessation; receiving royalties from UpToDate for reviews on smoking cessation; and receiving reimbursement for travel expenses from Pfizer to attend a consultant meeting. Dr Levy reported being a paid consultant to CVS Inc to provide expertise on tobacco policy. Dr Park reported receiving a grant from Pfizer to provide free varenicline for use in a trial funded by the National Cancer Institute. Dr Singer reported being a paid consultant for Pfizer Inc on matters separate from smoking cessation. No other disclosures were reported
Power calculations for sample size	A sample of 330 was planned to provide 83% power to detect a 15% difference (20% vs 35%) in the primary outcome. The sample was increased to 400 without interim analysis to add statistical power
Notes	The incremental per-participant costs in the intervention group were USD 540 (year 1) and USD 294 (subsequent years)

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Participants were randomly assigned (1:1) to sustained care or standard care in permuted blocks of 8, stratified by daily cigarette consumption (<10 vs .10) and admitting service (cardiac vs other)."
Allocation concealment (selection bias)	Low risk	Quote: "Treatment assignment was concealed in sequentially numbered sealed envelopes within each stratum. Research staff opened the next envelope corresponding to the participant's randomisation stratum."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information

Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "The analyses were performed using an intent-to-treat approach"
Selective reporting (reporting bias)	Low risk	Comment: the study protocol is available and all of the study's pre-specified outcomes that are relevant to the review were reported in the pre-specified way
Other bias	Low risk	Comment: groups were similar across all baseline characteristics

Rose 2015

Methods	**Aims**: to test the efficacy of a novel, fully automated continuing care programme, Alcohol Therapeutic IVR **Study design**: RCT; **recruitment**: primary care and community (clinic referrals, public service announcements, and local advertising online and in print) **Study duration**: 12 months; **study type**: management; **subtype**: alcohol consumption
Participants	**Inclusion criteria**: age 18 or older, diagnosis of current or lifetime DSM-IV Alcohol Dependence, past 90 days' report of ≥ 1 drink and ≥ 1 symptom of Alcohol Abuse or Alcohol Dependence, and attendance at ≥ 8 outpatient CBT sessions **Sample size**: 158; **mean age**: 49 years; **sex**: men - 53%, women - 47%; **ethnicity**: * **Country**: USA
Interventions	**Alcohol Therapeutic IVR** for 4 months. Participants were encouraged to call daily, but were not paid for calling. In the first month, participants who missed 2 consecutive Alcohol Therapeutic IVR calls received a single reminder phone call from an RA, who offered assistance with any technical difficulties and/or provided suggestions for remembering to call, as appropriate. In months 2-4, a reminder call was made if a participant missed 3 consecutive Alcohol Therapeutic IVR calls. There were 6 primary components to the Alcohol Therapeutic IVR: daily journal, targeted daily feedback, CBT skills encouragement, coping skills review, coping skills practice, and monthly personalised therapist message. Daily journal (compulsory) consisted of: 16 items that assessed mood states, craving, confidence in abstaining, number of risk situations, time with non-users, sobriety support, substance free recreation, coping management, and use of coping skills. Participants were instructed to respond to items based on the previous calendar day. If a participant indicated alcohol or drug use, a follow-up question for the current day's use was asked. If a participant reported current use and missed a previous day's call, they were asked to report on alcohol and drug use for that missed day and any previous missed days up to 1 week prior. If a participant's daily journal indicated alcohol or drug use, high craving, low confidence, and/or low coping levels, that report was 'red flagged' as indicating high risk. These participants received a feedback message **Participants in the control group** received usual care.
Outcomes	Alcohol consumption (number of drinks per drinking day) (primary); participant perceptions of the system (secondary)

Funding	National Institute on Alcohol Abuse and Alcoholism
Declaration of conflict of interest	None declared
Power calculations for sample size	The study was estimated to have power (1-beta) = 0.80 using alpha = 0.05 to detect a moderate effect size (Cohen's d = 0.45) for primary analyses of all randomised participants
Notes	-

Risk of bias *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "At the conclusion of CBT, participants returned to the research office for an assessment, and were randomised in a 1:1 allocation to either ATIVR or usual care. Randomization was stratified based on whether subjects had legal issues pending relating to their alcohol use. Within each stratum, a blocked randomisation was used to insure that an equal number of subjects were randomised to each of the two treatment conditions within each sequential block of 10 participants."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Missing outcomes were balanced in numbers across groups, but reasons for missing data were not provided. Quote: "There was no differential follow-up rate across groups"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Comment: groups were similar across all baseline characteristics but drinking days (the IVR group had nearly significantly more drinking days per week than control

Automated telephone communication systems for preventive healthcare and management of long-term conditions (Review) 294

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		group at baseline (P = 0.08)); however, it is unclear whether this imbalance has introduced bias

Rubin 2012

Methods	**Aims**: to provide an initial test of a totally automated, multi-session treatment for problem drinkers in the community using a sophisticated IVR system with speech recognition **Study design**: RCT; **recruitment**: other (adverts in newspapers and on the Internet) **Study duration**: 6months; **study type**: management; **subtype**: alcohol consumption
Participants	**Inclusion criteria**: problem drinkers **Sample size**: 47; **mean age**: 57 years; **sex**: men - 60%, women - 40%; **ethnicity**: Caucasian - 83%, African-American - 13% **Country**: USA
Interventions	**The intervention group**: Miller and Munoz's self-help book, *Controlling Your Drinking: Tools to Make Moderation Work for You* (2005) was adapted into a computer-controlled IVR system that incorporated Miller and Munoz's strategies while enhancing the motivational aspects of the programme; participants could receive up to 26 calls over 13 weeks **Participants in the control group** received an informational pamphlet in the mail.
Outcomes	Number of heavy drinking days per month; percent days abstinent per month; drinks per drinking day
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	Information from abstract only

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "There were no significant differences between groups at baseline on demographics or drinking variables."

Schillinger 2009

Methods	**Aims**: to examine the effectiveness of 2 self management strategies (SMS) across outcomes corresponding to the chronic care model **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 12 months; **study type**: management; **subtype**: diabetes
Participants	**Inclusion criteria**: adult with type 2 diabetes having suboptimal glycaemic control; a glycated haemoglobin value of 8% in the previous 12 months; ≥ 1 primary care visit in the previous 12 months; English-, Spanish-, or Cantonese-speaking; did not have limited vision or were hearing-impaired; and no diagnoses of psychotic illness or end-stage renal disease **Sample size**: 339; **mean age**: 55 years; **sex**: men - 41%, women - 59%; **ethnicity**: white/Latino - 47%, Asian - 23%, African American - 21%, white/non-Latino - 8%, other/unknown - 1% **Country**: USA
Interventions	**The IDEALL Automated Telephone Disease Management (ATDM)**: the ATDM system provides weekly calls with rotating queries in participants' native language for 9 months regarding: self-care (e.g. symptoms, medication adherence, diet, physical activity, self-monitoring of blood glucose, smoking), psychosocial issues (e.g. coping, depressive symptoms), referrals for preventive services (e.g. ophthalmologist). Each call took 6-12 min to complete. Participants selected call times at enrolment and could alter preferred times or call the system toll free. Participants respond via touch-tone commands. Depending on the response to an individual item, participants also receive automated health education messages in the form of narratives. Participants answering "out of range" on ≥ 1 item, based on predetermined clinical thresholds, receive a call back from a language concordant nurse care manager within 24 to 72 h. The care manager helps participants problem-solve around the issue identified in the report or any other concerns, with a focus on collaborative goal setting with action plans **Support, education, and patient activation** through monthly group medical visits with physician and health educator **Usual care**

Outcomes	Self-management behaviours (primary consisting of the 4 domains/sub-scales: self-monitoring of blood glucose and self-monitoring of diabetic foot, diet and exercise); and behavioural, functional, and metabolic outcomes (secondary)
Funding	The Commonwealth Fund, Agency for Healthcare Research and Quality, the California Endowment, the San Francisco Department of Public Health, the California Healthcare Foundation, National Institutes of Health
Declaration of conflict of interest	None declared
Power calculations for sample size	"We determined that 339 subjects would result in 100 subjects in each arm at the end of the study (n= 300), providing 80% power to detect a difference in diabetes self-care of 0.49 days/week, using 2 tailed tests, of 0.05, and Bonferroni correction for three group comparisons. However, the study was not adequately powered to provide definitive answers regarding relative impacts across subgroups, such as those with limited English proficiency and limited literacy."
Notes	This is a comparison between ATDM arm and UC. The annual cost of the ATSM intervention per QALY gained, relative to usual care, was USD 65,167 for start-up and ongoing implementation costs combined, and USD 32,333 for ongoing implementation costs alone. In sensitivity analyses, costs per QALY ranged from USD 29,402 to USD 72,407. The per-participant cost to achieve a 10% increase in the proportion of intervention participants meeting American Diabetes Association exercise guidelines was estimated to be USD 558 when all costs were considered and USD 277 when only ongoing costs were considered

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Patients were allocated using stratified (on languages) blocked randomisation."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Because the study was not blinded and because the usual care group did not receive any additional SMS intervention, systematic inaccuracies in patient-reported outcomes may have occurred due to recall bias or social desirability."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information

Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Analyses were conducted on an intent-to-treat basis." Comment: missing data have been imputed using appropriate methods. ITT analysis was used to include all participants who received the intervention or usual care in the analysis
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "There were no statistically significant differences in baseline characteristics across arms"

Sherrard 2009

Methods	**Aims**: to determine if IVR can improve medication adherence and reduce adverse events as patients transition from hospital to home among postoperative cardiac surgical patients **Study design**: RCT; **recruitment**: secondary care (organisational referral) **Study duration**: 6 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: adults who were discharged from the UOHI were considered for inclusion if they underwent coronary artery bypass grafts and/or valvular surgery, had telephone service to their home, and spoke either English or French **Sample size**: 331; **mean age**: 63 years; **sex**: * **ethnicity**: * **Country**: Canada
Interventions	**Automated telephone calls** at a predetermined time for 6 months, with calls made at 1, 2, 3, 4, 6, 8, 10, 12, 16, 20 and 24 weeks after discharge. The IVR system recorded participants' voiced responses (yes or no) into a central database. Used an algorithm of 11 questions addressing medication adherence, reporting of adverse events, providing information on common medications, and offering general medication safety tips. The intent of the IVR algorithm was to provide early identification of issues permitting timely intervention, provide a mechanism for tracking medication adherence, and provide medication information at the time deemed most valuable by the participant at his or her request and to provide longer term follow-up as the participant transitioned from hospital to home. If the participant responded "yes" to medicine adherence, the system provided a short description of the medication, including trade and generic names, desired effects and possible adverse effects. Participants could use the callback option from a nurse if they wish to discuss any concerns **Participants in the control group** received usual care.
Outcomes	Medication adherence and adverse events (composite primary outcome); emergency room visits and hospitalisations; medication adherence; patient satisfaction
Funding	Canadian Patient Safety Institute

Declaration of conflict of interest	NA
Power calculations for sample size	"A sample size of 166 patients per group was sufficient to detect the important difference of 16% in the primary outcome with an alpha-value of 0.05 and power of 80% using the Fisher exact tests. A dropout rate of 10% was anticipated over the six-month follow-up period and, therefore, a sample size of 368 patients (184 per group) was needed to assess the important difference of 16% in the primary outcome."
Notes	ClinicalTrials.gov Identifier: NCT01151800. All data were stored in the IVR system using a study identifier. The data were password protected and the drive was backed up daily for protection against data loss

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "Randomization occurred once consent to participate was obtained."
Allocation concealment (selection bias)	Low risk	Quote: "Allocation to the treatment group was blinded by using a sealed envelope identified by study number and containing the random allocation."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	High risk	Outcome assessment was not blinded. Quote: "The six month surveys were conducted by telephone interview by the research nurse coordinator who had intervened with the patients during the study"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Statistical analysis was conducted on an intention-to-treat basis." Comment: missing data have been imputed using appropriate methods. ITT analysis was used to include all participants who received the intervention or usual care in the analysis
Selective reporting (reporting bias)	Low risk	Comment: the protocol was available; and all of the study's pre-specified outcomes that are relevant to the review have been reported

Sherrard 2009 *(Continued)*

Other bias	Unclear risk	Quote: "There were no statistical differences in baseline characteristics between the 2 groups other than the variable of employment status, which showed a clinically insignificant yet statistically significant difference."
		Comment: unclear whether this has introduced bias.

Shet 2014

Methods	**Aims**: to assess whether customised mobile phone reminders would improve adherence to therapy and thus decrease virological failure among HIV infected patients starting antiretroviral treatment
	Study design: RCT; **recruitment**: primary care (advert in clinic)
	Study duration: 24 months; **study type**: management; **subtype**: HIV
Participants	**Inclusion criteria**: HIV infected individuals with adequate documentation of their HIV positive status, aged 18-60 years, ART naive, and meeting the criteria for start of first-line ART as per the 2007 Indian national guidelines
	Sample size: 631; **mean age**: inestimable; **sex**: men - 57%, women - 43%; **ethnicity**: Asian -100%
	Country: India
Interventions	**Multimodal intervention** was a customised motivational voice call that went out once a week at a time selected by each participant. The participant also chose the sex and language of the pre-recorded voice call. This automated call began with a greeting and the hope that the participant was feeling well, followed by an inquiry whether medications were taken as prescribed. The message was considered interactive or bidirectional, since it required the participant to respond to a question about the previous day's pill doses, by pressing '1' for yes or '2' for no. If the participant failed to respond to the call, a maximum of 3 more calls were made over the ensuing 24 h until a response was obtained. The second aspect of the intervention included a weekly non-interactive neutral pictorial message sent out as a reminder 4 days after the automated call. Participants in this group also received usual care
	Participants in the control group received usual care, which included up to 3 counselling sessions prior to initiation of ART, routine clinical and laboratory tests at baseline, and follow-up assessments every 6 months. First line ART regimens included those based on zidovudine, stavudine, or tenofovir, along with lamivudine and either nevirapine or efavirenz, and were dispensed free of cost as generic fixed-dose combination pills every 1-3 months
Outcomes	Time to virological failure (primary); ART adherence measured by pill count; death rate; attrition rate (secondary)
Funding	European Union, Framework Program 7 (No 222946)
Declaration of conflict of interest	None declared

Power calculations for sample size	A total sample of 532 participants (266 in each arm) would provide 90% power to detect such a risk difference in a 2-sided log-rank test with significance level of 0.05. Expecting an attrition rate of 10%, the trial was planned to have a minimum of 600 participants
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation was performed stratified for sex, in permuted blocks of four or six."
Allocation concealment (selection bias)	Low risk	Quote: "Sequentially numbered opaque sealed envelopes were used as a method of allocation concealment."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Patients and the randomisation team were aware of the intervention assignment; while research staff assessing patients, laboratory staff, statisticians, and authors were blind to the allocation."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Patients and the randomisation team were aware of the intervention assignment; while research staff assessing patients, laboratory staff, statisticians, and authors were blind to the allocation."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data have been imputed using appropriate methods. Quote: "Trial analysis was performed using an intention-to-treat principle that included all originally randomised patients"
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review have been reported
Other bias	Low risk	Comment: groups were similar across all baseline characteristics

Siegel 1992

Methods	**Aims**: to evaluate the efficacy of automated telephone needs assessment coupled with social worker follow-up in outpatients with advanced cancer who were receiving chemotherapy **Study design**: quasi-RCT; **recruitment**: secondary care (in-person at chemotherapy clinics or by letter with a follow-up phone call) **Study duration**: 24 months; **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria**: had primary tumours of the breast, colon/rectum, or lung; had recurrent or metastatic disease or non-resectable tumours; were receiving non-adjuvant outpatient chemotherapy; were 21 years of age or older; and spoke English with sufficient fluency to validly respond to the automated surveys and the research interview **Sample size**: 239; **mean age**: 58 years; **sex**: men - 50%, women - 50%; **ethnicity**: white - 89%, black- 6%, Hispanic - 4%, other 1% **Country**: USA
Interventions	**Intervention group** received 3 automated telephone surveys (surveys 1, 2, and 3), scheduled approximately 6 weeks apart. The system was configured to: call participants at times they designated as convenient; conduct needs assessment surveys with them in a high-quality, natural sounding, digitally stored voice; reliably interpret, confirm, and register their verbal answers to 12 questions; and identify participants who reported unmet need(s) so that they could receive prompt follow-up by a social worker. Outcome was to be assessed in a final comprehensive needs assessment through an interview held with a social worker 6 weeks after the participant's completion of the automated surveys + the approximately hour-long research interview by an experienced clinician **Participants in the control group** completed the research interview for the comprehensive needs assessment within 2 weeks + the approximately hour-long research interview by the experienced clinician
Outcomes	The prevalence of unmet needs
Funding	National Cancer Institute (CA 41012)
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "To simplify field operations, blocks of time were randomly assigned as periods of accrual for either the experimental or control group; each eligible patient was assigned to the experimental or control group based on the block of time during which the patient was identified."

		Comment: non-random assignment
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "In the experimental group, the interviewer was never the same social worker who worked with the patient during the intervention. This was done to avoid any bias that might be associated with interviewer's knowledge of the patient's intervention history" Comment: insufficient information to judge whether assessors were blinded
Incomplete outcome data (attrition bias) All outcomes	High risk	High attrition rate. Quote: "Of the 266 patients accrued into the experimental group, 109 (41%) completed both the series of automated surveys and the final assessment interview within the study period, and 157 (59%) did not"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "The control and experimental groups did not differ significantly with respect to almost all sociodemographic characteristics. However, patients in the experimental group were somewhat older than patients in the control group (mean age 60 versus 57 years)." Comment: groups were similar across all baseline characteristics. It is unlikely that the small age difference has introduced bias

Sikorskii 2007

Methods	**Aims**: to test 2 multimodal interventions for multiple symptoms experienced by patients with multiple cancer sites **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 10 weeks; **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria**: aged 21 years and above, having a diagnosis of a solid tumour cancer or non-Hodgkin's lymphoma, undergoing a course of chemotherapy, speak and read English, and having a touch-tone telephone

	Sample size: 437; **mean age**: 57 years; **sex**: men - 26%, women - 74%; **ethnicity**:* **Country**: USA
Interventions	**Automated telephone symptom management (ATSM)**: prerecorded pleasant female voice queried participants about severity of 17 symptoms: fatigue, pain, dyspnoea, insomnia, distress, nausea, fever, difficulty remembering, lack of appetite, dry mouth, vomiting, numbness and tingling, diarrhoea, cough, constipation, weakness, and alopecia. If they report severity in ≥ 4 symptoms, then the call directed them to the relevant part in the symptom management guide (SMG) for strategies to manage those symptoms. Participants advised to call the oncology office if they report severity of ≥ 7 symptoms or if there was no improvement. On subsequent calls, in participants with severity of ≥ 4 symptoms in the previous calls, ATSM enquired if the participants tried the strategies suggested in the SMG and whether it helped in lowering the severity. Numerical prompts were used so participants could respond using their telephone keypad. When all symptoms above threshold at the previous contact were evaluated, the system then reviewed the current severity of all symptoms **Calls by specially trained nurses**
Outcomes	Symptom severity
Funding	National Cancer Institute
Declaration of conflict of interest	NA
Power calculations for sample size	"The trial was powered to detect an effect size of 0.37 for group differences on symptom severity at 10 weeks."
Notes	Both total fixed and variable costs were greater for the nurse arm; total costs per participant were USD 69 and USD 167 for the ATSM and nurse arm respectively

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "[Participants] were randomized into either the NASM or the ATSM using a computer minimisation program that balanced the arms with respect to recruitment location and site of cancer"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information

Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data balanced in numbers across groups. ITT analysis was used to include all participants who received the intervention or usual care in the analysis. Quote: "A total of 13 patients (10 in the ATSM and 3 in the NASM) did not complete any of the intervention contacts, but had 10-week interviews. These patients were included in the intention-to-treat analysis of interview data"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "Most measures including symptom severity were equivalent at baseline." Comment: groups were similar across all baseline characteristics

Simon 2010a

Methods	**Aims**: to test the effectiveness of automated telephone outreach with speech recognition to improve rates of screening for colorectal cancer. The hypothesis is that the intervention improves rates of screening overall and specifically rates of colonoscopy **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 12 months; **study type**: prevention; **subtype**: screening
Participants	**Inclusion criteria**: aged 50-64 at baseline and continuous enrolment in health plan **Sample size**: 20,936; **mean age**: 57 years; **sex**: men - 47%, women - 53%; **ethnicity**: white - 86%, other - 9%, black - 5% **Country**: USA
Interventions	**Automated telephone outreach (ATO) calls** followed a script and branching algorithm that was informed by a theoretical framework, with the aim to educate the participants about the risk of colorectal cancer and about the importance and methods of screening, and to encourage them to contact their primary care providers to arrange for colorectal cancer screening. The calls used speech recognition technology and delivered the message with prerecorded human conversation either to the participant directly, or to another member who would then convey it to the intended participant. When unreachable, the system leaves a message and asks participants to call back **Participants in the control group** received usual care
Outcomes	Colorectal cancer screening including faecal occult blood testing, double-contrast barium enema, flexible sigmoidoscopy, or colonoscopy within 12 months following the intervention (primary); screening by colonoscopy during the 12-month period following the intervention (secondary)
Funding	Harvard Pilgrim Health Care Foundation

Declaration of conflict of interest	None declared
Power calculations for sample size	NA
Notes	The ATO calls verified participants identify and only after securing their permission did it proceed with the interaction regarding colorectal cancer screening

Risk of bias | | *Risk of bias* |

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "We randomly allocated to intervention and usual care arms, using a computerized random-number generator"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "The study was not blinded"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data balanced in numbers, with similar reasons for missing data across groups
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Groups were similar at baseline. Quote: "There were no baseline differences between the two study groups on any of the measured variables."

Simon 2010b

Methods	**Aims**: to assess the effects of automated telephone outreach with speech recognition (ATO-SR) on rates of testing for retinopathy, glycaemia, hyperlipidaemia, and nephropathy in a diverse population of privately insured patients with diabetes **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**:12 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: individuals with no insurance claim for a dilated eye examination in the prior year and no claim for ≥ 1 of the following tests: glycated haemoglobin, low-density lipoproteins, or microalbumin

	Sample size: 1200; **mean age**: 51 years; **sex**: men - 62%, women - 38%; **ethnicity**: other - 95%, black - 5% **Country**: USA
Interventions	**ATO-SR**: the computerised system placed 3 calls to the participants' home telephone numbers, encouraging the participants to fulfil recommended testing if it had not been performed in the preceding year. The system offered a live telephone call back to assist in scheduling tests and also offered to send participants the following items: a voucher that would allow the provider to waive the co-payment for a dilated eye examination; an educational nutrition video; a cookbook; or a pill box. For each of the 3 intervention calls, the automated telephone system made up to 6 attempts to reach the participant, leaving up to 2 messages requesting a call back. The system used speech recognition to respond to participants with segments of recorded text spoken with a human voice **Participants in the control group** received usual care (no intervention).
Outcomes	Retinopathy examination (primary); tests for glycaemia, hyperlipidaemia, and nephropathy (secondary)
Funding	American Diabetes Association, Agency for Healthcare Research and Quality, National Institute of Diabetes and Digestive and Kidney Diseases
Declaration of conflict of interest	"No potential conflicts of interest relevant to this article were reported"
Power calculations for sample size	NA
Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT analysis was used to include all participants who received the intervention or usual care in the analysis. Quote: "The main analyses included all subjects in the groups to which they were randomised"

Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "Compared with the usual care group, the intervention group was younger (50 vs. 52 years, P 0.02) and had a greater proportion of men (64 vs.41%, P 0.04); the groups were comparable on other socio-demographic measures and clinical indicators" Comment: groups were similar across all baseline characteristics but age and sex; however, it is unclear whether this imbalance has introduced bias

Simpson 2005

Methods	**Aims**: to evaluate compliance with 2 IVR monitoring protocols, subjective experiences with monitoring, and change in symptoms associated with monitoring (i.e. measurement reactivity) **Study design**: RCT; **recruitment**: primary care (advert in clinic) **Study duration**: 4 weeks; **study type**: management; **subtype**: alcohol consumption
Participants	**Inclusion criteria**: all participants who had consumed alcohol in the prior 28 days, met diagnostic criteria for an alcohol use disorder (APA, 1994), and indicated an intention to abstain from alcohol and other drug use over the coming month **Sample size**: 98; **mean age**: 46 years; **sex**: men - 91%, women - 9%; **ethnicity**: non-Hispanic white - 45%, African American - 40%, Native American - 7%, other - 6%, Hispanic - 2% **Country**: USA
Interventions	**Daily IVR**. Participants called a pre-recorded IVR system daily using a toll-free telephone number. A monitoring protocol to assess participant's alcohol substance use behaviour was used and they responded using an 8-point response option (0-7 on the telephone key pad) in order to use 9 as a skip option and to reduce confusion for participants (i.e. omitting 8 as an option and not requiring an extra key stroke after each entry to signal the end of an entry). IVR system automatically tracked compliance with the monitoring protocol. When participants failed to call the system as scheduled the study coordinator attempted to contact participants within 2 working days in order to reconstruct the data from missed calls verbally and to resolve any difficulties. If participants indicated clinical deterioration during follow-up calls, they were encouraged by the study coordinator to contact their clinical provider and were given the appropriate phone numbers to facilitate this. Participants in the IVR monitoring conditions received instruction on how to call into the IVR system and completed a practice call to familiarise themselves with the procedures. Participants received a "cheat sheet" that included the toll free number, the study coordinator's telephone number, their study ID number, and a list of the monitoring questions and response options. They also received incentives for each call that they made. At the end of each call, the IVR system informed the participants of the amount of money accumulated in their accounts. They could use the # key to repeat a

		question and the * key to back up to the previous question **Weekly IVR calls** **No calls** (controls)
Outcomes		Drinking habits; alcohol craving; PTSD symptoms (all primary)
Funding		University of Washington Alcohol and Drug Abuse Institute
Declaration of conflict of interest		NA
Power calculations for sample size		NA
Notes		This is a comparison between daily IVR versus no call

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "At the end of the baseline assessment participants were randomly assigned to one of three conditions" Comment: insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data have been imputed using appropriate methods. Quote: "Missing data on multi-item scales were handled in the following ways: mean scores for the PACS were imputed for the two cases where one item was missing, and scores for the PCL-C were generated with no mean imputation when $\geq$ 16 of the 17 items were completed; scores were not produced for three participants who were missing more than 1 item. No other missing data imputation techniques were used."
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review were reported

Other bias	Low risk	Comment: groups were similar across all baseline characteristics

Solomon 2007

Methods	**Aims**: to test the effectiveness of an intervention to improve care in patients at-risk of osteoporosis **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 10 months; **study type**: prevention; **subtype**: screening
Participants	**Inclusion criteria**: women 65 years of age and over; women and men 45 and older with a prior fracture of the hip, spine, forearm, or humerus; and women and men 45 and older who had used oral glucocorticoids for ≥ 90 days **Sample size**: 1973 participants; **mean age:** 69 years; **sex**: men - 8%, women - 92%; **ethnicity**: * **Country**: USA
Interventions	**Participants in the multimodal intervention group** received education + an introductory letter from Horizon Blue Cross Blue Shield of New Jersey and then an automated telephone call from the insurer inviting them to undergo bone mineral density testing. This call employed IVR technology that has been used for other screening tests. Such automated calling provides tailored education through a branching logic algorithm. For example, people who had never had a bone mineral density test but expressed an interest were offered specific encouragement, "It's great that you plan on having a bone density test; the best way to tell if a person is at risk for osteoporosis is to have a bone density test. The test only takes about 5 minutes, you don't have to take off your clothes, and it's painless." At the conclusion of the educational call, participants were able to transfer directly to a centralised radiology service to schedule a bone mineral density test **Participants in the control group** received no intervention.
Outcomes	Either undergoing a bone mineral density testing or filling a prescription for a bone active medication
Funding	Merck and Co., Inc.; NIH (AR48616, AG027066), the Arthritis Foundation, and the Engalitcheff Arthritis Outcomes Initiative
Declaration of conflict of interest	Drs Weiss and Chen are both employees of Merck and Co., Inc
Power calculations for sample size	NA
Notes	-

Risk of bias		*Risk of bias*
Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "We conducted a randomised controlled trial among primary care physicians and their at-risk patients"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Comment: missing data have been imputed using appropriate methods. An ITT analysis was used to include all participants who received the intervention or no intervention in the analysis
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Between-group differences at baseline were adjusted for as covariates. There is insufficient evidence that these differences have introduced bias

Sparrow 2010

Methods	**Aims**: to investigate the effectiveness of an automated telemedicine intervention to improve adherence to continuous positive airway pressure (CPAP) **Study design**: RCT; **recruitment**: primary care (home visit) **Study duration**: 12 months; **study type**: management; **subtype**: obstructive sleep apnoea syndrome (OSAS)
Participants	**Inclusion criteria**: aged 18 to 80 years with a physician diagnosis of OSAS and with polysomnography demonstrating an apnoea-hypopnoea index (AHI) >10 **Sample size**: 250; **mean age**: 55 years; **sex**: men - 82%, women - 18%; **ethnicity**: * **Country**: USA
Interventions	**Telephone-linked communications for CPAP (TLC-CPAP):** content includes assessment of the participant's perceptions about and experiences with OSAS and CPAP therapy and the participant's reported CPAP use (h per night and nights per week) during the week preceding each call; assessment of the participant's goals with regard to OSAS therapy; and feedback and counselling to enhance motivation to use CPAP and address barriers and poor self-efficacy. A side effect management module addressing mucocutaneous side effects, air leaks and mask discomfort was developed and incorporated in the

	dialogues as appropriate **Participants in the control group** received attention placebo: general health education via a TLC system. This system provides general information about a variety of health topics via telephone calls delivered on the same schedule as the TLC-CPAP calls made by the intervention group. At each call, participants selected a topic from a list of 61 content areas that included common symptoms, medical conditions and preventive medicine topics
Outcomes	CPAP use (primary); sleep symptoms checklist; functional outcomes of sleep questionnaire; depression (secondary)
Funding	Department of Veterans Affairs, Veterans Health Administration, Health Services Research and Development Service
Declaration of conflict of interest	MA is a paid employee of Philips/Respironics Inc and is a stockholder of Philips stock
Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation was stratified by sex, age and AHI using a randomised block design to ensure balance of these factors in the treatment arms."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Study personnel was blinded. Quote: "All data were collected by research assistants blind to group assignment."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Missing outcome data balanced in numbers across groups; however, reasons for missing data are not provided. Quote: "CPAP adherence data were available from either the 6- or 12-month follow-up visit in 93.6% of subjects (figure 1), who were therefore included in the primary analysis"

Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review were reported
Other bias	Low risk	Quote: "The baseline characteristics of the intervention and control groups were similar."

Sparrow 2011

Methods	**Aims**: to investigate the effectiveness of an automated telemedicine intervention that provides real-time guidance and monitoring of resistance training in the home **Study design**: RCT; **recruitment**: primary care (*) **Study duration**: 12 months; **study type**: prevention; **subtype**: physical activity
Participants	**Inclusion criteria**: no angina pectoris (unless symptomatically resolved post-revascularisation), no history of myocardial infarction within 6 months or remote (> 6 months) myocardial infarction with current myocardial ischaemia on exercise stress test, no history of ventricular dysrhythmia requiring therapy, baseline systolic blood pressure smaller than 165 mmHg and/or diastolic blood pressure smaller than 100 mmHg, and not currently participating in a regular exercise programme less than once a week for 20 min per session **Sample size**: 103; **mean age**: 71 years; **sex**: men - 69 %; women - 31 %; **ethnicity**: * **Country**: USA
Interventions	**Telephone-Linked Computer-based Long-term Interactive Fitness Trainer (TLC-LIFT)** system called participants, with a target exercise schedule of 3 days per week. At the initiation visit, users indicated what their preferred time to exercise was, and this was the time that TLC-LIFT was scheduled to call. The TLC-LIFT system is security enabled, so at the beginning of a call, each participant was asked to enter a personal password (PIN) to ensure security and confidentiality. Following the identification confirmation, TLC-LIFT asked the participant if he/she was ready to perform his/her exercises. If the participant was not ready, he/she was asked to call a toll-free number when ready, which informed TLC-LIFT to call the person shortly thereafter to begin the exercise session. If the person failed to call back within 4 h of TLC's call, calls were repeated periodically during a time period previously set by the user. After a 24-hour period had elapsed without the user completing a scheduled exercise session, the TLC system administrator was notified automatically and informed a staff member so that he or she could contact the user **Participants in the control group** received attention: general health education via a TLC system at weekly intervals. This system provides general information about a variety of health topics via telephone calls. At each call, participants selected a topic from a list of content areas that included common symptoms, medical conditions, and preventive medicine topics. The health information dialogues were adapted from Harvard Health Letter articles (http://www.health.harvard.edu). The dialogs were developed to allow users to identify subtopics about which they wanted more information, and to skip others, and avoided long stretches of uninterrupted talking by the system
Outcomes	Muscle strength; balance; walk distance; mood (all primary)

Funding	Rehabilitation Research and Development Service of the Department of Veterans Affairs, the Boston Claude D. Pepper Older Americans Independence Centre, and the US Department of Agriculture
Declaration of conflict of interest	NA
Power calculations for sample size	Study sample of 100 evaluable participants, approximately equally divided between intervention and control groups, provided 99.9% power to detect the smaller of these effects at a (2) = 0.05, and 80% power to detect a more conservative effect of 0.57 SD
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "After eligible participants gave written informed consent, we collected baseline study data and then randomised them to one of two groups using a computer-based algorithm (randomize function in Visual Basic) to perform random assignment without blocking or stratification."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Data for analyses were collected during four clinic-based examinations (baseline, 3, 6, and 12 months), conducted by research assistants blind to group assignment."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Analyses were performed by intention to treat, using all outcome data collected regardless of adherence to assigned treatment"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "The intervention and control groups were similar on baseline characteristics except for 6-minute walk (p=.02; Table 2)." Comment: groups were similar across all

		baseline characteristics but 6-minute walk; however, it is unclear whether this imbalance has introduced bias

Spoelstra 2013

Methods	**Aims**: to examine Automated Voice Response (AVR) to manage symptoms and adherence to oral agents **Study design**: RCT; **recruitment**: tertiary care (*) **Study duration**: 10 weeks; **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria**: 21 years or older, having a solid tumour cancer; diagnosis, and being on non-hormonal oral agents; understood English; having a touch-tone phone and no hearing deficits that interfered with using a telephone; having no cognitive deficits; willing to complete phone contacts; and not being diagnosed with an emotional or psychological disorder **Sample size**: 119; **mean age**: 60 years; **sex**: men - 31 %; women - 69 %; **ethnicity**: white - 76%, black - 7%, other - 17 % **Country**: USA
Interventions	**AVR system + symptom management toolkit (SMT) + nurse strategies to manage unresolved symptoms and improve adherence**. In addition to the AVR calls, participants with $\geq$ 1 symptoms rated at a 4 or greater or non-adherence defined as less than 80% during the immediate past 7-day period received a brief telephone call from the nurse to deliver strategies to assist participants to manage symptoms and/or improve their adherence. Participants were called weekly until symptom severity fell below 4 or until adherent **SMT + AVR phone system alone**. Participants in this arm received calls from the AVR system; symptoms were assessed, and those reporting severity at a 4 or higher on a 0-10 scale for any symptom were referred to the SMT for self-management of symptoms. Adherence to oral agents was identified via participant report (no nurse was involved) **AVR + SMT + nurse strategies to improve adherence alone**. In group 3, in addition to the AVR calls, participants received brief calls from a nurse when the adherence rate was less than 100% to improve their adherence. Participants were called weekly until adherent
Outcomes	Adherence to medications; symptom severity (both primary)
Funding	GlaxoSmithKline; Mary Margaret Walther Behavioural Oncology Group and the State of Michigan Nurse Corp
Declaration of conflict of interest	None declared
Power calculations for sample size	Study was powered to detect a medium effect size of 0.50 for pairwise differences between groups on symptom severity and adherence
Notes	This is a comparison between AVR + SMT + nurse strategies to manage unresolved symptoms and improve adherence and SMT + AVR alone

Risk of bias		Risk of bias
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "After completion of the baseline interview, patients were randomised into the groups"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rates with reasons were provided; attrition was balanced across the groups
Selective reporting (reporting bias)	High risk	No outcomes reported on depression scores at the study's completion
Other bias	Unclear risk	Insufficient information

Stacy 2009

Methods	**Aims**: to assess the impact of a behaviour change programme to increase statin adherence using IVR technology **Study design**: RCT; **recruitment**: other - health benefit company (organisational referral) **Study duration**: 6 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: continuously enrolled in the plan with a pharmacy benefit for a minimum of 12 months prior to the date of the index statin; no pharmacy claims evidence of any lipid-lowering agent in the 6-month period prior to the index statin; 21 years of age or older; and a statin prescription with a 30-day supply **Sample size**: 497; **mean age**: 54 years; **sex**: men - 38%, women - 62%; **ethnicity**:* **Country**: USA
Interventions	**Intervention group**: automated calls were generated by a computerised voice activated technology (VAT) that provided highly tailored messages that specifically reinforced adherence, persistence with statin medication by using a combination of behavioural science theories and techniques in a personalised or tailored manner dependent on the participant's previous response characteristics. 6 calls were attempted over a period of 10 days. If an answering machine or another member of the household was reached,

	the participant was asked to call back at a toll-free number. If the targeted participant was reached, and the calls went ahead, then a verbal informed consent was read. The subsequent calls referred respondents to the health plan website for additional information regarding dyslipidaemia, risk reduction, and lipid-lowering medication. These calls were coupled with a print guide (mailed at the conclusion of the first call) that provided tailored messages designed to enhance commitment, improve communication with the health care team, and address specific barriers to adherence **Participants in the control group** received enhanced care, which included non-tailored behavioural advice from a single IVR call, coupled with a non-tailored, generic, self-help cholesterol management guide received through the mail. This guide provided educational material on cholesterol and lipid values, a brief knowledge quiz, and a non-tailored action plan
Outcomes	Medication (statins) adherence (measured with 6-month point prevalence persistency)
Funding	NA
Declaration of conflict of interest	None declared
Power calculations for sample size	"it was anticipated that control group would have a 6-month point prevalence rate of 65%, and that exposure to the experimental intervention would increase this rate to 75%. With power set at 0.80 and alpha at <0.05 (1-sided test), it was necessary to impanel 260 participants per group. To account for 10% disenrollment over the 6-month follow-up period, approximately 290 participants per group were enrolled."
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "the IVR system randomly assigned subjects to either the experimental or the enhanced care control group."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing outcome data

Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "With the exception of the item assessing the number of chronic medications in the 3-month period prior to the index statin (participants assigned to the experimental group had a lower number of concomitant medications), no statistically significant group differences were detected between the groups." Comment: groups were similar across all baseline characteristics but the number of chronic medications; however, it is unclear whether this has introduced bias

Stehr-Green 1993

Methods	**Aims**: to evaluate the effectiveness of computer-generated telephoned reminders used to raise the rates of on-time immunisation among preschool-age children in 2 public clinics in Atlanta, GA **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**: 1 month; **study type**: prevention; **subtype**: immunisation
Participants	**Inclusion criteria**: children due to receive diphtheria-tetanus-pertussis, poliovirus, or measles, mumps and rubella vaccines during the study's 6-week enrolment period in February and March 1990 **Sample size**: 229; **mean age**: 9 months; **sex**: boys - 52%, girls - 48%;**ethnicity**: black - 91%, other - 6%, Hispanic - 3% **Country**: USA
Interventions	**Automated telephone reminder** from the Fulton County Health Department. The text of the standard message, which was delivered in a normal human voice, was: "This is the Fulton County Health Department calling to remind you that your child is due for an immunisation or 'shot' this month. Please call the health centre for an appointment or bring your child in to the health centre any day this week, Monday through Friday, between 8:30 am and 4 pm. Immunisations are important to protect your child from certain diseases, such as whooping cough, measles, and polio. They are also required for day care or school attendance." Calls were made during 5 days, beginning the day before the child became due for his or her immunisation. A maximum of 9 attempts (not counting wrong numbers, non-working numbers, or mis-dials) were made to each child's home, until an answer was obtained; $\geq$ 5 of the calls were made between 6 and 9 pm. Calls not answered, responses by an answering machine (for which no reminder message was left), hang-ups within 10 seconds, and busy signals were classified as missed attempts **Participants in the control group** received no calls.
Outcomes	Immunisation status

Funding	CDC, Atlanta, Ga, and Cooperative Agreement TS-622 from the Association for Teachers of Preventive Medicine, Washington, DC
Declaration of conflict of interest	None declared
Power calculations for sample size	NA
Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Quote: "Of the 229 children who met the eligibility criteria for entry into the study, 6 were lost to follow-up (that is, clinic records could not be located after their follow-up period), and 1 was deferred from receiving further vaccinations, pending medical evaluation." Comment: attrition was small (n = 7) and reasons for attrition were provided; however, it is unclear whether the attrition was similar across groups
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Comment: groups were similar across all baseline characteristics

Stuart 2003

Methods	**Aims**: to explore the use of an innovative IVR system to increase participant adherence with antidepressant medication prescribed in primary care settings **Study design**: cluster RCT; **recruitment**: primary care practices (*) **Study duration**: 12 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: ≥ 18 years old, able to read English, not currently taking an antidepressant medication; newly prescribed an antidepressant medication by their primary care provider; access to a touch-tone telephone; and willingness to participate in the study **Sample size**: 647; **mean age**: *; **sex**: *; **ethnicity**:* **Country**: USA
Interventions	**Education**: treatment team education and participant self-care education **Education + call**: as above + 1 office nurse telephone call within 2 days of the visit when the antidepressant medication was prescribed **Education + call + IVR**: as above + an IVR programme lasting for 3 months. A script was written for each of the IVR calls. In addition, the answer to each question generated a set of choices for the participant to respond to using a touch-tone phone
Outcomes	Adherence to (antidepressant) medication (primary); satisfaction (secondary)
Funding	Eli Lilly & Company
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	This is a comparison between education + call versus education + call +IVR. Cluster RCT with 30 primary care study sites as the unit of randomisation. Note that analysis did not appear to adjust for clustering, therefore a unit of analysis error exists that may result in overly precise effect estimates for this study

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "The study was randomised controlled clinical trial of 647 patients"
Allocation concealment (selection bias)	Unclear risk	Quote: "all patients a given site received 1 of 3 randomly assigned treatment strategies"
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	High risk	High attrition in the intervention group. No description of drop-outs in the control group. Quote: "Of the 232 assigned to the IVR, 116 (50%) either never used the system or stopped using it before the 12-week IVR program was completed"
Selective reporting (reporting bias)	High risk	The authors mentioned that there were no significant differences in medication adherence among the 3 groups. However, the analysis was restricted to 1 sub-group of participants who completed the IVR calls
Other bias	High risk	No baseline characteristics were provided. It was not possible to assess the possibility of selective recruitment of cluster participants based on the information reported

Szilagyi 2006

Methods	**Aims**: to measure the effect of telephone-based reminder/recall on immunisation and well-child care (WCC) visit rates among adolescents in urban practices **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 18 months; **study type**: prevention; **subtype**: immunisation
Participants	**Inclusion criteria**: subjects with a birth date between 1 June 1983, and 31 May 1987 (aged 11-14 years at the start of the intervention) **Sample size**: 3006; **mean age**:* **sex**: boys - 50%, girls - 50%; **ethnicity**: other or unknown - 41%, black non-Hispanic - 35%, white non-Hispanic - 17%, Hispanic - 7% **Country**: USA
Interventions	**Automated telephone message reminder system (Autodialer)**. The intervention mimicked an appointment-scheduling module that is linked to a telephone-reminder system. Adolescents were called if they were due for an annual WCC visit, a tetanus booster (5 years since diphtheria and tetanus toxoids and pertussis vaccination), or a hepatitis B vaccination according to Advisory Committee on Immunisation Practices guidelines. A variable number of calls was placed depending on the need for immunisations or WCC visits and prior response to reminder calls. The calls were voice recordings in English to request a vaccination appointment or WCC visit or to remind families of upcoming scheduled appointments. Calls were made 6 days per week during the day or early evening. During the initial 11 months of the 18-month clinical trial, telephone calls were stopped if recipients indicated from a telephone menu option that the telephone number was incorrect, the adolescent had left the practice, the parent requested calls to be stopped, or no appointment was scheduled despite 5 calls placed within 30 days ('un-

	responsive numbers'). After 11 months, the Autodialer telephone reminder calls were restarted for those participants with 'unresponsive numbers' to give families a second opportunity to respond to subsequent reminders **Participants in the control group** received usual care.
Outcomes	Immunisation status
Funding	CDC and Association for Teachers of Preventive Medicine, Washington, DC
Declaration of conflict of interest	NA
Power calculations for sample size	"To detect a 10% improvement in baseline immunisation rates of 50% (power of 0.80; =.05) within each practice required more than 750 adolescents per practice."
Notes	The study design stratified for age group (11-12 years and 13-14 years)

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "[Participants were] randomly allocated into a study group (n=1496) or control group (n=1510) using a random-number generator with the child as the unit of randomisation"
Allocation concealment (selection bias)	Low risk	Quote: "Health care professionals were unaware of group allocation for specific subjects because the intervention used research personnel and reminders from a central office."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Quote: "Health care professionals were unaware of group allocation for specific participants because the intervention used research personnel and reminders from a central office"
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Blinded medical record reviews at the end of the study using a standardized medical record review form."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Intention-to-treat analyses were performed for the 1496 study and 1510 control subjects"
Selective reporting (reporting bias)	Unclear risk	Insufficient information

Other bias	Low risk	Quote: "Study and control groups were similar with respect to age group, sex, practice, insurance, and race/ethnicity"

Szilagyi 2013

Methods	**Aims**: to assess the impact of a managed care-based patient reminder/recall system on immunisation rates and preventive care visits among low-income adolescents **Study design**: RCT; **recruitment**: primary care (organisational referral) **Study duration**: 12 months; **study type**: prevention; **subtype**: immunisation
Participants	**Inclusion criteria**: adolescents aged 10.5 through 17 years enrolled in Monroe Plan on 31 December 2009, with a primary care provider in a participating practice **Sample size**: 4115; **mean age**:* **sex**: boys - 50%, girls - 50%; **ethnicity**:* **Country**: USA
Interventions	**Telephone reminders** were sent at the same frequency as letters by an Autodialer service in which a recorded human voice in English or Spanish was used, with a message that mirrored the information in the letter reminders **Mail reminders**. The letters provided the practice's telephone number. Letters were sent at 10-week intervals for Tdap, MCV4, and preventive care visits (maximum of 5 reminders over 12 months) **Participants in the control group** received usual care
Outcomes	Immunisation status; preventive visit rate (both primary); process evaluation; costs (both secondary)
Funding	CDC
Declaration of conflict of interest	None declared
Power calculations for sample size	The study had > 90% power for a 5% improvement in immunisation rates at study end assuming 50% for controls (2-sided alpha = 0.05), using survival analysis and an intention to-treat analysis
Notes	Among all adolescents who received a reminder, the cost averaged USD 18.78 or USD 16.68 per adolescent per year for mail reminder group and telephone reminder group, respectively. There were no cost-effectiveness data available for usual care group. This is a comparison between Autodialer and no intervention. The other intervention included mailed reminders

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation by AB (using Stata 9.2) stratifying on practice, age in years,

		and sex"
Allocation concealment (selection bias)	Unclear risk	Insufficient information. Quote: "Health care providers were unaware of group assignment."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	An intention to-treat data analysis was used.
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review were reported
Other bias	Low risk	Quote: "The control and intervention groups had similar demographics (Table 2) and baseline immunisation and preventive visit rates."

Tanke 1994

Methods	**Aims**: to evaluate the effectiveness of automated telephone reminder on appointment reminder in patients undergoing tuberculosis care **Study design**: quasi-RCT; **recruitment**: other - county health department (organisational referral) **Study duration**: 6 months; **study type**: either; **subtype**: appointment reminder
Participants	**Inclusion criteria**: participants with a scheduled appointments in the Tuberculosis Control Programme of Santa Clara County Health Department over a period of 6 months **Sample size**: 2008; **median age**: 19 years; **sex**: male - 54 %; female - 46 %; **ethnicity**: Spanish-speaking - 39%, Vietnamese-speaking - 28%, English-speaking -14%, other - 13%, Tagalog-speaking Filipino - 6% **Country**: USA
Interventions	**Teleminder**: an automated telephone reminder call of their upcoming appointment in either English, Spanish, Tagalog, or Vietnamese was made 1 day prior to the appointment. Additional information about the clinic address and the time of appointment was also provided. Participants had the option to hear to the message again if they remained online. Participants receiving authoritative endorsement identified the source of message as coming from the Public Health Nurse at the Health Department while in the importance statement, the following statement was added - "coming to this appointment is important so that you and your family will not become seriously ill." Message was sent

	between 6 pm and 9 pm, the evening before the scheduled appointment. Message was left on answering machine and if the line was busy, up to 5 attempts were made at half hour intervals **Basic reminder + authority endorsement** **Basic reminder + importance statement** **Basic reminder + authority endorsement + importance statement** **No reminder** (controls)
Outcomes	Attendance rate (primary); satisfaction (attitude questionnaire) (secondary)
Funding	National Institute of Allergy & Infectious Diseases; National Institute on Ageing
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	This is a comparison between Teleminder arm and control

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Non-random sequence generation. Quote: "random assignment of patients to conditions and the delivery of multiple messages on the same day would have required substantially more experimenter time"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Tanke 1997

Methods	**Aims**: to assess the impact of automated telephone reminder on tuberculin skin test return **Study design**: RCT; **recruitment**: * (organisational referral) **Study duration**: 2 months; **study type**: either; **subtype**: appointment reminder
Participants	**Inclusion criteria**: participants of Santa Clara County immunisation programme who received tuberculin skin test **Sample size**: 701; **age**: 55% < 12 years; **sex**: boys - 45 %; girls - 55 %; **ethnicity**: English-speaking - 59%, Spanish-speaking - 29%, Vietnamese-speaking - 3%, other - 9% **Country**: USA
Interventions	**Participants in the Teleminder group** received an automated reminder in either English, Spanish, or Vietnamese between 6 pm and 9 pm of the evening before the scheduled day to have the tuberculin skin test read. The message was pre-recorded by a female speaker that also provided the time and place of appointment. The message was repeated twice and if it reached an answering machine, the message was saved. If the line was busy, then up to 5 attempts were made, at half-hour intervals **Participants in the control group** received no calls
Outcomes	Return of tuberculin test (primary); satisfaction (perceptions about reminders) (secondary)
Funding	National Institute of Allergy & Infectious Diseases; National Institute on Ageing
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "A research assistant randomly assigned the participants to either a control or an experimental group."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information

Tanke 1997 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Tucker 2012

Methods	**Aims**: to evaluate the effectiveness of IVR self-monitoring to support natural resolutions among community-dwelling problem drinkers who had recently stopped high-risk drinking without treatment and who were abstaining or engaging in low-risk drinking **Study design**: RCT; **recruitment**: community (media adverts) **Study duration**: 6 months; **study type**: prevention; **subtype**: alcohol
Participants	**Inclusion criteria**: participants aged ≥ 21 years, problem drinking history more than 2 years, currently not taking any drugs except nicotine, and cessation of high-risk drinking in the past 3-16 weeks without alcohol-focused interventions **Sample size**: 187; **age**: 45 years; **sex**: men - 63 %; women - 37 %; **ethnicity**: white - 54%, other race/ethnicity - 46% **Country**: USA
Interventions	**Participants in the intervention group** received IVR: the system was programmed using commercial software (SmartQ Version 5 [5.0.141], Telesage, Inc., Chapel Hill, NC). A daily survey assessed ounces of beer, wine, and distilled spirits consumed; use of other drugs to 'get high'; and dollars spent on alcohol and other drugs during the preceding day (defined as the 24-hour period midnight-to-midnight yesterday). When no substance use was reported, participants answered questions about other prior-day activities to balance call duration. 4 once-a-week surveys on Mondays through Thursdays assessed other relevant domains (e.g. strategies used to avoid/limit drinking, activities paired with drinking) **Participants in the control group** received an assessment-only.
Outcomes	Drinking practices; spending on alcohol (both primary)
Funding	National Institutes of Health/National Institute on Alcohol Abuse and Alcoholism (NIH/NIAAA)
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	No significant IVR main effects were found in any analysis either before or after adjusting for covariates (all ps > .20). Significant effects by compiler average causal effect (CACE) models examined IVR self-monitoring effects. The other report from this trial had different aims: "to assess IVR in community-dwelling HIV/AIDS patients in rural Alabama self-monitored for enhancing daily HIV risk behaviours reporting.". Inclusion criteria: age ≥ 19 years (the age of majority in Alabama); reported use of alcohol or illicit

| | | drugs and sex with a partner within the past 3 months (in order to obtain sexually active substance users, the high risk target population for HIV risk reduction programmes) ; no health problems that precluded participation (e.g. dementia, psychosis); were not living in the HSC Hospice or other residential facility (e.g. inpatient substance abuse treatment programme) and were not taking any medication (e.g. disulfiram, methadone) that would substantially constrain opportunities for engaging in the risk behaviours of interest; and had daily phone access; Sample size: 54; mean age: 38 years; percentage of men - 65 % and women - 35 %; ethnicity: black - 43%; and outcomes: changes in risk behaviours |

Risk of bias		*Risk of bias*
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Urn randomisation used sex and race as balancing factors"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	High risk	High attrition rate. Data were not imputed using appropriate methods. Quote: "The follow-up rate was about 70%. This sub-optimal rate was partially addressed by including a 'missing' category as an outcome code along with the 3 resolution outcomes so that the analyses included all enrolled participants"
Selective reporting (reporting bias)	Low risk	Comment: all of the study's pre-specified outcomes that are relevant to the review were reported
Other bias	Low risk	Comment: groups were similar across all baseline characteristics

Vance 2011

Methods	**Aims**: to determine the effectiveness of delivering 4 different interactive telephone technology programmes to reduce weight and improve blood glucose, insulin, high-density lipoproteins, and triglycerides values **Study design**: RCT; **recruitment**: * (*) **Study duration**: 12 weeks; **study type**: prevention; **subtype**: weight management
Participants	**Inclusion criteria**: * **Sample size**: 140; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Interactive telephone counselling (ITC) + control** **Online behaviour-based incentives + control** **ITC + behaviour-based incentives + control** **Control** - written materials and once monthly group meetings
Outcomes	Weight change (primary); BMI; waist circumference; systolic blood pressure; blood glucose (secondary)
Funding	NA
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	This is a comparison between ITC + control versus and control. Information derived from abstract only

Risk of bias | | *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information
Selective reporting (reporting bias)	Unclear risk	Insufficient information

Other bias	Unclear risk	Insufficient information

Velicer 2006

Methods	**Aims**: to perform an effectiveness trial of nicotine replacement therapy (NRT) in combination with 3 low-cost behavioural therapies (manuals, tailored expert system interventions, and an automated counselling intervention) **Study design**: RCT; **recruitment**: primary care (mail) **Study duration**: 30 months; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: self-identification as a smoker who regularly smoked ≥ 10 cigarettes per day and, therefore, met the requirements for using NRT **Sample size**: 2054; **mean age**: 51 years; **sex**: women - 23%, men - 77%; **ethnicity**: white - 89%, black - 5%, other - 4%, Native American - 2% **Country**: USA
Interventions	**Multimodal intervention automated counselling + NRT, manuals, and expert system** (TEL + EXP + NRT + MAN). The interactive telecommunications system was developed for this study and employed a series of prerecorded voice files assembled in the form of a conversation that was tailored to the responses of the smoker. The telecommunications contacts served to both complete the assessment of progress on the 14 TTM variables and provide instant automated feedback. Material similar to that in the written paragraphs of the expert system progress reports was presented during the call and reproduced verbally **Expert system + NRT and manuals** (EXP + NRT + MAN) **NRT + manuals** (NRT + MAN) **Stage-matched manuals** (MAN)
Outcomes	Smoking abstinence
Funding	National Cancer Institute Grant CA71356
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	This is a comparison between the multimodal intervention and the stage-matched manuals

Risk of bias
Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "After completing the survey, all eligible smokers were randomised by computer-based random number generator to one of four intervention conditions"
Allocation concealment (selection bias)	Unclear risk	Insufficient information

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "Subjects were blinded to their treatment condition until they received the first intervention material; thus, awareness of the treatment condition could not influence the readiness for study participation. However, subjects were aware that several of the possible treatment conditions included NRT and that up to four follow-up assessments by telephone were scheduled over the following 30 months." Insufficient information to judge whether this has introduced bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Blinding of outcome assessment ensured. Quote: "The survey centre staff was blind to treatment condition."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "The intention-to-treat analysis was conducted on the entire sample of 2, 054 subjects identified as at risk for smoking"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "As a randomisation check, tests of significance (p < .01) were performed to determine whether there were any differences between the four groups. All tests were non significant."

Vollmer 2006

Methods	**Aims**: to test the ability of an automated telephone outreach intervention to reduce acute healthcare utilisation and improve quality of life among adult asthma patients in a large managed care organisation **Study design**: RCT; **recruitment**: other - health plan (organisational referral) **Study duration**: 10 months; **study type**: management; **subtype**: asthma
Participants	**Inclusion criteria**: aged $\geq$ 18 years and either on the Kaiser Permanente Northwest (KPNW) high-risk asthma registry or had $\geq$ 180 days of antiasthma medication dispensing during the 2-year period 2000-2001 and $\geq$ 1 medical contact for asthma during the same 2 years **Sample size**: 6,948; **mean age**: 52 years; **sex**: men - 35%, women - 65%; **ethnicity**: white, non-Hispanic - 92%, other - 8% **Country**: USA

Interventions	**Automated telephone outreach system (ATOS)**: the calls consisted of a series of questions designed to assess recent emergency department or hospital care for which the member had not had a follow-up visit, current level of asthma control, current patterns of asthma medication use, and whether the member could identify a primary care provider whom he or she usually saw for asthma care. Based on the responses to these initial questions, members were offered (optional) tailored feedback regarding their overall level of asthma control and their use of asthma medications. Feedback was designed to convey a positive message without being prescriptive. The calls lasted less than 10 min and were made using speech-recognition technology. The telephone message were translated into text message that was continuously updated in the electronic medical record. Participants at high risk of a future exacerbation are flagged and an electronic alert via electronic surveillance system placed in the medical record prompting their provider to review the encounter and clear the alert from the record **Live calls** (the same script as above) **Usual care** (controls)
Outcomes	Healthcare utilisation; asthma control; medication use; quality of life (all primary); satisfaction/acceptability to participants (secondary)
Funding	CDC and the Kaiser Permanente Care Management Institute
Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	Per protocol, the 2 intervention arms (automated and live-person calling) were combined for the primary and post hoc analyses

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Eligible individuals were randomly assigned to either usual care (n = 3367) or telephone outreach (n = 3581)."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "The primary outcome analysis used an intention-to-treat design that in-

		cluded in the intervention group all randomised individuals, as well as persons who declined to participate in the intervention"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

Vollmer 2011

Methods	**Aims**: to evaluate the effectiveness of an intervention based on health information technology (HIT) that used speech recognition software to promote adherence to inhaled corticosteroids among individuals with asthma who were members of a large health maintenance organisation **Study design**: RCT; **recruitment**: other - health plan (mail) **Study duration**: 18 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: treatment for asthma during the 12-month period prior to randomisation; ≥ 1 dispensing of a respiratory medication at a Kaiser Permanente Northwest or Kaiser Permanente Hawaii outpatient pharmacy during the 12-month period prior to randomisation; aged ≥ 18 years, continuous Kaiser Permanente membership from the start of the baseline year until the time of randomisation **Sample size**: 8517; **mean age**: 54 years; **sex**: men - 34%; women - 66%; **ethnicity**: white - 50%, unknown - 26%, Asian - 11%, mixed - 7%, Native Hawaiian/Pacific Islander - 4%, African American - 2%, American Indian/Alaskan Native - 1% **Country**: USA
Interventions	**Participants in the intervention group** received IVR: 3 basic IVR call types, each of which typically lasted 2-3 min: a refill reminder call, a tardy refill call, and an initiator/restart call. Each month, participants' electronic medical records were scanned to determine who was eligible for which type of call. The tardy refill call went to individuals who were more than 1 month past their projected refill date. It not only reminded participants that they were due for an inhaled corticosteroids refill, but also assessed asthma control, explored inhaled corticosteroids adherence barriers, and provided tailored educational messages. Poorly controlled participants who declined to be transferred to the automated pharmacy refill line were offered the option to speak to a live pharmacist. The initiator/restart call was designed to provide support to participants who were either starting inhaled corticosteroids for the first time (new users) or were lapsed users. These calls went to individuals with an inhaled corticosteroids order or dispensing in the previous month and no other inhaled corticosteroids dispensing in the previous 6 months, and were similar to the tardy refill calls in that they included probes for asthma control and adherence barriers and offered tailored educational messages **Participants in the control group** received usual care.
Outcomes	Medication adherence (primary); asthma-related healthcare utilisation (secondary)
Funding	NA

Declaration of conflict of interest	NA
Power calculations for sample size	"A priori power calculations showed near-100% power to detect differences of 0.04 in adherence and 85% power to detect differences of 0.5 on the 7-point mini-AQLQ score."
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "[Participants] were randomised to either the intervention or usual care arms, with randomisation stratified by region and the clinic facility to which each patient was paneled."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Comment: missing data have been imputed using appropriate methods. An ITT analysis was used to include all participants who received the intervention or usual care in the analysis
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "Baseline characteristics of the intervention and usual care groups were very similar."

Vollmer 2014

Methods	**Aims**: to evaluate the utility of 2 electronic medical record-linked, automated phone reminder interventions for improving adherence to cardiovascular disease medications **Study design**: RCT; **recruitment**: other - health plan (organisational referral) **Study duration**: 12 months; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: $\geq$ 40 years with diabetes mellitus and/or cardiovascular disease, suboptimally (< 90%) adherent to a statin or ACE inhibitor/angiotensin receptor blocker (ARB) during the previous 12 months, and due or overdue for a refill **Sample size**: 21,752; **mean age**: 64 years; **sex**: men - 53%; women - 47%; **ethnicity**: white - 47%, Asian - 17%, African American -15%, native Hawaiian/Pacific Islander - 11%, unknown - 9%, American Indian/Alaskan Native - 1% **Country**: USA
Interventions	**IVR calls**. IVR participants received automated phone calls when they were due or overdue for a refill. The calls used speech-recognition technology to educate participants about their medications and help them refill prescriptions (we created separate 'refill' and 'tardy' calls). The flow of each call was determined by participants' responses; each call lasted 2-3 min. At randomisation, IVR participants received a pamphlet explaining these calls. Both call types offered a transfer to Kaiser Permanente's automated pharmacy refill line. The tardy call also offered a transfer to a live pharmacist. With permission, obtained at the first successful call contact, the programme left detailed messages on answering machines or with another household member **Enhanced IVR (IVR Plus)**. In addition to IVR calls, participants in the IVR Plus arm received a personalised reminder letter if they were 60-89 days overdue and a live outreach call if they were $\geq$ 90 days overdue, as well as electronic medical records-based feedback to their primary care provider. IVR Plus participants received additional materials, including a personalised health report with their latest blood pressure and cholesterol levels, a pill organiser, and bimonthly mailings **Usual care** participants had access to the full range of usual services, including each region's normal education and care management outreach efforts to encourage statin and ACEI/ARB use
Outcomes	Medication adherence (primary); blood pressure and lipid levels (secondary)
Funding	R01HS019341 from the Agency for Healthcare Research and Quality
Declaration of conflict of interest	None declared
Power calculations for sample size	The study had roughly 90% power to detect effects of 0.032 (3.2 percentage points) in adherence for statins and 0.045 (4.5 percentage points) for ACEI/ARBs in sex-specific subgroup analyses, and effects of 0.039 (statins) and 0.045 (ACEI/ARBs) in subgroups defined by terciles of some baseline factor
Notes	The estimated costs were USD 9 to USD 17 per participant per year for IVR and USD 36 to USD 47 for IVR Plus. No costs for UC were provided. This is a comparison between IVR and control

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Computer-generated randomisation assignments were stratified by region and blocked to assure balance across treatment arms."
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Neither participants nor providers were blinded to treatment assignment."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "We used an intention-to-treat analysis to compare primary and secondary outcomes between intervention and UC participants."
Selective reporting (reporting bias)	Low risk	Comment: the study protocol is available and all of the study's pre-specified outcomes that are relevant to the review have been reported
Other bias	Low risk	Quote: "Baseline characteristics of the intervention and UC groups for the pooled statin and ACEI/ARB analysis samples were very similar"

Williams 2012

Methods	**Aims**: to investigate the effects of the TLC Diabetes programme on health outcomes postintervention (time point 2) and at 12-month follow-up (time point 3) **Study design**: RCT; **recruitment**: primary care and the community (adverts in newspapers, flyers, newsletters and through diabetic clinics) **Study duration**: 12 months; **study type**: management; **subtype**: diabetes
Participants	**Inclusion criteria**: participants with type 2 diabetes diagnosis of ≥ 3 months; aged 18-70 years; residing in the greater Brisbane area (Australia); a glycated haemoglobin level of ≥ 7.5%; stable diabetes pharmacotherapy type for ≥ 3 months; stable pharmacotherapy dosage for ≥ 4 weeks; ability to clearly speak and understand English via the telephone, and weekly access to a telephone **Sample size**: 120 ; **mean age**: 57 years; **sex**: men - 62.5%; women - 37.5%; **ethnicity**: * **Country**: Australia

Interventions	**Telephone-Linked Care (TLC) Diabetes system**: participants receive TLC Diabetes kit containing the TLC Handbook, an ACCU-CHEK Advantage glucose meter, test strips, and a Bluetooth device with which to upload their blood glucose results to the TLC Diabetes system. They call the system weekly using a landline or mobile phone. TLC's responses, including feedback and encouragement, were tailored according to information entered in the TLC database at the start and the answers that it received from participants during all calls. TLC stressed on the following self-management behaviours: blood glucose testing (covered in all calls), nutrition (calls 9-12; 21-24), physical activity (calls 5-8; 17-20) and medication-taking (calls 1-4; 13-16) **Participants in the control group** received usual care.
Outcomes	Glycated haemoglobin; health-related quality of life (physical and mental components of the Short-Form-26 (SF-26) scale) (all primary)
Funding	National Health Medical Research Council project grant, HCF Health and Medical Research Foundation, and Queensland Health
Declaration of conflict of interest	Dr Friedman has stock ownership and a consulting agreement with Infomedics, the company that owns commercial rights to the TLC technology used in the computerised intervention. He is also a member of its Board of Directors. The other authors declare that they have no competing interests
Power calculations for sample size	With 80% power and a type 1 error of 5% (2-tailed), it was possible to detect a difference in the primary outcome, glycated haemoglobin, of 0.61% between the intervention and control arms (based on a standard deviation change of 1.0% between the randomised arms)
Notes	43% of total participants were on insulin (injected). Mean BMI: 33 kg/m^2. The TLC coordinator phones intervention participants after their first 2 calls to the TLC system and at weeks 6, 12 and 20, to identify and resolve any issues faced during their use of the TLC Diabetes system or to identify reasons for not calling regularly

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The arm allocation was conducted using a 4 x 4 block randomised block design with the participant as the unit of randomisation."
Allocation concealment (selection bias)	Low risk	Correspondence with the author: "We used opaque envelopes, so all envelopes were prepared at the start of the trial, contained allocation to intervention or control according to randomisation schedule.'

Automated telephone communication systems for preventive healthcare and management of long-term conditions (Review)   **337**

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Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "The treating physicians were not blinded to the allocation."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data have been imputed using appropriate methods. Quote: "To account for subjects lost to follow-up in intention-to-treat analyses, multiple imputation was performed using ten imputed datasets"
Selective reporting (reporting bias)	High risk	The protocol lists about 16 secondary outcome measures that were not reported in the 6-month report. Correspondence with the author: "these data have been collected but I'm afraid no analyses have been performed yet. We could not fit the 6-month secondary outcomes into this paper unfortunately."
Other bias	High risk	Quote: "Comparison of the baseline characteristics across usual care and intervention arms revealed important differences in e-GFR which showed a significantly greater impairment in renal function in the intervention compared with usual care arm, and creatinine. Other differences observed were in age, education, and self-care behaviours (adherence to blood glucose testing recommendations and daily insulin/diabetes medications, and foot inspections)."

Wright 2013

Methods	**Aims**: to evaluate the acceptability and feasibility of a scalable obesity treatment programme integrated with paediatric primary care and delivered using IVR to families from underserved populations **Study design**: RCT; **recruitment**: primary care (advert in clinic) **Study duration**: 3 months; **study type**: prevention; **subtype**: weight management
Participants	**Inclusion criteria**: 9-12 years old, a BMI 0-5 BMI points above the 95th percentile for age and sex, attended a paediatric visit within the last year, and due for an annual well-child exam in 4 months

Wright 2013 (*Continued*)

	Sample size: 50 dyads; **mean age**: 10 years; **sex**: boys - 58%, girls - 42%; **ethnicity**: white - 6%, African American - 72%, other - 22% **Country**: USA
Interventions	**Intervention**: both parents and children received a 12-week telephone counselling delivered by an automated IVR system. The intervention also included an EHR behavioural counselling tool used by the PC clinician during well-child follow-up visits. Similar but separate interventions were developed for parents and children. The IVR was designed to monitor, educate, and counsel parents and children on healthy weight management and television time through weekly IVR telephone conversations. During these conversations, the system spoke to participants using computerised voice by means of text-to-speech technology. Participants communicated by speaking into the telephone receiver or by pressing keys on the telephone keypad. The conversation is tailored to the individual user of the IVR such that the IVR asked questions and provides tailored feedback based on the user's response. Questions are asked to monitor the user's behaviour and provided education and theory-based behaviour change strategies for the targeted behaviours as well as generate a conversation that is more human-like. The HEAT system stores responses that are used to tailor the questions asked during the same conversation or inform subsequent calls **Participants in the control group** received no calls (wait-list).
Outcomes	BMI z-score; calorie intake; fat intake; fruit intake; vegetable intake; television-viewing time (all primary)
Funding	National Institute of Child and Human Development (NICHD R21 HD050939-02)
Declaration of conflict of interest	None declared
Power calculations for sample size	NA
Notes	-

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Fifty parent-child dyads were randomised in blocks of six to either the intervention condition (HEAT) or WLC condition. The blocks were generated by an investigator who did not have contact with the participants."
Allocation concealment (selection bias)	Low risk	Quote: "Assignments to condition were placed in sealed envelopes and opened after all baseline measures were completed."

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Intention-to-treat analyses with baseline values carried forward for those missing at follow-up were also conducted"
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Comment: groups were similar across all baseline characteristics but weight and height; however, it is unclear whether this has introduced bias

Xu 2010

Methods	**Aims**: to evaluate the effects of an automated IVR system and specialist nurse support to reduce health care utilisation and improve health-related quality of life in children with asthma **Study design**: RCT; **recruitment**: secondary care (*) **Study duration**: 6 months; **study type**: management; **subtype**: asthma
Participants	**Inclusion criteria**: children and adolescents aged 3-16 years with doctor-diagnosed asthma who had either had an admission to hospital in the previous 12 months or had presented at least once to an emergency department or to their general practitioner or specialist with acute asthma requiring oral steroid rescue in the previous 12 months **Sample size**: 121; **mean age**: 7 years; **sex**: men - 53%, women - 47%; **ethnicity**:* **Country**: Australia
Interventions	**IVR**: participants received an automated telephone call twice a week on their home phone or mobile phone. Children over 12 years old were encouraged to answer calls themselves. Parents answered calls for children younger than 12 years old. The IVR system asked questions about asthma symptoms and medication use and participants entered clinical data using the keypad on the phone. Educational messages, appropriate information from the asthma management plan, and medication reminders were given. Reports generated from the electronic system were sent to the primary physician electronically or by fax **Nurse support group** **Usual care** (control group)
Outcomes	Healthcare utilisation (primary); use of oral steroid rescue; health-related quality of life; costs (secondary)

Funding	Asthma Foundations of Australia and Royal Children's Hospital Foundation Brisbane Australia
Declaration of conflict of interest	None declared
Power calculations for sample size	NA
Notes	IVR was more cost-effective than usual care in reducing the total health care costs (mean AUD −451 (95% CI −1075, 172); but less cost-effective than nurse support group

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Block randomisation was used with random block sizes of three or six to create an allocation to one of the three groups for all study subjects"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Insufficient information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "One child in the control group was lost to follow-up during the study." Comment: low attrition rate and unlikely to have introduced bias
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Quote: "The groups were reasonably well matched at baseline, although the control group had fewer hospital admissions and ED presentations over the previous 12 months compared with Nurse Support and IVR groups at baseline." Comment: groups were similar across all baseline characteristics but hospital admissions and ED presentation; however, it is unclear whether this has introduced bias

Methods	**Aims**: to evaluate the efficacy of technology-based symptom monitoring and reporting in reducing symptom burden in patients with advanced lung cancer **Study design**: RCT; **recruitment**: primary care (*) **Study duration**: 12 weeks, **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria**: ≥ 18 years old, English-speaking, having advanced non-small cell lung cancer or small cell lung cancer, receiving active treatment with traditional chemotherapy no later than day 1 of cycle 2 or receiving oral therapy, having access to a telephone, and life expectancy of ≥ 6 months **Sample size**: 253; **mean age**: 61 years; **sex**: men - 49%, women - 51%; **ethnicity**: white - 58%, black or African American - 36%, other - 6% **Country**: USA
Interventions	**Participants in the intervention group** received monitoring and reporting (MR group) via IVR. The participants delivered reports of clinically significant symptoms to their clinical team for further assessment and/or management; and had paper copies of longitudinal, graphical displays of symptom scores available **Participants in the control group** received monitoring alone (MA) via IVR
Outcomes	Symptom burden (primary); quality of life; treatment satisfaction; symptom management barriers; self-efficacy (secondary)
Funding	National Cancer Institute (R01-CA115361)
Declaration of conflict of interest	None declared
Power calculations for sample size	"The study was powered to detect a difference between the two study groups in SDS total score. For this endpoint, a standardized effect size (mean group difference/common standard deviation) of 0.33 has been suggested to be meaningful in the measurement of PROs in several different cancer populations"
Notes	Both groups received ATCS interventions

Risk of bias   *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "After providing informed consent, participants completed baseline measures and were randomly assigned by computer in a 1:1 ratio to the MR or the MA group. Randomization was blocked, stratified by institution, with a goal of enrolling 100 participants from each of the three sites (total N = 300), 150 in each group."
Allocation concealment (selection bias)	Unclear risk	Insufficient information

Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "This was a non-blinded, randomised, controlled trial of technology-based symptom monitoring with reporting (MR group) to the clinical team compared with symptom monitoring alone (MA group)"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "A blinded interim analysis of symptom severity and study burden data was planned after half of the randomised patients (N = 150) had reached the week 12 assessment, and this analysis was reviewed by the institutional cancer centre data and safety monitoring board." Insufficient information to judge whether blinded assessments were performed
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Analyses were based on intention-to-treat in all randomised participants and were not adjusted for multiple comparisons."
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Low risk	Quote: "The study groups were equivalent in baseline characteristics"

Zautra 2012

Methods	**Aims**: to examine the effects of a brief, daily intervention targeting either personal control/mastery (MC) or mindful awareness/acceptance (MA) compared with a placebo treatment that consisted of tips to a healthy life-style (HT) **Study design**: RCT; **recruitment**: community (phone and home visits) **Study duration**: 1 month; **study type**: management; **subtype**: depression
Participants	**Inclusion criteria**: individuals with mild to moderate symptoms of depression **Sample size**: 73; **mean age**: * **sex**: * **ethnicity**: other - 74%, Hispanic - 26% **Country**: USA
Interventions	**Personal control/mastery**. Intervention was delivered in pre-recorded messages via phone each morning. Each evening, participants completed an on-line daily diary that included the outcome measures **Mindful awareness/acceptance** (delivered as above) **Healthy lifestyle** (controls)
Outcomes	Stress; depression
Funding	NIA Grant RO1-AG-6026006

Declaration of conflict of interest	NA
Power calculations for sample size	NA
Notes	-

Risk of bias *Risk of bias*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information. Quote: "Seventy-three adults recruited to participate in the trial, and randomly assigned to MC, MA, or HT conditions"
Allocation concealment (selection bias)	Unclear risk	Insufficient information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of study personnel was ensured. Quote: "The research assistants were blinded to the hypotheses of the study and did not have access to the daily diary data of the participants at any time during the study."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low attrition rate. Missing outcome data balanced in numbers, with similar reasons for missing data across groups
Selective reporting (reporting bias)	Unclear risk	Insufficient information
Other bias	Unclear risk	Insufficient information

ACE: angiotensin-converting-enzyme; **ART**: antiretroviral therapy; **AT2**: angiotensin 2; **ATCS**: automated telephone communication system; **BI**: brief intervention; **BMI**; body mass index; **CBT**: cognitive behavioural therapy; **CDC**: Centers for Disease Control and Prevention; **COPD**: chronic obstructive pulmonary disease; **CPAP**: continuous positive airway pressure; **DSM**: Diagnostic and Statistical Manual of Mental Disorders; **EHR**: electronic health record; **EMR**: electronic medical record; **FDA**: Food and Drug Administration; **HMO**: health maintenance organisation; **ITT**: intention-to-treat; **IVR**: interactive voice recognition; **MI**: motivational interviewing; **NA**: not available; **NIAAA**: National Institute on Alcohol Abuse and Alcoholism; **OSAS**: obstructive sleep apnoea syndrome; **QALY**: quality-adjusted life year; **PCI**: percutaneous coronary intervention; **PCP**: primary care provider; **PHQ-8/9**: personal health questionnaire, version 8/9; **PTSD**: post-traumatic stress disorder; **RCT**: randomised controlled trial; **UC**: usual care; **UOHI**: University of Ottawa Heart Institute.
[a]Please note that for reporting of participants' ethnicity, the terms used by authors of the included studies have been used in each case and are cited directly from each of the included studies.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aarons 2012	Intervention does not use an ATCS
Abbott 2013	Intervention does not use an ATCS
Adie 2010	Intervention does not use an ATCS
Agel 2001	No preventive healthcare or management of long-term condition
Aharonovich 2006	Inappropriate study design
Aikens 2015a	Inappropriate study design
Aikens 2015b	Inappropriate study design
Albert 2014	Inappropriate study design
Albert 2015	Inappropriate study design
Albisser 2001	Inappropriate study design
Albisser 2005	Inappropriate study design
Alemagno 1996	Inappropriate study design
Alemi 1994	Inappropriate study design
Alemi 1995	Inappropriate study design
Alemi 1996	Intervention does not use an ATCS
Alemi 1996a	Intervention does not use an ATCS
Alkema 2007	Intervention does not use an ATCS
Allen 2013	Intervention does not use an ATCS
Alsabbagh 2013	Intervention does not use an ATCS
Altfeld 2013	Intervention does not use an ATCS
Anderson 2004	Intervention does not use an ATCS
Andersson 2013	No preventive healthcare or management of long-term condition

Andersson 2014	No preventive healthcare or management of long-term condition
Arezina 2011	Intervention does not use an ATCS
Armstrong 2009	Intervention does not use an ATCS
Aseltine 2010	Intervention does not use an ATCS
Avery 2004	Intervention does not use an ATCS
Avery 2004a	Intervention does not use an ATCS
Bambauer 2005	Intervention does not use an ATCS
Barohn 2013	Inappropriate study design
Bartholomew 2011	Intervention does not use an ATCS
Basch 2006	Intervention does not use an ATCS
Bastian 2002	Intervention does not use an ATCS
Bellazzi 2003	Intervention does not use an ATCS
Bellazzi 2004	Intervention does not use an ATCS
Berkman 2014	Intervention does not use an ATCS
Berman 2012	No preventive healthcare or management of long-term condition
Bexelius 2010	Inappropriate study design
Bigby 1983	Intervention does not use an ATCS
Bischof 2008	Intervention does not use an ATCS
Bischof 2010	Intervention does not use an ATCS
Bjorner 2014a	No preventive healthcare or management of long-term condition
Bjorner 2014b	No preventive healthcare or management of long-term condition
Blackstone 2009	No preventive healthcare or management of long-term condition
Bloom 2004	Intervention does not use an ATCS
Blumenthal 2014	Intervention does not use an ATCS
Boekeloo 1998	Inappropriate study design

Boisseau 2010	Inappropriate study design
Bombardier 2013	Intervention does not use an ATCS
Boren 2006	Inappropriate study design
Borland 2003	Intervention does not use an ATCS
Borland 2013	Intervention does not use an ATCS
Borsari 2014	Intervention does not use an ATCS
Bosworth 2008	Intervention does not use an ATCS
Bowen 2010	Intervention does not use an ATCS
Brown 2004	Intervention does not use an ATCS
Brown 2007	Intervention does not use an ATCS
Bruce 2005	Intervention does not use an ATCS
Brustad 2003	Inappropriate study design
Budin 2008	Intervention does not use an ATCS
Burda 2012	Inappropriate study design
Buscemi 2011	Intervention does not use an ATCS
Bustamante 2013	Intervention does not use an ATCS
Candy 2004	Intervention does not use an ATCS
Carcaise-Edinboro 2008	Intervention does not use an ATCS
Carlbring 2006	Intervention does not use an ATCS
Carmody 2013	Intervention does not use an ATCS
Cecinati 2010	Intervention does not use an ATCS
Chae 2000	Intervention does not use an ATCS
Champion 2007	Intervention does not use an ATCS
Chang 2010	Inappropriate study design
Chiu 2010	Intervention does not use an ATCS

Choudhry 2013	Inappropriate study design
Collins 2003	No preventive healthcare or management of long-term condition
Collins 2010	No preventive healthcare or management of long-term condition
Cooney 2015	Inappropriate study design
Corkrey 2002a	Inappropriate study design
Costanza 2007	Intervention does not use an ATCS
Coughey 2010	Intervention does not use an ATCS
Crawford 2005	Inappropriate study design
Crawford 2014	Inappropriate study design
Cudkowicz 2013	Intervention does not use an ATCS
Curry 1995	Intervention does not use an ATCS
Curry 2003	Intervention does not use an ATCS
Dalal 2011a	No preventive healthcare or management of long-term condition
Dalal 2011b	No preventive healthcare or management of long-term condition
Damschroder 2010	Intervention does not use an ATCS
Datta 2010	Intervention does not use an ATCS
Datto 2003	Intervention does not use an ATCS
Davidoff 1985	Inappropriate study design
Day 2002	Intervention does not use an ATCS
De San Miguel 2013	Intervention does not use an ATCS
Decker 2009	Inappropriate study design
Denis 2012	Intervention does not use an ATCS
Depp 2015	Intervention does not use an ATCS
Digenio 2009	Intervention does not use an ATCS

(Continued)

Duncan 2014	Intervention does not use an ATCS
Durso 2003	Inappropriate study design
Dyches 1999	Inappropriate study design
Eakin 2009	Intervention does not use an ATCS
Eakin 2010	Intervention does not use an ATCS
Eakin 2012	Intervention does not use an ATCS
Eisdorfer 2003	Intervention does not use an ATCS
Elliott 2013	No preventive healthcare or management of long-term condition
Elston 2010	Intervention does not use an ATCS
Eng 2013	No preventive healthcare or management of long-term condition
Fadol 2011	Inappropriate study design
Fairhurst 2008	Intervention does not use an ATCS
Farabee 2013	Intervention does not use an ATCS
Faridi 2008	Intervention does not use an ATCS
Farmer 2005	Intervention does not use an ATCS
Feldstein 2009	Inappropriate study design
Fischer 2001	No preventive healthcare or management of long-term condition
Fischer 2014	Inappropriate study design
Fisher 2013	Intervention does not use an ATCS
Flax 2014	No preventive healthcare or management of long-term condition
Franc 2014	Intervention does not use an ATCS
Furber 2010	Intervention does not use an ATCS
Fursse 2008	Intervention does not use an ATCS
Gazmararian 2010	Inappropriate study design
Gilbert 2006	Intervention does not use an ATCS

(Continued)

Gilman 2014	Inappropriate study design
Glasgow 1996	Intervention does not use an ATCS
Glasgow 2008	Intervention does not use an ATCS
Goel 2008	Intervention does not use an ATCS
Gonzalez 1997	Inappropriate study design
Greaney 2012	Intervention does not use an ATCS
Green 2010	Intervention does not use an ATCS
Green 2013	Intervention does not use an ATCS
Greene 1998	Inappropriate study design
Greenley 2012	Intervention does not use an ATCS
Groeneveld 2010	Intervention does not use an ATCS
Haas 2015	Intervention does not use an ATCS
Hall 2000	Intervention does not use an ATCS
Hanauer 2009	Intervention does not use an ATCS
Hardy 2011	Intervention does not use an ATCS
Hasin 2014	Inappropriate study design
Haynes 2006	Inappropriate study design
Hedeker 2003	Intervention does not use an ATCS
Henry 2012	Inappropriate study design
Hersey 2012	Intervention does not use an ATCS
Hettema 2012	Inappropriate study design
Hollis 2005	Intervention does not use an ATCS
Horng 2004	Intervention does not use an ATCS
Horton 2008	No preventive healthcare or management of long-term condition

Hubbard 2007	Intervention does not use an ATCS
Hurling 2007	Intervention does not use an ATCS
Hurling 2013	Intervention does not use an ATCS
Hwang 2014	Intervention does not use an ATCS
Jacobs 2004	Intervention does not use an ATCS
Jacobs 2011	Intervention does not use an ATCS
Jiménez-Muro 2013	Intervention does not use an ATCS
Johnson 2014	Inappropriate study design
Joyce 2008	Intervention does not use an ATCS
Katz 2008	Intervention does not use an ATCS
Kauer 2012	Intervention does not use an ATCS
Kearney 2009	Intervention does not use an ATCS
Kempe 2012	Inappropriate study design
Kim 2007	Intervention does not use an ATCS
Kim 2008	Intervention does not use an ATCS
Kim 2012	Inappropriate study design
Kim 2013	Intervention does not use an ATCS
Klausen 2012	Intervention does not use an ATCS
Kobak 1997	Inappropriate study design
Kobak 2015	Intervention does not use an ATCS
Kolt 2007	Intervention does not use an ATCS
Konstam 2011	Intervention does not use an ATCS
Kristal 2000	Intervention does not use an ATCS
Kwon 2010	Intervention does not use an ATCS
Kwon 2012	Intervention does not use an ATCS

Ladyzynski 2007	Intervention does not use an ATCS
Larocque 2014	Inappropriate study design
Leichter 2013	Intervention does not use an ATCS
Leigh 2014	Inappropriate study design
Leimig 2008	Intervention does not use an ATCS
Leon 1999	No preventive healthcare or management of long-term condition
Levin 2011	Intervention does not use an ATCS
Levinson 2008	Intervention does not use an ATCS
Lewis 2010	Intervention does not use an ATCS
Lichtenstein 2008	Intervention does not use an ATCS
Lim 2011	Intervention does not use an ATCS
Linder 2014	Intervention does not use an ATCS
Lindner 2013	Intervention does not use an ATCS
Lindsay 2014	Inappropriate study design
Liu 2008	Intervention does not use an ATCS
Liu 2011	Intervention does not use an ATCS
Lovejoy 2014	Intervention does not use an ATCS
Ludman 2007	Intervention does not use an ATCS
Mahoney 1999	Inappropriate study design
Markert 2013	Intervention does not use an ATCS
Marshall 1993	Inappropriate study design
McCann 2009	Intervention does not use an ATCS
McDaniel 2005	Inappropriate study design
Miskelly 2005	Intervention does not use an ATCS

Mollon 2008	Inappropriate study design
Mooney 2002	Inappropriate study design
Mooney 2013	Inappropriate study design
Naylor 2002	Inappropriate study design
O'Brien 1998	Intervention does not use an ATCS
Oake 2009	Inappropriate study design
Odegard 2012	Intervention does not use an ATCS
Orsama 2013	Intervention does not use an ATCS
Osgood-Hynes 1998	Inappropriate study design
Pakhale 2015	Intervention does not use an ATCS
Patrick 2000	Inappropriate study design
Patten 2003	Data for ATCS group unavailable. Contact with author: "I apologize for not being helpful and regret that the value of the data cannot be extended by inclusion in the systematic review. Apparently, the back-up files for this project were scored on 3.5 inch floppy disks (!!) that were discarded during an office move"
Pellegrini 2012	Intervention does not use an ATCS
Pinto 2011	Intervention does not use an ATCS
Pinto 2013a	Intervention does not use an ATCS
Pinto 2013b	Intervention does not use an ATCS
Pizzi 2014	Intervention does not use an ATCS
Prochaska 2001	Intervention does not use an ATCS
Ramelson 1999	Inappropriate study design
Riegel 2006	Intervention does not use an ATCS
Rizvi 2011	Intervention does not use an ATCS
Roberts 2007	Intervention does not use an ATCS
Rolnick 1997	Intervention does not use an ATCS

Rose 2010	Inappropriate study design
Rosser 1992	Intervention does not use an ATCS
Rothemich 2010	Intervention does not use an ATCS
Rubin 2006	Inappropriate study design
Salisbury 2013	Intervention does not use an ATCS
Sano 2013	No preventive healthcare or management of long-term condition
Sano 2014	No preventive healthcare or management of long-term condition
Schuurman 1980	Inappropriate study design
Scott 2011	Inappropriate study design
Seto 2012	Intervention does not use an ATCS
Shah 2014	Intervention does not use an ATCS
Siddiqui 2011	Intervention does not use an ATCS
Silveira 2011	Intervention does not use an ATCS
Simon 2000	Intervention does not use an ATCS
Simon 2004	Intervention does not use an ATCS
Simon 2006	Intervention does not use an ATCS
Simpson 2011a	Inappropriate study design
Simpson 2011b	Intervention does not use an ATCS
Skolarus 2012	No preventive healthcare or management of long-term condition
Soran 2008	Intervention does not use an ATCS
Statland 2011	Inappropriate study design
Stevens 2008	Intervention does not use an ATCS
Stiles-Shields 2014	Intervention does not use an ATCS
Stockwell 2012	Intervention does not use an ATCS

Automated telephone communication systems for preventive healthcare and management of long-term conditions (Review) 354

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Tourangeau 2002	Inappropriate study design
Tucker 2013	Inappropriate study design
VanWormer 2009	Intervention does not use an ATCS
Veroff 2013	No preventive healthcare or management of long-term condition
Vivier 2000a	Intervention does not use an ATCS
Vivier 2000b	Intervention does not use an ATCS
Wade 2010	Inappropriate study design
Wu 2014a	Intervention does not use an ATCS
Wu 2014b	Intervention does not use an ATCS
Yoon 2008	Intervention does not use an ATCS
Zhu 2012	Intervention does not use an ATCS

ATCS: automated telephone communication system.

Characteristics of ongoing studies *[ordered by study ID]*

Almeida 2014

Trial name or title	diaBEAT-it!
Methods	**Aims**: to determine the reach of each active intervention, the effectiveness of the strategies in supporting patients to lose and maintain a 5% weight loss, and the cost-effectiveness of the interventions in achieving standard weight loss **Study design**: RCT; **recruitment**: primary care (mail and telephone) **Study duration**: ongoing; **study type**: management; **subtype**: diabetes
Participants	**Inclusion criteria**: age > 18; BMI > 25; and indicates high risk for developing diabetes, based on the diabetes risk test calculator **Sample size**: 360; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: small group intervention + 12 months of interactive voice response telephone follow-up (SG-IVR) **Arm b**: DVD version of the small group intervention with the same IVR follow-up (DVD-IVR) **Arm c**: standard care
Outcomes	Weight loss; reach; cost; physical activity; dietary intake

Starting date	2014
Contact information	falmeida@vt.edu
Notes	Clinicaltrials.gov identifier: NCT02162901

Ashmore 2013

Trial name or title	COPD-SMART
Methods	**Aims**: to determine if a self-management lifestyle physical activity intervention would improve physical functioning and dyspnoea **Study design**: RCT; **recruitment**: primary care (mail and telephone) **Study duration**: ongoing **study type**: management; **subtype**: chronic obstructive pulmonary disease
Participants	**Inclusion criteria**: age $\geq$ 45 years; physician diagnosis of chronic obstructive pulmonary disease; forced expiratory volume in 1 second (FEV_1)/forced vital capacity (FVC) ratio < 70% and FEV_1 < 70%; modified Medical Research Council dyspnoea score $\geq$ 2 **Sample size**: 305; **mean age**: 69; **sex**: women - 50%, men - 50%; **ethnicity**: white - 92%, black - 6%, Hispanic - 1%, other - 1% **Country**: USA
Interventions	**Intervention group** received self-management needs assessment; chronic obstructive pulmonary disease self-management education (Weeks 1-6); physical activity self-management (weeks 7-36) - the program is delivered using a structured workbook supported by one-on-one telephone counselling every other week by the health coach with computer assisted telephone calls on alternating weeks **Usual care** continued regular follow-up with their physician and to call the health coach using a toll-free number if they have any questions. Study-related contact occurs through monthly automated telephone calls, which collect health care utilisation data, and follow-up visits for data collection at 6, 12, and 18 months
Outcomes	Chronic Respiratory Questionnaire (CRQ) dyspnoea domain and 6-minute walk distance; other CRQ domains (fatigue, emotion, and mastery); Quality of Life (SF-12); Health care utilisation; Process outcomes
Starting date	2010
Contact information	david.coultas@va.gov
Notes	Clinicaltrials.gov identifier: NCT1108991

Baker 2013

Trial name or title	Boston Osteoarthritis Strengthening telephone linked-communication (BOOST TLC)
Methods	**Aims**: to empower and motivate people with knee OA to adhere to strengthening exercise after participating in a class **Study design**: RCT; **Recruitment**: community (*) **Study duration**: ongoing **Study type**: management; **Sub - type**: osteoarthritis

Participants	**Inclusion criteria**: subjects with painful knee osteoarthritis (OA) **Sample size**: 100; **Mean age**: * **sex**: * **Ethnicity**: * **Country**: USA
Interventions	**Arm a**: TLC is an automated, interactive conversation system that speaks with a recorded human voice. During the conversation the system asks questions, comments on the users' responses and educates and counsels them. TLC stores the users' answers in a database used to direct current and future TLC conversations. The system is run by a scheduling protocol with the ability to receive and make calls **Arm b**: the control group receives an automated message once per month, reminding them to strength train and record their progress in their log
Outcomes	Pain and physical function; timed physical function tasks; isokinetic muscle strength
Starting date	2013
Contact information	bsenkbeil@rheumatology.org
Notes	-

Droste 2013

Trial name or title	ICT-supported cardiovascular disease prevention through phone-based automated lifestyle coaching
Methods	**Aims**: to support cardiovascular disease patients in performing appropriate behaviour changes in order to minimise their individual risk factors **Study design**: RCT; **recruitment**: * **Study duration**: ongoing **study type**: prevention; subtype: cardiovascular disease
Participants	**Inclusion criteria**: already suffered a stroke or transient ischaemic attack (TIA) or $\geq$ 2 risk factors for stroke: high blood pressure, overweight; low physical activity; smoking; unhealthy diet **Sample size**: 94; **mean age**: * **sex**: * **ethnicity**: * **Country**: Luxemburg
Interventions	**Arm a**: computer-based lifestyle coaching system via IVR **Arm b**: no details of **control group**
Outcomes	Change in systolic blood pressure; serum high-density lipoproteins, low-density lipoproteins and triglycerides levels; glycated haemoglobin; glycaemia; BMI; acceptance; efficacy
Starting date	January 2013
Contact information	Department of Neurology, Centre Hospitalier de Luxembourg, Luxembourg
Notes	ClinicalTrials.gov identifier: NCT02444715

Emmons 2008

Trial name or title	A sustainable approach to increasing cancer screening (CATCH)
Methods	**Aims**: to compare the efficacy of two intervention arms intended to increase breast, cervical, and colon cancer screening rates among patients served by community health centres **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: prevention; subtype: screening
Participants	**Inclusion criteria**: all eligible patients, using centre guidelines, in need of: breast, cervical or colorectal cancer screenings **Sample size**: 13,675; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: consistent, but spaced-out calls generated by an IVR system reminding them of breast, cervical and colon cancer screenings needed, as applicable **Arm b**: IVR calls followed up by prevention care coordinator calls for those who do not respond to IVR
Outcomes	Change in population level cancer screening level at the health clinics involved
Starting date	September 2008
Contact information	Karen Emmons, Harvard School of Public Health
Notes	ClinicalTrials.gov identifier: NCT01395459

Estabrooks 2011

Trial name or title	CardiACTION!
Methods	**Aims**: to assess whether physical activity behaviour change is more likely when the participants' social-cognitive beliefs are intervened upon (individual intervention), when access is provided to environmental resources for physical activity (environmental intervention), or when both social-cognitive beliefs and access to environmental physical activity resources are manipulated (combination intervention including individual and environmental intervention components) **Study design**: randomised 2 × 2 factorial trial; **recruitment**: primary care (health professional referral) **Study duration**: ongoing; **study type**: prevention; **subtype**: physical activity
Participants	**Inclusion criteria**: patients who did not report meeting the recommended guidelines for physical activity (i. e. < 150 min of moderate physical activity per week), spoke English, did not currently have a fitness facility membership, and had a telephone **Sample size**: *; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: interactive computer session **Arm b**: automated telephone counselling. Over 6 months participants received frequent contacts delivered via IVR automated telephone calls and mailings, each providing intervention-specific information to encourage and facilitate physical activity or healthful eating behaviour change **Arm c**: tailored mailings **Arm d**: combination intervention

Outcomes	Changes in physical activity levels
Starting date	-
Contact information	estabrkp@vt.edu
Notes	-

Fellows 2012

Trial name or title	Health and economic effects from linking bedside and outpatient tobacco cessation services for hospitalised smokers in two large hospitals: study protocol for a RCT
Methods	**Aims**: the study assesses the effectiveness and cost-effectiveness of linking a practical inpatient assisted referral to outpatient cessation services plus interactive voice recognition (AR + IVR) follow-up calls, compared to usual care inpatient counselling (UC) **Study design**: RCT; **recruitment**: secondary care (*) **Study duration**: ongoing; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: aged ≥ 18 years who smoked ≥ 1 cigarettes in the past 30 days, willing to remain abstinent postdischarge, have a working phone, live within 50 miles of the hospital, speak English, and have no health-related barriers to participation **Sample size**: 900; **mean age**: *; **sex**: men (KPNW - 51.7%, OHSU - 51.7%); women (KPNW - 48.3%, OHSU - 48.3%); **Ethnicity**: KPNW: white - 79.4%, Hispanics - 2.2%, black - 4.1%; OHSU: white - 89. 0%, Hispanics - 3.5%, Black - 5.3% **Country**: USA
Interventions	**Participants in the AR + IVR arm** will receive a brief inpatient cessation consult plus a referral to available outpatient cessation programs and medications, and 4 IVR follow-up calls over 7 weeks postdischarge **Control group** will receive usual care.
Outcomes	Self-reported 3-day smoking abstinence at 6 months postrandomisation for outpatient cessation services plus interactive voice recognition (AR + IVR) participants compared to usual care
Starting date	-
Contact information	-
Notes	ClinicalTrials.gov identifier: NCT01236079

Forster 2015

Trial name or title	Information systems-enabled outreach for preventing adverse drug events (ISTOP-ADE)
Methods	**Aims**: to determine whether the ISTOP-ADE system, compared to routine care, will reduce: the probability of discontinuing the use of prognosis-altering medications; the probability of a patient experiencing a severe ADE; the proportion of patients experiencing ADEs, preventable ADEs and ameliorable ADEs; and health services utilisation **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**: ongoing; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: French- and English-speaking adult patients (age >18) who receive a high-risk incident prescription, use Régie de l'assurance maladie du Québec insurance to pay for medications and are followed by a physician who has consented to be in the Medical Office of the 21st Century research network **Sample size**: 2200; **mean age**: * **sex**: * **ethnicity**: * **Country**: Canada
Interventions	**Arm a**: IVR system paired with pharmacist support **Arm b**: routine care
Outcomes	Medication persistence; healthcare utilisation
Starting date	Date registered: 10 January 2014
Contact information	aforster@ohri.ca
Notes	ClinicalTrials.gov identifier: NCT02059044

Glasgow 2007

Trial name or title	Linking self-management and primary care for diabetes 2 (LB2)
Methods	**Aims**: to evaluate the impact of 2 different interactive, multimedia self-management programs, relative to 'enhanced' usual care **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: diabetes
Participants	**Inclusion criteria**: being 25-75 years of age, live independently, have a telephone, are able to read in either English or Spanish, able to access the Internet at least twice per week are capable of providing informed consent, have been diagnosed with type 2 diabetes for at least 1 year are overweight (BMI ≥ 25), and have at least one additional UKPDS equation risk factor (i.e. high lipids, hypertension, glycated haemoglobin, or smoking) **Sample size**: 463; **mean age**: 60 years; **sex**: men - 52%; women - 48%;**ethnicity**: Latino - 23% **Country**: USA
Interventions	**Arm a**: computer-assisted self-management plus social support. An interactive, automated self-management (ASM) programme that uses web and interactive voice recognition (IVR) media combined with enhanced support in the form of group Diabetes Care Management visits and live follow-up phone calls from Diabetes Care Managers **Arm b**: computer-assisted self-management (CASM). An interactive ASM programme that uses web and

	interactive voice recognition (IVR) media **Arm c**: usual care
Outcomes	Improvement in health behaviours (e.g. dietary patterns, physical activity, medication taking); and biologic outcomes (glycated haemoglobin, lipid ratio, blood pressure, and smoking status)
Starting date	January 2007
Contact information	Russell E Glasgow, PhD, Kaiser Permanente
Notes	ClinicalTrials.gov identifier: NCT00987285

Heapy 2011

Trial name or title	Interactive voice response (IVR)-based treatment for chronic low back pain
Methods	**Aims**: the proposed study will test how well an innovative IVR method can be used for delivering treatment for chronic low back pain **Study design**: RCT; **recruitment**: secondary care **Study duration**: ongoing; **study type**: management; **subtype**: pain
Participants	**Inclusion criteria**: presence of at least a moderate level of pain (i.e. pain scores of ≥ 4) and presence of pain for a period of ≥ 3 months; ability to participate safely in the walking portion of the intervention as evidenced by ability to walk at least one block; availability of a touch-tone telephone and computer with Internet access in the participant's residence; veteran receiving care at VA Connecticut Healthcare System **Sample size**: 230; **mean age**: 58.6 years sex: men - 83%; women - 17%; **ethnicity**: white - 56.5% **Country**: USA
Interventions	**Arm a**: interactive CBT. IVR treatment consisted of a patient workbook supplemented by 10 weeks of daily IVR calls that provided pre-recorded didactic information and weekly, pre-recorded personalised therapist feedback. It also included daily IVR calls to collect pain-related symptoms, adherence to pain coping skill practice and pedometer-measured step counts **Arm b**: CBT
Outcomes	Numeric Rating Scale of Pain Intensity
Starting date	May 2011
Contact information	-
Notes	ClinicalTrials.gov identifier: NCT01025752

Kulnawan 2011

Trial name or title	Diabetes telephone-linked care system for self-management support in Thailand
Methods	**Aims**: to develop the diabetes telephone-linked care system for self-management support and test acceptability in terms of system uses, satisfaction and perception of easiness, helpfulness, and emotion with the system **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: diabetes
Participants	**Inclusion criteria**: * **Sample size**: 112; **mean age**: * **sex**: * **ethnicity**: * **Country**: Thailand
Interventions	**The intervention group** received the automated telephone system with diabetes knowledge IVR subsystem as the telephone-linked care (TLC) No details of the control group reported
Outcomes	Glycemic control; patient satisfaction; system usability
Starting date	2011
Contact information	nittayawan@yahoo.com
Notes	-

McDaniel 2010

Trial name or title	Technology-enhanced quitline services to prevent smoking relapse (TEQ)
Methods	**Aims**: to see if automated telephone monitoring will enhance existing quit line services, such as Alere Well-being's Quit For Life programme, and help people quit smoking **Study design**: RCT; **recruitment**: * **Study duration**: ongoing **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: ≥ 18 years of age; enrolled in Free & Clear, Inc. services; self-reported abstinence for at least 24 h at the quit date call; able to read and speak English; personal access to a touch-tone telephone or cellular telephone **Sample size**: 1785; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: quit line service + 20 automated monitoring calls **Arm b**: quit line Service + 10 automated monitoring calls **Arm c**: usual care
Outcomes	Participant smoking status
Starting date	April 2010
Contact information	Anna M McDaniel, PhD RN FAAN, Indiana University

McDaniel 2010 (*Continued*)

Notes	ClinicalTrials.gov identifier: NCT00888992

Mooney 2010

Trial name or title	Hospice and end-of-life symptom monitoring & support using an automated system designed for family caregivers (SCP)
Methods	**Aims**: to test an automated monitoring and coaching system for family caregivers during home hospice **Study design**: RCT; **recruitment**: secondary care (*) **Study duration**: ongoing **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria** for patient/caregiver dyad: both patient and caregiver are adults aged ≥ 18 years; patient has a limited life expectancy and has histological diagnosis of cancer; caregiver is caring for a family member with a limited life expectancy and admitted to one of the participating home care hospice or palliative care programmes; caregiver is English-speaking and writing; caregiver has access to a telephone on a daily basis; caregiver is cognitively and physically able to use the phone unassisted and complete questionnaire; patient is assigned to a nurse case manager who has consented to participate in the research project; caregiver and patient intend to reside in the local area until the time of the patient's death **Sample size**: 450; **mean age**: 73 years; sex: men - 52 %; women - 48 %; **ethnicity**: white/Caucasian - 95% **Country**: USA
Interventions	**Arm a**: intervention group will receive a computer-based telecommunication system to monitor symptoms as perceived and reported by the family caregiver; tailored care management messages that SCP provides directly to the caregivers to promote care management based on the individualised patient symptom profile and caregiver distress; and an automated alerting function that notifies the hospice nurse of unrelieved symptoms that have exceeded a pre-set threshold **Arm b**: control group will receive usual care.
Outcomes	Family caregiver's assessment of dying patient's symptom severity level at end-of-life; caregiver's report their assessment of the severity of patient's symptoms daily
Starting date	May 2010
Contact information	Kathi.Mooney@nurs.utah.edu
Notes	ClinicalTrials.gov identifier: NCT02112461

Mori 2009

Trial name or title	Telerehabilitation intervention to promote exercise for diabetes
Methods	**Aims**: to develop an innovative strategy to address the problems of obesity and diabetes by promoting exercise adoption **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: prevention; **subtype**: physical activity

Participants	**Inclusion criteria**: clinical diagnosis of type 2 diabetes mellitus; receive a medical clearance from physician; be sedentary; be interested in exercising; have a BMI > 25 kg/m^2; have glycated haemoglobin of 7%-10%; be on medication for diabetes **Sample size**: 89; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: Telephone-Linked Care - Promoting Exercise for Diabetes (TLC-PED), a method that uses IVR and speech recognition technologies, will be developed to provide individualised and personalised motivational messages using automated telephone calls for veterans with type 2 diabetes who participate in a home-based walking programme **Arm b**: usual care
Outcomes	7-day physical activity recall; a self-report measure of minutes of physical activity over the previous 7 days
Starting date	January 2009
Contact information	Deanna L Mori, PhD, VA Medical Center, Jamaica Plain Campus
Notes	ClinicalTrials.gov identifier: NCT00334113

NCT00505024

Trial name or title	Interactive voice response system (IVRS) for managing symptoms of patients following thoracic surgery
Methods	**Aims**: to study the effectiveness of the IVR system (IVRS), which is designed to send a report to a patient's doctor about severe symptoms they are experiencing **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria**: patients scheduled for thoracic surgery for non-small cell lung cancer, esophageal cancer and lung metastasis; aged ≥ 18, of any sex, who were English-speaking and residing in the United States **Sample size**: 100; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: IVR system + symptoms report (twice weekly) **Arm b**: IVR system only
Outcomes	NA
Starting date	2006
Contact information	Xin Shelley Wang, MD; Anderson Cancer Center
Notes	Clinicaltrials.gov: NCT00505024

NCT00625638

Trial name or title	Interactive voice response system in advanced cancer patients
Methods	**Aims**: to determine whether the IVR system, supplemented by nursing telephone intervention (NTI), results in better symptom management and quality of life than standard care for individuals with advanced cancer as evidenced by reduced scores on symptom measures **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria**: individuals with advanced cancer (incurable disease) who are seen in the supportive care centre at MD Anderson Cancer Center, who have a pain score of ≥ 4 or higher on the average pain scale item of the brief pain inventory for ≥ 2 weeks and at least 1 other symptom on the ESAS (fatigue, nausea, depression, anxiety, drowsiness, shortness of breath, appetite, sleep), who are able to identify a primary caregiver who also agrees to participate in the study, who have no clinical evidence of cognitive failure in the opinion of the referring MD. Caregivers must be able to understand the instructions for the study, be ≥ 18 years of age, have access and utilise a touch-tone telephone, be willing to engage in a telephone follow-up with the IVR system and nurses every Monday, Wednesday and Friday, be willing to follow up by phone or in person on day 8 (+/- 3 days) and return for a follow-up visit on day 15 (+/-5 days), be willing and able to provide written informed consent; be a partner, parent, sibling, or child of the individual with advanced cancer; reside with the individual with advanced cancer and be responsible for most of the individual with advanced cancer's care **Sample size**: 136; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: IVR system phone calls made once daily, each taking about 3-5 min to complete **Arm b**: standard care
Outcomes	Better symptom management and improved quality of life for participants
Starting date	January 2008
Contact information	Sriram Yennurajalingam, MD, MD Anderson Cancer Center
Notes	ClinicalTrials.gov identifier: NCT00625638

NCT00876330

Trial name or title	Improving antihypertensive and lipid-lowering therapy (CERT2)
Methods	**Aims**: to evaluate the impact of electronic health record clinical decision support and automated telephone outreach on antihypertensive and lipid-lowering therapy in ambulatory care **Study design**: RCT; **recruitment**:* **Study duration**: ongoing; **study type**: management; subtype: cardiovascular disease
Participants	**Inclusion criteria**: Medical doctors, nurse practitioners, physician assistants, or doctors of osteopathic medicine practicing in primary care or medical subspecialties and using eClinical Works EHR .Patients of eligible physicians who have hypertension or hyperlipidaemia **Sample size**: 6000; **mean age**: * **sex**: * **ethnicity**: * **Country**:USA

Interventions	**Arm a**: hypertension and hyperlipidemia intervention with automated telephone outreach **Arm b**: hypertension and hyperlipidemia intervention using clinical decision support
Outcomes	The main outcome measure will be the proportion of participants at treatment goal
Starting date	May 2009
Contact information	Steven Simon, VA Boston Healthcare System
Notes	ClinicalTrials.gov identifier: NCT00876330

NCT01079533

Trial name or title	Initiation of colon cancer screening in veterans or 'Start Screening Now' (SSN)
Methods	**Aims**: to increase first time colorectal cancer screening colorectal cancer among veterans aged ≥ 50 **Study design**: factorial RCT; **recruitment**: * **Study duration**: ongoing; **study type**: prevention; **subtype**: screening
Participants	**Inclusion criteria**: veterans aged 50-64. **Sample size**: 1504; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: in step 1, investigators will evaluate a theory-based minimal cue delivered by a letter, telephone call, or automated telephone call. People who do not complete colorectal cancer screening in step 1 will be randomised to step 2 using principles of motivational interviewing. Step 2 also will determine whether an automated approach, telephone-linked communication (TLC), is as effective as a telephone counsellor in promoting initiation of colorectal cancer screening. Steps 1 and 2 together will address the important issue of the 'dose' needed to encourage completion of colorectal cancer screening **Arm b**: a survey-only control arm will be compared to the experimental arm to determine whether the 3 different delivery channels are equally efficacious and cost-effective
Outcomes	Colorectal cancer screening
Starting date	July 2008
Contact information	Sally Vernon, the University of Texas Health Science Center, Houston
Notes	ClinicalTrials.gov identifier: NCT01079533

NCT01120704

Trial name or title	Evaluation of treatments to improve smoking cessation medication adherence
Methods	**Aims**: to identify treatments that improve the use of cessation medications and to determine whether an increase in medication use results in increased cessation success **Study design**: factorial RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: ≥ 18 years of age or older; report smoking ≥ 5 cigarettes/day for the previous 6 months; able to read and write English; agree to attend visits, to respond to coaching calls, and to respond to IVR phone prompts; plans to remain in the intervention catchment area for at least 12 months; currently interested in quitting smoking (defined as would like to try to quit in the next 30 days) **Sample size**: 544; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: automated adherence prompting phone calls. Participants in this condition will receive fully automated prompts with messages designed to encourage participants to take their medication. Adherence prompting calls will occur twice in the first week of the quit attempt, and then once a week in weeks 2, 3, 4, 5, and 7. Those in the 26-Week medication condition who are assigned to the active adherence prompting calls intervention, will receive one prompting call a week during Weeks 11, 15, 19 and 23 **Arm b**: electronic medication monitoring device (the helping hand) + feedback **Arm c**: cognitive medication adherence counselling (CAM) **Arm d**: intensive maintenance counselling **Arm e**: long-term combination nicotine replacement therapy (patch + gum) **Arm f**: short-term combination nicotine replacement therapy (patch + gum)
Outcomes	Latency to relapse
Starting date	June 2010
Contact information	Michael C Fiore, MD, MPH, MBA, University of Wisconsin School of Medicine and Public Health, Center for Tobacco Research and Intervention
Notes	ClinicalTrials.gov identifier: NCT01120704

NCT01125371

Trial name or title	Computerized brief alcohol intervention (BI) for binge drinking HIV at-risk and infected women
Methods	**Aims**: to examine two novel brief alcohol intervention delivery strategies specifically tailored to be culturally/ socially relevant to this minority population **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: alcohol use
Participants	**Inclusion criteria**: 18 years of age or older; HIV infected or HIV negative and attending the Baltimore City Health Department sexually transmitted infection clinic for STI-related services; consumes an average of 8 or more drinks per week OR has had two binge drinking episodes (4 drinks/occasion) in the last 3 months; sexually active; cognitively able to understand proposed research design (10 min screening, followed by random assignment to one of three study groups (if individual fulfills criteria for RCT enrollment); able

	to speak and understand English; able and willing to receive text messages **Sample size**: 450; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: computerised brief alcohol intervention + IVR booster calls: clinic-based computerised brief alcohol intervention (delivered once) followed by 3 booster phone calls using interactive voice response technology + text messages **Arm b**: computerised brief alcohol intervention: clinic-based computer-delivered brief alcohol intervention delivered one time **Arm c**: attention control
Outcomes	Reduction in alcohol use
Starting date	Geetanjali Chander, MD
Contact information	Geetanjali Chander, MD, Johns Hopkins University
Notes	ClinicalTrials.gov identifier: NCT01125371

NCT01131143

Trial name or title	Trial of provider-to-patient interactive voice response (IVR) calls to improve weight management in community health centers (CHCs)
Methods	**Aims**: to test the effect of provider to patient interactive voice response (IVR) calls in local Community Health Centers within a weight management program **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: prevention; **subtype**: weight management
Participants	**Inclusion criteria**: adult patients who have screened positive for overweight or obesity **Sample size**: 1228; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: a phone call with the pre-recorded doctor's voice will be made to their patients who have been pre-screened for obesity before the participant's appointments, prompting the participants to ask about physical activity, nutrition, and weight loss **Arm b**: a phone call with a pre-recorded neutral voice will be made to the doctor's patients who have been prescreened for obesity before their patient's appointments. The call will prompt them to ask their doctor about physical activity, nutrition, and weight loss
Outcomes	Weight loss
Starting date	June 2009
Contact information	Daniel O Clark, PhD, Indiana School of Medicine
Notes	ClinicalTrials.gov identifier: NCT01131143

NCT01188135

Trial name or title	Antidepressant adherence via telephonic interactive voice recognition (IVR)
Methods	**Aims**: to carry out a trial of a low-cost, IT-enabled antidepressants adherence program, specifically a direct-to-patient, automated telephone interactive voice recognition (IVR) intervention to boost patient antidepressants persistence **Study design**: RCT; **recruitment**: secondary care (*) **Study duration**: ongoing; **study type**: management; **subtype**: mental health
Participants	**Inclusion criteria**: Kaiser Permanente NW Region health plan members aged 21-75 and be members for at least 6 months prior to the initial antidepressive medications dispense; with an EMR chart diagnosis or presenting complaint of a unipolar mood diagnosis, anxiety disorder, or any subclinical or 'not otherwise categorised' (NOC) variant of these **Sample size**: 6000; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: no contact control arm **Arm b**: usual care (UC) control condition **Arm c**: UC plus the IVR automated telephone programme **Arm d**: UC plus the IVR automated telephone programme plus receipt of psycho-education materials about antidepression medication use
Outcomes	Medication adherence (based on prescription refill data); cost-effectiveness
Starting date	August 23, 2010
Contact information	Clarke, Gregory; Kaiser Foundation Research Institute, Oakland, CA, United States
Notes	ClinicalTrials.gov identifier: NCT01188135

NCT01199666

Trial name or title	Text message reminder-recalls for early childhood vaccination
Methods	**Aims**: to demonstrate the effectiveness of tailored text message appointment and immunisation reminders linked to a well-established and functional immunisation registry to increase coverage rates and timeliness of the sentinel vaccines of measles, mumps and rubella and hepatitis A **Study design**: RCT; **recruitment**:* **Study duration**: ongoing; **study type**: prevention; **subtype**: immunisations
Participants	**Inclusion criteria**: parents of child aged 9-25 months; child with ≥ 1 visit to one of the participating clinical sites in the previous 12 months; parental cell phone number recorded in the registration system **Sample size**: 2586; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: automated phone call appointment reminder hep A: recall letter, automated phone call appointment reminder **Arm b**: text message reminders

Outcomes	Immunisation uptake (receipt of measles, mumps and rubella)
Starting date	June 2011
Contact information	Melissa Stockwell, MD, MPH, Columbia University
Notes	ClinicalTrials.gov identifier: NCT01199666

NCT01229722

Trial name or title	ARemind: a personalized system to remind for adherence
Methods	**Aims**: to continue and complete development of a cellular phone-based system that assists patients with their medication adherence **Study design**: RCT; **recruitment**: * **Study duration**: ongoing **study type**: management; **subtype**: adherence to medications/laboratory tests
Participants	**Inclusion criteria**: stable ART (no change of ART for 3 months), $\geq$ 18 years of age self-report adherence < 85% **Sample size**: 70; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: aRemind will personalise reminder messages based on adherence levels and facilitate patient phone calls with social workers/adherence counsellors when appropriate. It will also consist of a text-messaging, IVR, or phone-based pill count remote adherence assessment module **Arm b**: beepers are handheld portable devices which can be attached to a belt. At regular intervals corresponding to the participant's preferred reminder time, they buzz for a few minutes or until the participant presses a button to stop the buzzing
Outcomes	Adherence to anti-retroviral therapy
Starting date	October 2011
Contact information	Vikram Sheel Kumar, Dimagi Inc.
Notes	ClinicalTrials.gov identifier: NCT01229722

NCT01260207

Trial name or title	Using IVR to maintain ACS patients on best practice guidelines (IVR-ACS BPG)
Methods	**Aims**: to determine whether IVR technology can be used to bring postdischarge care for acute coronary syndrome (ACS) closer to best practice guidelines (BPGs) **Study design**: RCT; **recruitment**:* **Study duration**: ongoing; **study type**: management; **subtype**: adherence to medications/laboratory tests

Participants	**Inclusion criteria**: patients discharged from London Health Science Centre with ACS (acute myocardial infarction, STEMI, NSTEMI or unstable angina); patients who have a land line telephone service at home; patients who speak English **Sample size**: *; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: participants in this arm will receive IVR follow-up telephone calls at 1, 3, 6, 9, and 12 months postdischarge consisting of predetermined questions related to medication management, smoking cessation, diet, exercise and education as recommended by the ACC/AHA BPG for ACS. Upon completion of the IVR follow-up, all participants will be called by a member of the clinical research staff and asked to complete a follow-up survey **Arm b**: usual care
Outcomes	Adherence with best practice guidelines
Starting date	January 2010
Contact information	Neville Suskin, Lawson Health Research Institute
Notes	ClinicalTrials.gov identifier: NCT01260207

NCT01484717

Trial name or title	Interactive voice response technology to mobilize contingency management for smoking cessation
Methods	**Aims**: to examine the effectiveness of using interactive voice response technology (IVR) to implement contingency management in smokers who want to quit **Study design**: randomised controlled trial; **recruitment**: * **Study duration**: ongoing **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: regular cigarette smoker, age ≥ 18, mailing address and valid photo I.D, wants transdermal nicotine **Sample size**: 90; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: contingency management for abstinence from cigarettes. Telephone counselling and nicotine patch plus contingency management (contingency management for smoking abstinence + transdermal nicotine + telephone counselling) **Arm b**: transdermal nicotine+ telephone counselling
Outcomes	Longest duration of abstinence
Starting date	January 2012
Contact information	Sheila Alessi, PhD, University of Connecticut Health Center
Notes	ClinicalTrials.gov Identifier: NCT01484717

NCT01530958

Trial name or title	Kidney awareness registry and education (KARE)
Methods	**Aims**: to evaluate the feasibility and acceptability of two different interventions aimed at improving health outcomes among patients with chronic kidney disease, who are at high risk of chronic kidney disease progression **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: hypertension
Participants	**Inclusion criteria**: patients with chronic kidney disease (defined as estimated Glomerular Filtration Rate < 60 mL/min/1.73m^2 or proteinuria consistently over 3 months) who speak English, Spanish or Cantonese and have a primary care provider **Sample size**: 100; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: automated telephone self-management (ATSM) + health coach. Participants with chronic kidney disease will participate in an ATSM programme, which blends automated phone calls with live targeted call-backs from a health coach. Participants will receive bi-weekly automated calls for 52 weeks in their native language, consisting of pre-recorded queries pertaining to the disease management, preventive services, and lifestyle changes. Participants will interact with the system using a touch-tone keypad; out-of-range values or invalid responses will prompt a live call-back within 24-48 h by a health coach **Arm b**: usual care
Outcomes	Change in blood pressure
Starting date	April 2013
Contact information	Neil Powe, MD, University of California, San Francisco
Notes	ClinicalTrials.gov identifier: NCT01530958

NCT01609842

Trial name or title	Hybrid effectiveness-implementation study to improve clopidogrel adherence
Methods	**Aims**: to test the effectiveness of a successfully piloted, evidence-based, multifaceted intervention to improve patient adherence to clopidogrel following percutaneous coronary intervention (PCI) **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: adherence to medications/laboratory tests
Participants	**Inclusion criteria**: all patients undergoing PCI with either a bare-metal (BMS) or drug-eluting stent (DES) and are prescribed clopidogrel regardless of the intended treatment duration; other potential antiplatelet medications (thienopyridines) used following PCI to accommodate changes in practice (e.g. prasugrel, ticagrelor, or ticlopidine); all patients undergoing PCI and receiving clopidogrel at the randomised sites, regardless of gender, ethnicity or race. Based on data from the national Clinical Assessment, Reporting and Tracking (CART) system, we anticipate ~23% minorities (African American 16.8%, Hispanic 4.4%, Asian/American Indian 1.4%) and 3.1% women will be included in the study **Sample size**: 2500; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA

Interventions	**Arm a**: phone reminders and pharmacist. An alerted inpatient pharmacist or a designated study team member will bring the clopidogrel medication to the participant who has received a coronary stent. The participant will return home and receive IVR refill reminder calls **Arm b**: usual care
Outcomes	Medication adherence
Starting date	January 2014
Contact information	Michael Ho, MD PhD, VA Eastern Colorado Health Care System, Denver, CO
Notes	ClinicalTrials.gov identifier: NCT01609842

NCT01672385

Trial name or title	Improving transition outcomes through accessible health IT and caregiver support
Methods	**Aims**: to determine the extent to which the CarePartner model for supporting effective transitions from hospital to home improves outcomes of care, including lower readmission rates, emergency department visits, and improved patient functional status **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: cardiovascular disease
Participants	**Inclusion criteria**: being discharged from study site with any diagnoses that indicate a chronic condition with a high risk of short-term readmission, for example: stroke, heart failure, coronary artery disease, cardiac arrhythmias, COPD, peripheral vascular disease, deep venous thrombosis, pulmonary embolism, pneumonia, diabetes, urinary tract infection, cellulitis, gastroenteritis, fevers, and other infections; at least 50 years of age **Sample size**: 1692; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: telemonitoring plus self-management support; automated telephone calls that ask about their health and self-care along with tailored health-related feedback. The participant's CarePartner receives health update reports about the participant and how they can help via e-mail. Urgent health problems are reported to the participant's health care team via fax or e-mail **Arm b**: usual care
Outcomes	Short-term readmission rates, emergency department visits, and participants' functional status
Starting date	August 2012
Contact information	John Piette, University of Michigan
Notes	ClinicalTrials.gov identifier: NCT01672385

NCT01672398

Trial name or title	Trial of the CarePartner program for improving the quality of transition support
Methods	**Aims**: to determine the extent to which the CarePartner model for supporting effective transitions from hospital to home improves outcomes of care, including short-term readmission rates, emergency department visits, and patients' functional status **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: cardiovascular disease
Participants	**Inclusion criteria**: being discharged from study site with any diagnoses that indicate a chronic condition with a high risk of short-term readmission, for example: stroke, heart failure, coronary artery disease, cardiac arrhythmias, COPD, peripheral vascular disease, deep venous thrombosis, pulmonary embolism, pneumonia, diabetes, urinary tract infection, cellulitis, gastroenteritis, fevers, and other infections; at least 21 years of age **Sample size**: 844; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: telemonitoring plus self-management support; automated telephone calls that ask about their health and self-care along with tailored health-related feedback. The participant's CarePartner receives health update reports about the participant and how they can help via e-mail. Urgent health problems are reported to the participant's health care team via fax or e-mail **Arm b**: usual care
Outcomes	Short-term readmission rates, emergency department visits, and patients' functional status
Starting date	August 2012
Contact information	John Piette, University of Michigan
Notes	ClinicalTrials.gov identifier: NCT01672398

NCT01700894

Trial name or title	Women's Walking Program (WWP3)
Methods	**Aims**: to compare the effects at 24 weeks and 48 weeks of the WWP plus three telephone conditions on increasing adherence to lifestyle physical activity over baseline physical activity **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: prevention; **subtype**: physical activity
Participants	**Inclusion criteria**: Afican American women; sedentary, defined as no participation in regular planned (3 or more times a week) moderate (e.g. walking) or vigorous (e.g. jogging, speed walking) in the past 6 months; aged 40-65 years; able to commit to attending the study group visits and have a telephone; without disabilities that would prevent regular participation in physical activity such as walking as determined by the physical activity readiness questionnaire (PAR-Q) and baseline screening **Sample size**: 288; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: walking programme + motivational interviewing calls **Arm b**: walking programme + automated calls

	Arm c: walking programme
Outcomes	Adherence to physical activity prescription
Starting date	March 2010
Contact information	JoEllen Wilbur, PhD, APN, FAAN, Rush University Medical Center
Notes	ClinicalTrials.gov identifier: NCT01700894

NCT01701791

Trial name or title	Telemedicine for depression in primary care
Methods	**Aims**: to evaluate the feasibility and effectiveness of a care support programme developed in conjunction with the PC-based assessment for patients suffering from depression, as based on two main objectives: to support GP decisions with treatment algorithms and improve the quality of GP and mental health service collaboration; and to improve patient adherence and treatment adherence by using appropriate telecommunication tools and technologically advanced tools to conduct systematic routine assessment **Study design**: cluster randomised trial; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: adherence to medication/laboratory tests
Participants	**Inclusion criteria**: patients aged 18-65 years; PHQ-9 score of $\geq$ 14 at baseline; IDS-SR score of $\geq$ 26 at baseline; no filling of antidepressant medication; prescription for 270 prior days; illiteracy or the lack of working telephone to receive reminders **Sample size**: 400; **mean age**: * **sex**: * **ethnicity**: * **Country**: Italy
Interventions	**Arm a**: GPs will use a CDSS with treatment algorithms, supervision from a consultant psychiatrist, and dispatch to participants of reminders via mobile texting or automatic mobile (or landline) phone calls to improve adherence to the treatment prescribed **Arm b**: treatment as usual
Outcomes	Proportion of participants reaching remission
Starting date	January 2013
Contact information	Matteo Balestrieri, MD, IRCCS Centro San Giovanni di Dio Fatebenefratelli (gdegirolamo@fatebenefratelli.it)
Notes	ClinicalTrials.gov Identifier: NCT01701791

NCT01706380

Trial name or title	3M Study - Maria Malmö mobile telephone study
Methods	**Aims**: to examine the effect on treatment retention of a mobile telephone follow-up technique (interactive voice response), with or without personal feedback **Study design**: RCT; **recruitment**: outpatient clinics **Study duration**: ongoing; **study type**: management; subtype: substance use
Participants	**Inclusion criteria**: patient applying for substance use disorder treatment at outpatient facility Maria Malmö, Malmö, Sweden, who are < 25 years old and who provide written informed consent to participate in the study **Sample size**: 120; **mean age**: * **sex**: * **ethnicity**: * **Country**: Sweden
Interventions	**Arm a**: IVR with personal feedback; twice weekly for 3 months with respect to symptoms and substance use, in both arms. This group also receives a personalised and automated feedback describing whether the symptom status of the participant is better, worse or equal, compared to the preceding follow-up **Arm b**: IVR without personal feedback
Outcomes	Retention in substance use disorder treatment at 3 months
Starting date	October 8, 2012
Contact information	Anders C Håkansson, Region Skane
Notes	ClinicalTrials.gov identifier: NCT01706380

NCT01737073; NCT02508285

Trial name or title	Comprehensive opioid management in patient aligned care teams (COMPACT)
Methods	**Aims**: to test the effectiveness of COMPACT for improving pain-relevant outcomes including physical functioning and pain intensity; to determine whether opioid monitoring promotes guideline concordant care; and to examine key components of the intervention process to inform future implementation **Study design**: factorial RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: pain
Participants	**Inclusion criteria**: presence of at least moderate non-cancer, non-headache pain (i.e. pain scores of ≥ 4 as measured by the Numeric Rating Scale) for a period of ≥ 3 months; receipt of chronic opioid therapy as defined by ≥ 90 continuous days out of any 104 day period in the prior 12 months; ability to participate safely in the walking portion of the intervention as evidenced by ability to walk at least one block; availability of a landline or cellular telephone **Sample size**: 308; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: the IVR system will be used to deliver a 12-week course of opioid education and self-management support followed by 24 weeks of skill maintenance training. Self-management skills will include walking, stretching, pleasant activities, pacing, relaxation, cognitive restructuring, opioid education and sleep **Arm b**: monitoring will include: proactive, IVR-collected monthly information regarding opioid risk; and based on participants' IVR reports, automated output of electronic medical record documentation regarding

	participants' status for use by the primary care team
Outcomes	Pain-related physical functioning; 7-item interference sub-scale of the brief pain inventory; providers' concordance with chronic opioid treatment practice guidelines
Starting date	October 2015
Contact information	Alicia A Heapy, PhD, VA Connecticut Healthcare System
Notes	ClinicalTrials.gov identifier: NCT02508285; and NCT01737073

NCT01756001

Trial name or title	GlowCaps adherence randomized control trial
Methods	**Aims**: to study simple "behavioral economics" interventions that rely on consumer engagement to overcome cognitive and motivational barriers to medication adherence **Study design**: RCT; **recruitment**: * **Study duration**: ongoing **study type**: management; **subtype**: adherence to medications/laboratory tests
Participants	**Inclusion criteria**: patients diagnosed with chronic disease aged 16-64 **Sample size**: 600; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: incentives and reminders (email reminders, text message reminders, or daily phone call reminders) **Arm b**: reminders only **Arm c**: no intervention
Outcomes	Medication adherence (number of doses taken)
Starting date	February 2015
Contact information	Judd Kessler, University of Pennsylvania
Notes	ClinicalTrials.gov identifier: NCT01756001

NCT01778751

Trial name or title	Advanced comprehensive diabetes care for veterans with poorly-controlled diabetes (ACDC)
Methods	**Aims**: to determine whether home telehealth-based implementation of an evidence-based intervention targeting veterans with persistent poorly controlled diabetes (PPDM) can improve glycated haemoglobin, patient self-management, and comorbid depressive symptoms in this high-risk, high-cost population **Study design**: RCT; **recruitment**: * **Study duration**: ongoing **study type**: management; **subtype**: diabetes

Participants	**Inclusion criteria**: veterans with type 2 diabetes managed for > 1 year at an eligible site (Durham, Raleigh, Greenville, or Morehead City) will be eligible for enrolment. Veterans with PPDM (defined as the presence of at least 2 glycated haemoglobin values of > 9.0% during the past year with no readings of < 9.0% despite ongoing medical care) by reviewing electronic medical records and soliciting referrals from primary physicians **Sample size**: 50; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: health technology (HT) programme, provided with standard tele-monitoring equipment by HT nursing staff (current HT practice at DVAMC is use of the Health Buddy 3 device for participants with landline phones and the Cardiocom IVR system for participants with cell phones), and will receive the study intervention for 6 months. Veterans without depressive symptoms on baseline PHQ-9 assessment (PHQ-9 < 10) will not initially be entered into the depression symptom management component of the intervention, but will be monitored for new symptoms throughout the intervention **Arm b**: diabetes educational materials and management per their primary provider
Outcomes	Diabetes control; change in glycated haemoglobin from baseline to 6 months
Starting date	December 2013
Contact information	Matthew Crowley, MD, VA Office of Research and Development
Notes	ClinicalTrials.gov identifier: NCT01778751

NCT01794988

Trial name or title	Can therapy alter CNS processing of chronic pain? A longitudinal study
Methods	**Aims**: to investigate whether a psycho-therapeutic approach, group CBT + relapse prevention programme, Therapeutic Interactive Voice Response (TIVR), modifies the dysfunctional sensory, emotional, and cognitive neural circuitry associated with chronic pain **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: pain
Participants	**Inclusion criteria**: at least 12 months of muscular-skeletal, non-neuropathic pain **Sample size**: 120; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: 4 months of TIVR **Arm b**: group CBT **Arm c**: pain education **Arm d**: no intervention
Outcomes	Pain
Starting date	July 2010
Contact information	Magdalena Naylor, MD, PhD, University of Vermont

NCT01794988 (*Continued*)

Notes	ClinicalTrials.gov identifier: NCT01794988

NCT01852656

Trial name or title	Effectiveness of influenza vaccine reminder systems
Methods	**Aims**: to test the effectiveness and cost of different methods of reminders for annual influenza immunisation among adults with asthma and chronic obstructive pulmonary disease **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: prevention; **subtype**: immunisations
Participants	**Inclusion criteria**: aged 19-64 years; enrolled in Kaiser Permanente Colorado health plan; diagnosis of asthma and/or COPD **Sample size**: 12,255; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: IVR only reminder group **Arm b**: postcard and IVR reminder group **Arm c**: postcard only reminder group
Outcomes	Receipt of influenza vaccine
Starting date	September 2012
Contact information	Matthew F. Daley, MD, Kaiser Permanente
Notes	ClinicalTrials.gov identifier: NCT01852656

NCT01900561

Trial name or title	Optimizing veteran-centered prostate cancer survivorship care
Methods	**Aims**: to conduct an RCT to compare a personally tailored automated telephone symptom management intervention for improving symptoms and symptom self-management versus usual care **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria**: veteran patient at one of the three study sites, history of treatment for prostate cancer treated by surgery, radiation or androgen deprivation therapy between 1-5 years prior to identification **Sample size**: 650; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: the intervention will consist of two components: automated telephone monitoring of prostate cancer survivor symptoms and goals for symptom reduction, based on a patient empowerment approach, and personally tailored newsletters that incorporate elements of CBT to improve survivors' identification with the material, confidence/self-efficacy in symptom management, and to reduce common cognitive distortions

	related to successful implementation of behaviour change. Intervention-group participants will receive 4 automated assessment and self-management support calls over a 3-month period (at baseline, 1 month, 2 months, 3 months) **Arm b**: enhanced usual care
Outcomes	The Expanded Prostate Cancer Index
Starting date	April 2015
Contact information	Sarah T Hawley, PhD MPH BA, VA Office of Research and Development
Notes	ClinicalTrials.gov identifier: NCT01900561

NCT01940016

Trial name or title	Communication & peer support effects on physical activity in overweight postmenopausal women (BePHIT)
Methods	**Aims**: to design, develop and test the feasibility of implementing a physical activity intervention using tailored communication and IVR technology **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: prevention; **subtype**: weight management
Participants	**Inclusion criteria**: present a letter/documentation from a primary physician stating that they can participate in a physical activity programme that will require walking up to 10,000 steps per day, have a BMI of 25-40 kg/m^2 (inclusive), be postmenopausal, defined as no period for 12 months if over age 55, or no period for 12 months; also, women who have had their ovaries removed will be considered as postmenopausal, willing to participate in a wellness programme that lasts 12 weeks and involves walking for at least 30 min a day on most days, access to a cell phone during the 12-week intervention, functional knowledge of English **Sample size**: 71; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: 12-week physical activity intervention (walking programme) and receive health mail messages via IVR system and from a health coach. Participants in this arm of the study interacted with the IVR system and had the option of interacting with the health coach **Arm b**: 12-week physical activity intervention (walking programme) and receive health mail messages via IVR system. Participants in this arm of the study only interacted with the IVR system
Outcomes	Change in time taken to complete a one mile walk
Starting date	April 2007
Contact information	Electra Paskett, Ohio State University Comprehensive Cancer Center
Notes	ClinicalTrials.gov identifier: NCT01940016

NCT01953653

Trial name or title	Feasibility of using a structured daily diary
Methods	**Aims**: to implement a 66-day structured daily diary with 90 HIV-positive young men who have sex with men (MSM) to explore relationships among daily mood, stressful events, social support, substance use, sexual behavior, and adherence to ART among youth who are currently prescribed to take medication **Study design**: randomised cross-over trial; **recruitment**: * **Study duration**: ongoing; **study type**: prevention; **subtype**: HIV
Participants	**Inclusion criteria**: receives services at one of the selected Adolescent Medicine Trial Unit (AMTU) sites; HIV-1 infection as documented in the participant's medical record by at least one of the following criteria: reactive HIV screening test result with an antibody-based, FDA-licensed assay followed by a positive supplemental assay (e.g. HIV-1 Western Blot, HIV-1 indirect immunofluorescence); positive HIV-1 DNA polymerase chain reaction (PCR) assay; plasma HIV-1 quantitative RNA assay > 1000 copies/mL; or positive plasma HIV-1 RNA qualitative assay; aged 16-24 years, inclusive, at the time of screening; born biologically men and self-identifies as man at the time of screening; HIV-infected through sexual behavior; at least one self-reported sexual encounter with another man involving oral or anal sex in the past 12 months prior to screening; at least one self-reported episode of unprotected vaginal or anal intercourse within the past 90 days prior to screening and/or substance use, defined as at least 1 occasion in which $\geq$ 4 alcoholic beverages were consumed and/or $\geq$ 2 occasions of illicit drug use, in the past 90 days, as assessed by the assessment of substance use and sexual behavior questionnaire; has active cell phone service; is able to access his cell phone 7 days a week between 6:00 pm and 6:00 am the next morning; and is willing and able to use approximately 10 min of talk time and receive 2 text messages per day; consistent Internet access 7 days a week between 6:00 pm and 6:00 am the next morning; ability to understand, read, and speak English; ability to read at a fifth grade level, as assessed by the rapid estimate of adolescent literacy in medicine (REALM)-TEEN; and willingness to provide signed informed consent for study participation **Sample size**: 67; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: IVR system **Arm b**: interactive web response (IWR) system
Outcomes	Number of participants who complete the 66-day structured daily diary; participant responses to how diary can provide personalised feedback on triggers to risk behaviors
Starting date	February 2013
Contact information	Patrick Wilson, PhD, Columbia University
Notes	ClinicalTrials.gov identifier: NCT01953653

NCT01958359

Trial name or title	Screening and brief intervention via IVR for problematic use of alcohol: a randomized controlled trial
Methods	**Aims**: the study evaluates the efficacy of two interactive voice recognition (IVR) interventions, short IVR and therapeutic IVR **Study design**: RCT; **recruitment**: * **Study duration**: ongoing **Study type**: management; **Sub - type**: alcohol

Participants	**Inclusion criteria**: alcohol Use Disorders Identification Test (AUDIT) >7 for men or AUDIT >5 for women **Sample size**: 260; **mean age**: * **sex**: * **ethnicity**: * **Country**: Sweden
Interventions	**Arm a**: therapeutic IVR-based conversation offering a menu of exercises and vignettes **Arm b**: IVR-based alcohol diary with feedback **Arm c**: untreated control group
Outcomes	Change in total AUDIT score, as a summarised measure of alcohol use (including alcohol consumption and alcohol-related problems
Starting date	February 2011
Contact information	Anne H Berman, Karolinska Institutet
Notes	ClinicalTrials.gov Identifier: NCT01958359

NCT01973946

Trial name or title	Cancer symptom monitoring telephone system with nurse practitioner (NP) follow up
Methods	**Aims**: to test a daily telephone-based automated symptom monitoring and response system to track and further treat unrelieved symptoms for patients living at home during chemotherapy treatment as compared with usual care which consists of participants calling their oncology provider for symptom concerns **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: cancer
Participants	**Inclusion criteria**: adult (age ≥ 18); histological diagnosis of cancer; life expectancy of at least 3 months and cognitively able to participate; beginning a new course of chemotherapy that is planned for a minimum of 3 cycles; care is under the direction of one of the 8 designated provider teams; English-speaking; has access to a telephone on a daily basis and is able to use the phone unassisted as verified by the study staff during participant orientation **Sample size**: 358; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: participants call the automated monitoring system daily to report presence, severity, and distress on 11 symptoms. The system provided automated self-care coaching based on the symptoms reported and automatically generated alerts to the study NP if symptoms exceeded preset thresholds. 2 thresholds were set: a simple alert when severity or distress was ≥ 4 on a 10-point scale and trend alerts based on a pattern of moderate severity over several days. The alerts went into a case management site. The study NP logged into the system daily and responded to the alerts within 24 h by calling participants to further assess the symptoms and to intensify symptom treatment using evidence based guidelines **Arm b**: control group will receive usual care (via IVR).
Outcomes	Medical encounters telephone interview; symptom-related interference with daily activities; SF-36 functional status; work interference; work limitations questionnaire

Starting date	September 2007
Contact information	Kathi.Mooney@nurs.utah.edu
Notes	ClinicalTrials.gov identifier: NCT01973946

NCT02001129

Trial name or title	Improving follow-up adherence in a primary eye care setting
Methods	**Aims**: to examine the effectiveness of three different ways of helping patients attend their recommended eye care appointments **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: either; **subtype**: appointment reminders
Participants	**Inclusion criteria**: aged ≥ 18 years; primary eye care patients who were recommended for a 6-, 12-, or 24-month follow-up appointment in September 2013 to November 2013; access to a telephone **Sample size**: 1000; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: automated telephone call **Arm b**: personalised telephone call **Arm c**: usual care
Outcomes	Appointment adherence
Starting date	August 2013
Contact information	Julia Haller, Wills Eye
Notes	ClinicalTrials.gov identifier: NCT02001129

NCT02043184

Trial name or title	Improving adherence to oral cancer agents and self care of symptoms using an IVR
Methods	**Aims**: to test and compare 2 strategies for improving adherence to their oral cancer medication prescriptions to standard care **Study design**: factorial RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: adherence to medications/laboratory tests
Participants	**Inclusion criteria**: ≥ 21 years, newly prescribed one of the designated oral cancer medications for treatment of cancer, ECOG score of 0,1, or 2, or Karnofsky score of 50 or higher, patient of one of the participating National Cancer Institute comprehensive cancer centres, able to speak, read, and understand English, able and willing to receive phone calls **Sample size**: 274; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA

Interventions	**Arm a**: standard care for 12 weeks **Arm b**: standard care for 8 weeks + daily IVR for 4 weeks **Arm c**: daily IVR 8 weeks **Arm d**: daily IVR 4 weeks, every other day IVR 4 weeks
Outcomes	Medication adherence using pill count and self report
Starting date	March 2013
Contact information	Barbara Given, Michigan State University (Barb.Given@hc.msu.edu)
Notes	ClinicalTrials.gov identifier: NCT02043184

NCT02056002

Trial name or title	Peer-driven intervention for sleep apnea (PCORI)
Methods	**Aims**: to test whether participants in the peer-driven intervention with IVR (PDI-IVR) group will experience a greater participant satisfaction (measured by Likert scale and PACIC) and perception of care coordination (measured by CPCQ) than participants in the usual care (control) group **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: OSAS
Participants	**Inclusion criteria**: obstructive sleep apnea; 18-85 years of age; availabilityaof cell or other reliable phone line (for subjects) **Sample size**: 257; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: IVR. Once a week for the first month followed by 4 phone conversations over the subsequent 2-month period (8 scheduled telephone interactions) and as needed in the subsequent 3 months. There will be no more than 10 such 'as-needed' phone calls in the latter 3 months between participant and peer-buddy. Therefore, over the 6 months, there will not be in excess of 18 phone calls per subject assigned to peer-buddy. Each phone conversation will last a maximum of 30 min. The PDI-IVR system will be programmed to recognise the peer-buddy's phones (cell or home) and be programmed to link this with the participant's phones (cell or home) and thereby protect the privacy of both participants **Arm b**: usual care
Outcomes	Patient rating of sleep-specific services
Starting date	January 2014
Contact information	Sairam Parthasarathy, MD, University of Arizona
Notes	ClinicalTrials.gov identifier: NCT02056002

NCT02118454

Trial name or title	Antiretroviral adherence and quality-of-life support for HIV+ patients in India with twice-daily IVR calls with health and mental health messaging compared to weekly IVR survey only control condition: the mobile-messaging adherence and support for health study, India. (MASHIndia)
Methods	**Aims**: to test whether twice-daily IVR calls made at the estimated times of patients' antiretroviral (ART) medication dosing and 3 reminder calls for monthly clinic appointments, will result in improvements in ART adherence, appointment attendance, health indicators (CD4 cell counts), coping skills, social support, depressive symptoms, and other quality of life indicators, compared to a control group receiving one IVR assessment call each week, over 6 months **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: adherence to medications/laboratory tests
Participants	**Inclusion criteria**: age ≥ 18; HIV +; taking first-line ART 6 months or longer; missed taking any ART dose in the previous 6 months Able to speak and understand Bengali, Hindi, or English; willing to receive health-related IVR messages on mobile phones; able to provide informed consent. Phase 2A - client at Mamata Care and Treatment Center (MCTC) or member of Mamata Network of Positive Women (MNPW), or peer referral of MCTC client or MNPW member; received a CD4 count result in the prior 2 months. Phase 2B - patient at Calcutta School of Tropical Medicine ART Centre, or peer referral of a patient **Sample size**: 400; **mean age**: * **sex**: * **ethnicity**: * **Country**: India
Interventions	**Arm a**: daily IVR calls intervention: consisting of 2 automated voice calls ('intervention messages') each day for 6 months, + 1 IVR assessment call (consisting of 4 questions) every week for 6 months **Arm b**: weekly IVR survey only control condition: consisting of standard care, + 1 IVR assessment call (consisting of 4 questions) every week for 6 months
Outcomes	Change in antiretroviral medication adherence measured by AIDS Clinical Trials Group (ACTG) self-report measure
Starting date	April 2014
Contact information	NA
Notes	ClinicalTrials.gov identifier: NCT02118454

NCT02124980

Trial name or title	Automated recovery line for medication assisted treatment
Methods	**Aims**: to test the effectiveness of Recovery Line in substance abuse **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: addiction
Participants	**Inclusion criteria**: ≥ 18 years old; currently receiving methadone maintenance treatment; illicit drug use in the past 14 days or a positive urine screen for any tested illicit drug **Sample size**: 60; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA

Interventions	**Arm a**: Recovery Line plus usual care (RL + UC). Recovery Line is an automated computer-based IVR system that provides CBT-based modules. The RL + UC condition will include the customised therapeutic recommendations developed in Phase 1, and the contact reminders messages and time frame that maximised system use in Phase 2. Participants will receive an orientation, 24-hour access, encouragement to use the system from clinic staff reminder, and technical assistance line for system problems. Participants will receive 12 weeks of system access **Arm b**: usual care
Outcomes	Bi-weekly urine screens negative for illicit drugs; self-reported drug use; monthly days of self reported illicit drug abstinence
Starting date	October 2015
Contact information	Brent A. Moore, Yale University
Notes	ClinicalTrials.gov identifier: NCT02124980

NCT02204956

Trial name or title	Smoking cessation following psychiatric hospitalisation
Methods	**Aims**: to adapt an Extended Care (ExC) model to smokers with severe mental illness (SMI) engaged in a psychiatric hospitalisation and to conduct a randomised, pragmatic effectiveness trial designed to assess the benefit of this adapted ExC in real-world practice **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: ≥ 18 years of age, current smoker (i.e.≥ 5 cigarettes/day when not hospitalised) **Sample size**: 422; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: extended care. A 40-min, in-hospital motivational counselling session about smoking cessation, 8 IVR phone calls over 90 days, including the possibility of a warm transfer to a telephone tobacco quit line and prescriptions for combination (2 types of) nicotine replacement medications **Arm b**: brief education. A brief 5-10 min education session with a hospital staff member, during which they will be provided with: a brochure describing the services of their local tobacco quit line and the services provided, and a brochure describing FDA-approved smoking cessation medications, their usage and side effects
Outcomes	Biochemically verified smoking abstinence via saliva cotinine
Starting date	April 2015
Contact information	Nancy A Rigotti, MD Massachusetts General Hospital
Notes	ClinicalTrials.gov identifier: NCT02204956

Trial name or title	Diabetes prevention among post-partum women with history of gestational diabetes (Star-Mama)
Methods	**Aims**: to develop a patient-tailored telephone-base counselling intervention for young Latino women who are at high risk of diabetes **Study design**: RCT; **recruitment**: * **Study duration**: ongoing **study type**: management; **subtype**: weight management
Participants	**Inclusion criteria**: postpartum Latino women (English or Spanish speakers) with history of gestational diabetes; aged ≥ 18 **Sample size**: 180; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: 6 months weekly automated phone calls with queries and narratives about health habits. The participant's answers will be sent to a health coach who will follow up with the participant, and develop a plan with the participant to address her needs **Arm b**: educational resource support
Outcomes	Weight loss
Starting date	December 2014
Contact information	Margaret A Handley, MPH, PhD, University of California, San Francisco
Notes	ClinicalTrials.gov identifier: NCT02240420

Trial name or title	System Alignment for VaccinE Delivery (SAVED): improving rates of influenza and pneumococcal vaccination through patient outreach, improved medical record accuracy and targeted physician alerts
Methods	**Aims**: to improve the capture of vaccinations administered to Reliant Medical Group (RMG) patients in the community, hospitals and nursing facilities via system-level health information exchange (HIE) **Study design**: factorial RCT; **recruitment**: by invitation **Study duration**: ongoing; **study type**: prevention; **subtype**: immunisations
Participants	**Inclusion criteria**: RMG patients ≥ 18 years of age. Overdue for vaccination against influenza and/or not up-to-date on vaccination for pneumococcal vaccine per RMG EHR data. No documented allergy to the vaccination in question **Sample size**: 30,000; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: e-portal message with IVR call **Arm b**: e-portal message with no IVR call **Arm c**: no e-portal message with IVR call **Arm d**: no e-portal message with no IVR call (control, e-portal users) **Arm e**: IVR call **Arm f:** no IVR call (control, non e-portal users)

Outcomes	Percent of intervention participants with self-reported influenza vaccinations documented in electronic health record (EHR)
Starting date	October 10, 2014
Contact information	Sarah Cutrona, University of Massachusetts, Worcester
Notes	ClinicalTrials.gov identifier: NCT02266277

NCT02328326

Trial name or title	Caring Others Increasing EngageMent in PACT (CO-IMPACT)
Methods	**Aims**: to compare 2 methods of increasing engagement in care and success in diabetes management, among patients with diabetes with high-risk features, who also have family members involved in their care **Study design**: RCT; **recruitment:*** **Study duration**: ongoing; **study type**: management; subtype: diabetes
Participants	**Inclusion criteria**: provide signed and dated informed consent form; willing to comply with all study procedures and plan to be be available for the duration of the study; men or women, aged 30-70 years old; plan to get most diabetes care at Ann Arbor VA over the subsequent 12 months; able to use telephone to respond to bi-weekly automated IVR calls; be able to identify an adult family member or friend who is regularly involved in their health management or health care (involved with medications, managing sugars, coming to appointments, etc); have a diagnosis of diabetes and be at high-risk for diabetes complications, defined as: a diagnosis of diabetes based on encounter diagnoses from 1 inpatient or 2 outpatient encounters (ICD9 code of 250.xx, 357.2x, 362.xx, 366.41, 962.3 or E932.3) OR a diabetes medication (at least one > 3 month prescription from VA drug classes HS501 (insulin) or HS502, other than metformin), have an assigned VAAAHS primary care provider and at least 2 visits to VAAHS primary care in the previous 12 months, poor glycaemic control (last glycated haemoglobin > 9% or glycated haemoglobin > 8% among participants < 55 years old) OR poor blood pressure control (last blood pressure 160/100 or mean 6 month blood pressure > 150/90); active AAVA primary care patients - at least 2 visits in last 12 months (for patients) **Sample size**: 480; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: patient and supporter (dyad) receive one coaching session on action planning, communicating with providers, navigation skills and support skills; preparation by phone before patients primary care visits; after-visit summaries by mail; and biweekly automated phone calls to prompt action on new patient health concerns **Arm b**: patient and their health supporter (dyad) will receive PACT care for high-risk diabetes, which includes (at primary care team discretion): nurse care manager visits, diabetes education classes, chronic disease self-management groups, telehealth, clinical pharmacist visits
Outcomes	Patient activation; cardiac event 5-year risk score
Starting date	January 2016
Contact information	VA Ann Arbor Healthcare System, Ann Arbor, MI, Ann-Marie.Rosland@va.gov

Notes	ClinicalTrials.gov identifier: NCT02328326

NCT02360605

Trial name or title	Health literacy interventions to overcome disparities in colorectal cancer screening
Methods	**Aims**: to compare the effectiveness of 2 distinct follow-up strategies to promote colorectal cancer screening: a prevention coordinator (PC) approach vs an automated telephone reminder (ATR) system **Study design**: randomised controlled trial; **recruitment**: * **Study duration**: ongoing; **study type**: prevention; **subtype**: screening
Participants	**Inclusion criteria**: a patient of the identified clinics, age 50-75 (based on ACS guidelines) and can speak and understand English **Sample size**: 800; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: automated telephone reminder **Arm b**: prevention coordinator **Arm c**: health literacy appropriate education and demonstration
Outcomes	Colorectal cancer screening rate
Starting date	February 2015
Contact information	Connie L Arnold, PhD (carnol@lsuhsc.edu)
Notes	ClinicalTrials.gov Identifier: NCT02360605

NCT02382731

Trial name or title	Interventions to support long-term adherence and decrease cardiovascular events post-myocardial infarction (ISLAND)
Methods	**Aims**: to evaluate whether and in what format to sustain and/or scale-up post-MI educational reminder interventions **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: adherence to medications/laboratory tests
Participants	**Inclusion criteria**: patients aged 18 years and older having a coronary angiography following a myocardial infarction (ST-elevation myocardial infarction or non-ST-elevation myocardial infarction), with evidence of coronary artery disease (> 50% blockage of left main or > 70% blockage of either other main cardiac arteries); discharged from the catheterisation centre alive, either home or to a local (non-cardiac) hospital; and Ontario residents **Sample size**: 2571; **mean age**: * **sex**: * **ethnicity**: * **Country**: Canada

Interventions	**Arm a**: usual care + letters + automated calls (IVR phone calls to the participant delivered approximately 2 weeks after the letters, as well as personalised telephone follow-up by trained peer health workers for participants identified by the IVR system as non-adherent. The automated algorithm is designed to identify patients who are non-adherent and who may benefit from personalised educational phone call and/or system navigation support by the peer health worker. Peer health workers will not provide clinical advice **Arm b**: usual care + letters
Outcomes	Medication adherence
Starting date	September 2015
Contact information	Noah Ivers, Women's College Hospital
Notes	ClinicalTrials.gov identifier: NCT02382731

NCT02429297

Trial name or title	Developing accessible telehealth programs for diabetes and hypertension management in bolivia
Methods	**Aims**: to evaluate the feasibility and impact of an automated phone system in monitoring and improving self-care and health outcomes among patients with diabetes and/or hypertension in Bolivia, in addition to assessing the additional benefit of support from a family member or friend **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; **subtype**: diabetes/hypertension
Participants	**Inclusion criteria**: 21-80 years of age; diagnosis of hypertension, a systolic blood pressure > 140 mmHg, and/or diagnosis of diabetes; access to a functional cell phone; able to respond to automated telephone calls **Sample size**: 100; **mean age**: * **sex**: * **ethnicity**: * **Country**: Bolivia
Interventions	**Arm a**: experimental: participant only - health information technology/care manager (HITCM)-only participants enrolling without a CarePartner receive weekly HITCM automated assessment and self-care support calls with feedback to the clinical team **Arm b**: experimental: participant and CarePartner - HITCM-only participants enrolling with a CarePartner receive weekly HITCM automated assessment and self-care support calls with feedback to the clinical team **Arm c**: experimental: participant and CarePartner - HITCM + CP participants enrolling with a CarePartner receive weekly HITCM automated assessment and self-care support calls with feedback to the clinical team plus updates to their CarePartner via phone or email
Outcomes	Change from baseline on self-care behaviours and health at 16 weeks
Starting date	June 2014
Contact information	John Piette, University of Michigan
Notes	ClinicalTrials.gov identifier: NCT02429297

NCT02442089

Trial name or title	Impact of automated calls on pediatric patient attendance in Chile (Health Call)
Methods	**Aims**: evaluate whether a patient reminder system, Health Call, can decrease the overall failure to attend appointment rate as a percentage of overall appointments **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: either; **subtype**: appointment reminder
Participants	**Inclusion criteria**: guardian with a phone number (landline or mobile) who is able to receive and answer voice calls, is willing to take part in the study and complete the consent form, is sufficiently proficient in Spanish so as to complete the questionnaire, has a referral appointment at Hospital Luis Calvo Mackenna who is ≤ 18 years of age **Sample size**: 564; **mean age**: * **sex**: * **ethnicity**: * **Country**: Chile
Interventions	**Arm a**: Health Call is an automated interactive voice reminder system that can contact guardians of patients ahead of their child's appointment, asks then confirms a security question about the participant, then, if the call recipient passes the security screen, provides a reminder about upcoming appointment **Arm b**: no calls
Outcomes	'Do not attend' (DNA)
Starting date	December 2013
Contact information	William Weiss, DrPH, MA (bweiss@jhsph.edu), Johns Hopkins Bloomberg School of Public Health
Notes	Clinicaltrials.gov: NCT02442089

NCT02478359

Trial name or title	Walk On! Physical activity coaching
Methods	**Aims**: to determine the effectiveness of a 12-month physical activity coaching intervention (Walk On!) compared to standard care for 1650 COPD patients from a large integrated health care system **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; subtype: COPD
Participants	**Inclusion criteria**: patients with any COPD-related hospitalisation, emergency department visit or observational stay in the previous 12 months; COPD-related encounters are defined according to the Centers for Medicare and Medicaid Services (CMS) and National Quality Forum (NQF) criteria for the Hospital Readmission Reduction Program. The following principal discharge diagnoses of COPD (ICD-9 codes: 491. 21, 491.22, 491.8, 491.9, 492.8, 493.20, 493.21, 493.22, and 496) or respiratory failure (ICD-9 codes: 518. 81, 518.82, 518.84, 799.1) with a secondary diagnosis of COPD exacerbation (ICD-9 codes: 491.21, 491. 22, 493.21, 493.22) will be used; age > 40 years; on at least a bronchodilator or steroid inhaler prior to the encounter or if not on an inhaler, had a previous disease diagnosis; continuous health plan membership in the 12 months prior to the encounter **Sample size**: 1650; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA

Interventions	**Arm a**: the 12-month Walk On! intervention includes a baseline in-person assessment, collaborative monitoring of steps using 2 types of activity sensors, semi-automated step goal recommendations using an IVR system or web application, ongoing individualised reinforcement from a physical activity coach, and peer/family support **Arm b**: usual care
Outcomes	Composite: all-cause hospitalisations, emergency department (ED) visits, observational stays, and mortality
Starting date	June 2015
Contact information	Huong Q Nguyen, PhD, RN, Kaiser Permanente
Notes	ClinicalTrials.gov identifier: NCT02478359

Ratanawongsa 2012

Trial name or title	SelfManagement Automated and Real-Time telephonic support (SMARTSteps)
Methods	**Aims**: to investigate differences in 6-month changes in patient-centred outcomes including quality of life and functional status (SF-12 and number of days spent in bed due to illness), comparing participants exposed to ATSM with wait-list controls and comparing participants exposed to ATSM (SMARTSteps-ONLY) with ATSM augmented by medication adherence and intensification (SMARTSteps-PLUS) **Study design**: stepped wedge; **recruitment**: primary care (mail and telephone) **Study duration**: ongoing; **study type**: management; **subtype**: diabetes
Participants	**Inclusion criteria**: San Francisco Health Plan (SFHP) membership; ≥ 1 primary care clinic visit in the preceding 24 months at one of our designated clinics; age ≥ 18 years; a diagnosis of diabetes (type 1 or 2); English-, Cantonese-, or Spanish-speaking; access to a touch-tone phone; and plans to remain in the region during the evaluation period (12 months) **Sample size**: 362; **mean age**: 55 years; **sex**: women - 71%, men - 29%; **ethnicity**: Asian - 58.6%, black - 6.9%, white - 9.4%, Hispanic - 22.4% Native American/Eskimo - 0.3%, Hawaiian/Pacific Islander - 0.8%, other -1.4%, Unknown - 0.3% **Country**: USA
Interventions	**Arm a**: SMARTSteps-ONLY received the ATSM intervention within 2 weeks. Developed with extensive input from participants to be sensitive to literacy, language, and culture in the target populations, this ATSM system provided 27 weeks of 8-12 min weekly calls in English, Cantonese, or Spanish. Participants specified the weekday and time convenient for their schedules or called toll-free into the system if they missed their scheduled call. The content consisted of rotating sets of queries about self-care (such as diet, exercise, and medication adherence), psychosocial issues (such as depressive symptoms), and access to preventive services (such as eye care). Participants responded via touch-tone commands, and based on their answers, participants heard automated health education messages in the form of narratives **Arm b**: SMARTSteps-PLUS intervention to detect and intervene for participants whose medication treatment was sub-optimal **Arm c**: wait-list (controls) continued to receive usual care through their clinics, as well as all existing SFHP benefits (reminders and incentives for receipt of recommended health services, including laboratory testing, eye and foot examination, and influenza vaccination). At the end of the 6-month wait-list period, each participant

	"crossed-over" to begin SMARTSteps-ONLY or SMARTSteps-PLUS, depending on initial randomisation arm
Outcomes	Quality of life and functional status; diabetes self-efficacy and self-management behaviour; medication adherence in the preceding 7 days; participant perspectives on the structure of their care; glycated haemoglobin; blood pressure; low-density lipoproteins
Starting date	April 2009
Contact information	ratanawongsan@medsfgh.ucsf.edu
Notes	ClinicalTrials.gov identifier: NCT00683020

Reid 2015

Trial name or title	The Helping HAND 2
Methods	**Aims**: to test the hypothesis that a multi-component sustained care intervention is more effective than standard care in helping hospitalised cigarette smokers stop smoking after hospital discharge **Study design**: RCT; **recruitment**: secondary care (health professional referral) **Study duration**: ongoing; **study type**: management; **subtype**: smoking
Participants	**Inclusion criteria**: admission to a participating hospital; received tobacco cessation counselling for > 5 min in hospital; age ≥18 years; current daily smoker (defined as having smoked ≥ 1 cigarette/day in the past month when smoking as usual); plan to sustain or initiate a quit attempt immediately after hospital discharge **Sample size**: 1350; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: multi-component sustained care: the IVR calls at 2, 12, 28, 58, and 88 days after discharge. For each call, the IVR system makes up to 8 attempts to reach participants for each scheduled call, beginning on the scheduled call day and proceeding with 2 attempts per day for 4 days or until the call is completed; access to smoking cessation telephone counselling support; pharmacotherapy **Arm b**: standard care (control) group receive the same bedside counselling session in the hospital as the intervention group. The counsellor informs smokers about postdischarge counselling resources, provides specific advice to call the state telephone quit line, makes a specific recommendation to the hospital physician for postdischarge medication, and completes a consultation note in the participant's hospital record. No additional resources are provided to the participant after discharge from the hospital
Outcomes	Tobacco abstinence (biochemically validated); self-reported tobacco abstinence; duration of tobacco abstinence after discharge; proportion of participants who make a 24-h quit attempt after discharge
Starting date	December 2012
Contact information	zreid@partners.org
Notes	ClinicalTrials.gov identifier: NCT01714323

Ritchie 2012

Trial name or title	The E-Coach
Methods	**Aims**: to test the E-Coach intervention in congestive heart failure and COPD patients admitted to a large tertiary hospital **Study design**: RCT; **recruitment**: tertiary care (health professional referral) **Study duration**: ongoing; **study type**: management; **subtype**: heart failure
Participants	**Inclusion criteria**: patients are considered for inclusion if they were admitted from home with chronic heart failure or COPD, have an estimated prognosis of greater than 6 months, are English-speaking, have a telephone, and are expected to be discharged to home **Sample size**: 478; **mean age**: 63 years; **sex**: women - 47%; men -53%; **ethnicity**: * **Country**: USA
Interventions	**Arm a**: E-Coach intervention is delivered through an IVR monitoring system that is based on Coleman's 4 pillars of care transition support and a web-based 'dashboard' for care transition nurses, with alerts of patient/ caregiver concerns after discharge. After discharge, Ida is programmed to call participants daily for 7 days and for an additional 21 sessions thereafter (either daily or every 3 days, depending on participant preference). In a stepped-care approach, the IVR is then supported by the care transition nurse, who monitors participant issues through the E-Coach IVR secure web-based dashboard. Support for participant self-management is provided through personal telephone-based interactions when needed, up to 2 months (60 days) after discharge. Clients are advised to use condoms as dual protection from HIV and sexually transmitted infections as appropriate. Follow-up calls to clients are made during preferred times indicated by the client on her registration form. Clients in the intervention arm are also able to call the MOTIF service at any time to request to speak with a counsellor. Clients who opt to receive the OC or injectable can opt in to receive additional reminder messages appropriate to their method (that is, to start a new packet of pills or when to receive a new injection). The sixth and final voice message provides similar information to the first five, but also reminds the client that this will be the last message they will receive **Arm b**: control group received usual care (no intervention).
Outcomes	Rehospitalisations; rehospitalisations at 90 days; community tenure
Starting date	1 June 2010
Contact information	critchie@uab.edu, christine.ritchie@ucsf.edu
Notes	ClinicalTrials.gov identifier: NCT01135381

Silveira 2010

Trial name or title	Care partners: web-based support for caregivers of veterans undergoing chemotherapy
Methods	**Aims**: to determine if VA patients undergoing chemotherapy who receive automated telephonic assessment and symptom management advice plus web-based feedback to inform and engage a CarePartner report significant improvement in the number and severity of symptoms compared to patients receiving monitoring only **Study design**: RCT; **recruitment**: * **Study duration**: ongoing; **study type**: management; subtype: cancer

Participants	**Inclusion criteria**: all participants must be ≥ 18 years, cognitively intact, English-speaking, able to hear, and own a telephone. Patients can have any solid tumour; must be initiating IV cytotoxic chemotherapy and, if recurrent, have experienced a 1 month treatment free interval. Caregivers must have a computer with high speed Internet access **Sample size**: 214; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: participants receive automated telephone symptom assessment and symptom management advice; caregivers receive access to a website that updates them on participant's symptoms and provides tailored problem solving advice **Arm b**: participants receive automated telephone symptom assessment and symptom management advice; caregivers receive nothing
Outcomes	Symptom severity
Starting date	October 2010
Contact information	Maria J Silveira, MD MA MPH, VA Ann Arbor Healthcare System, Ann Arbor, MI
Notes	ClinicalTrials.gov identifier: NCT00983892

Smith 2013

Trial name or title	MObile Technology for Improved Family Planning (MOTIF)
Methods	**Aims**: to evaluate a mobile phone-based intervention using voice messages to support postabortion family planning (PAFP) in Cambodia by testing whether additional regular, structured, interactive mobile phone-based support improves use of PAFP **Study design**: RCT; **recruitment**: primary care (health professional referral) **Study duration**: ongoing; **study type**: prevention; **subtype**: sexual health
Participants	**Inclusion criteria**: participants are eligible for the trial if they are attending for induced abortion, aged ≥ 18 years, own a mobile phone, do not want to have a child at the present time and are willing to receive simple voice messages from Marie Stopes International Cambodia related to contraception **Sample size**: 500; **mean age**: * **sex**: * **ethnicity**: Cambodian **Country**: the Netherlands
Interventions	**Arm a**: six automated voice messages to remind clients about available family planning methods and provide a conduit for additional support. Clients can respond to message prompts to request a phone call from a counsellor, or alternatively state they have no problems. Clients requesting to talk to a counsellor, or who do not respond to the message prompts, receive a call from a Marie Stopes International Cambodia counsellor who provides individualised advice and support regarding family planning **Arm b**: standard of care without the additional mobile phone-based support
Outcomes	Use of an effective modern method of contraception at 4 months; repeat abortion; contraceptive discontinuation

Starting date	30 March 2013
Contact information	christopher.smith@lshtm.ac.uk
Notes	ClinicalTrials.gov identifier: NCT01823861

Te Boveldt 2011

Trial name or title	Rationale, design, and implementation protocol of the Dutch clinical practice guideline pain in patients with cancer: a cluster RCT with Short Message Service (SMS) and IVR
Methods	**Aims**: to evaluate the implementation of the Dutch guideline *Pain in Patients with Cancer* to improve pain reporting, pain measurement, and hence pain control in patients with cancer and pain **Study design**: cluster RCT; **recruitment**: secondary care (health professional referral) **Study duration**: ongoing; **study type**: management; **subtype**: cancer pain
Participants	**Inclusion criteria**: diagnosed with cancer; aged ≥ 18 years; pain intensity of 3 or more on a numeric rating scale for the worst pain experienced in the last 24 h; and having and being familiar with the use of a mobile phone **Sample size**: 210; **mean age**: * **sex**: * **ethnicity**: * **Country**: the Netherlands
Interventions	**Arm a**: SMS-IVR + personal advice by phone on how to reduce pain if rating is ≥ 5 or higher on a numeric rating scale (NRS) of 0-10. The research nurse of the hospital, specialised in pain treatment and trained for this project, will provide the personal advice **Arm b**: control group will receive a leaflet on cancer pain
Outcomes	The first primary outcome is the percentage of all participants that visit the medical oncology outpatient clinic with adequate pain therapy/medication. Pain treatment adequacy will be calculated with both the Cleeland's Pain Management Index (PMI) and Ward's variation of the PMI
Starting date	November 2009
Contact information	n.teboveldt@anes.umcn.nl
Notes	Netherlands Trial Register (NTR): NTR2739

Wright 2014

Trial name or title	The study of automated telephone programs for the maintenance of dietary change
Methods	**Aims**: to compare two theory-based interventions (social cognitive theory (SCT) vs goal systems theory (GST)) designed to maintain previously achieved improvements in fruit and vegetableconsumption **Study design**: RCT; **recruitment**: other - voter registration list (mail and telephone) **Study duration**: ongoing; **study type**: prevention; **subtype**: cancer

Participants	**Inclusion criteria**: participants were adults ≥ 18 years old who consumed less than the recommended level of fruits and vegetables (i.e. ≤ 5 servings/day), lived in the Boston area, had access to a touch-tone telephone, and were generally healthy **Sample size**: 1049; **mean age**: * **sex**: * **ethnicity**: * **Country**: USA
Interventions	**Arm a**: TLC maintenance intervention based on SCT used a skills-based approach to build self-efficacy. It assessed confidence in and barriers to eating fruit and vegetables, provided feedback on how to overcome barriers, plan ahead, and set goals **Arm b**: control group received assessment only
Outcomes	Fruit and vegetable intake; self-efficacy; costs
Starting date	July 2006
Contact information	julie.wright@umb.edu
Notes	Clinicaltrials.gov: NCT00148525

ACS: acute coronary syndrome; **ART**: antiretroviral therapy; **ATCS**: automated telephone communication system; **ATSM**: automated telephone self-management; **BMI**; body mass index; **CBT**: cognitive behavioural therapy; **CDSS**: clinical decision support system; **CPCQ**: client perceptions of coordination questionnaire; **COPD**: chronic obstructive pulmonary disease; **ECOG**: Eastern Cooperative Oncology Group; **EHR**: electronic health record; **EMR**: electronic medical record; **ESAS**: Edmonton symptom assessment system; **FDA**: Food and Drug Administration; **GP**: general practitioner; **IDS-SR**: inventory of depressive symptomatology (self-report); **IVR**: interactive voice response; **MI**: motivational interviewing; **NA**: not available; **NSTEMI**: non-ST-elevation myocardial infarction; **OSAS**: obstructive sleep apnoea syndrome; **PACIC**: patient assessment of chronic illness care; **PCI**: percutaneous coronary intervention; **PHQ-9**: personal health questionnaire, version 9; **RCT**: randomised controlled trial; **SF-36**: Short Form-36-Health Survey; **STEMI**: ST-elevation myocardial infarction; **UC**: usual care; **UKPDS**: UK Prospective Diabetes Study; **VA**: Veteran's Administration.

DATA AND ANALYSES

Comparison 1. ATCS vs control for improving health services uptake (immunisations)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Immunisation in children	5	10454	Risk Ratio (M-H, Random, 95% CI)	1.25 [1.18, 1.32]
2 Immunisation in adolescents	2	5725	Risk Ratio (M-H, Random, 95% CI)	1.06 [1.02, 1.11]
3 Immunisation in adults	2	1743	Risk Ratio (M-H, Random, 95% CI)	2.18 [0.53, 9.02]

Comparison 2. ATCS vs control for improving health services uptake (screening rates)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Breast cancer screening	4		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
1.1 Multimodal/complex interventions	2	462	Risk Ratio (M-H, Random, 95% CI)	2.17 [1.55, 3.04]
1.2 IVR	2	2599	Risk Ratio (M-H, Random, 95% CI)	1.05 [0.99, 1.11]
2 Colorectal cancer screening	7		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
2.1 Multimodal/complex intervention	3	1013	Risk Ratio (M-H, Random, 95% CI)	2.19 [1.88, 2.55]
2.2 IVR (shorter follow-up)	2	16915	Risk Ratio (M-H, Random, 95% CI)	1.36 [1.25, 1.48]
2.3 IVR (longer follow-up)	2	21335	Risk Ratio (M-H, Random, 95% CI)	1.01 [0.97, 1.05]

Comparison 3. ATCS vs control for reducing body weight

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 BMI adults	3	672	Mean Difference (IV, Random, 95% CI)	-0.64 [-1.38, 0.11]

Comparison 4. ATCS vs usual care for managing diabetes mellitus

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Glycated haemoglobin	7	1216	Mean Difference (IV, Random, 95% CI)	-0.26 [-0.50, -0.01]
2 Self-monitoring of diabetic foot	2	498	Std. Mean Difference (IV, Random, 95% CI)	0.24 [0.06, 0.42]

Comparison 5. ATCS vs usual care for reducing healthcare utilisation in patients with heart failure

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Cardiac mortality	2	215	Risk Ratio (M-H, Random, 95% CI)	0.60 [0.21, 1.67]
2 All-cause mortality	3	2165	Risk Ratio (M-H, Random, 95% CI)	1.00 [0.79, 1.28]

Comparison 6. ATCS vs usual primary care and education or usual care for managing hypertension

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Systolic blood pressure	3	65256	Mean Difference (IV, Random, 95% CI)	-1.89 [-2.12, -1.66]
2 Diastolic blood pressure	2	65056	Mean Difference (IV, Random, 95% CI)	0.02 [-2.62, 2.66]

Comparison 7. ATCS for smoking cessation

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Smoking abstinence	7	2915	Risk Ratio (M-H, Random, 95% CI)	1.20 [0.98, 1.46]

Analysis 1.1. Comparison 1 ATCS vs control for improving health services uptake (immunisations), Outcome 1 Immunisation in children.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 1 ATCS vs control for improving health services uptake (immunisations)

Outcome: 1 Immunisation in children

Study or subgroup	ATCS	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
Dini 1995	107/189	87/186		7.5 %	1.21 [0.99, 1.47]
LeBaron 2004	305/763	259/763		16.8 %	1.18 [1.03, 1.34]
Lieu 1998	89/167	70/162		5.7 %	1.23 [0.98, 1.55]
Linkins 1994	1684/4636	955/3366		67.3 %	1.28 [1.20, 1.37]
Stehr-Green 1993	46/112	41/110		2.7 %	1.10 [0.79, 1.53]
Total (95% CI)	**5867**	**4587**		**100.0 %**	**1.25 [1.18, 1.32]**

Total events: 2231 (ATCS), 1412 (Control)

Heterogeneity: Tau² = 0.0; Chi² = 1.99, df = 4 (P = 0.74); I² =0.0%

Test for overall effect: Z = 8.08 (P < 0.00001)

Test for subgroup differences: Not applicable

```
        0.5   0.7   1    1.5   2
     Favours ATCS        Favours control
```
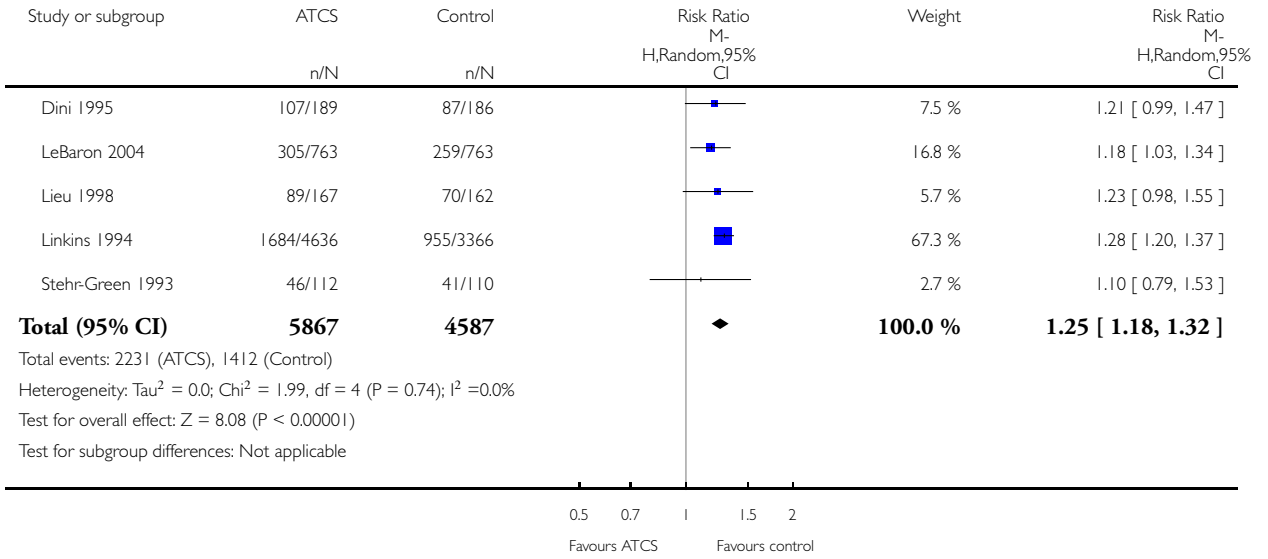
Analysis 1.2. Comparison 1 ATCS vs control for improving health services uptake (immunisations), Outcome 2 Immunisation in adolescents.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 1 ATCS vs control for improving health services uptake (immunisations)

Outcome: 2 Immunisation in adolescents

Study or subgroup	Unidirectional ATCS n/N	Usual care n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Szilagyi 2006	928/1496	873/1510		61.0 %	1.07 [1.01, 1.14]
Szilagyi 2013	748/1423	651/1296		39.0 %	1.05 [0.97, 1.13]
Total (95% CI)	**2919**	**2806**		**100.0 %**	**1.06 [1.02, 1.11]**

Total events: 1676 (Unidirectional ATCS), 1524 (Usual care)
Heterogeneity: Tau² = 0.0; Chi² = 0.28, df = 1 (P = 0.60); I² =0.0%
Test for overall effect: Z = 2.60 (P = 0.0093)
Test for subgroup differences: Not applicable

```
     0.5   0.7    1    1.5    2
  Favours usual care    Favours ATCS
```
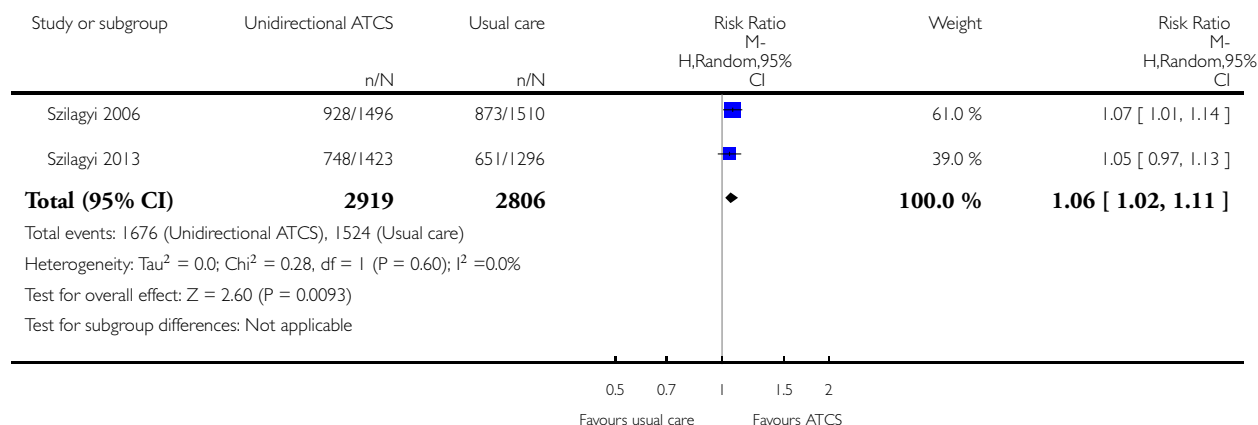
Analysis 1.3. Comparison 1 ATCS vs control for improving health services uptake (immunisations), Outcome 3 Immunisation in adults.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 1 ATCS vs control for improving health services uptake (immunisations)

Outcome: 3 Immunisation in adults

Study or subgroup	Unidirectional ATCS n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Hess 2013	21/791	6/902		58.6 %	3.99 [1.62, 9.84]
Nassar 2014	3/26	3/24		41.4 %	0.92 [0.21, 4.14]
Total (95% CI)	**817**	**926**		**100.0 %**	**2.18 [0.53, 9.02]**

Total events: 24 (Unidirectional ATCS), 9 (Control)
Heterogeneity: Tau² = 0.68; Chi² = 2.71, df = 1 (P = 0.10); I² =63%
Test for overall effect: Z = 1.07 (P = 0.28)
Test for subgroup differences: Not applicable

```
     0.01   0.1    1    10    100
  Favours controls    Favours ATCS
```
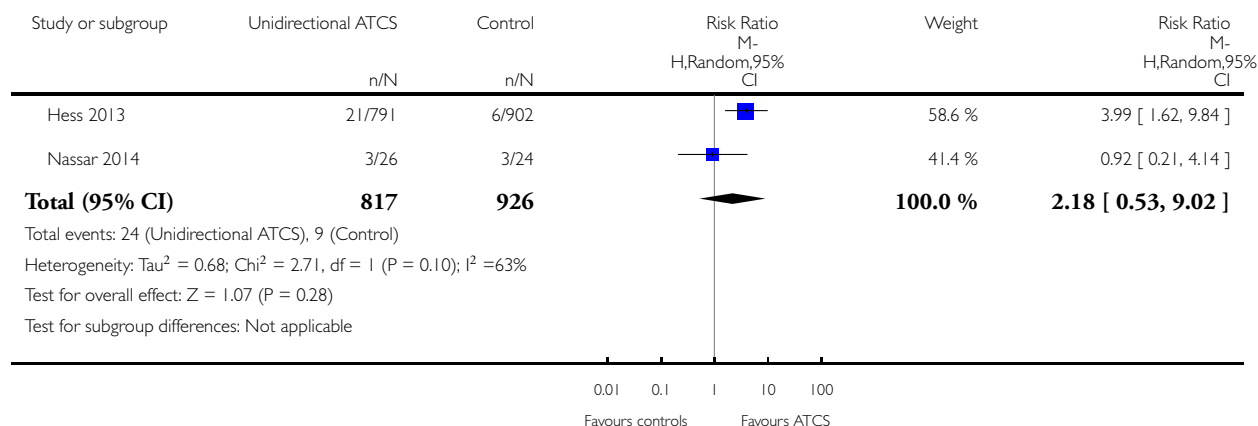
Analysis 2.1.   Comparison 2 ATCS vs control for improving health services uptake (screening rates), Outcome 1 Breast cancer screening.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 2 ATCS vs control for improving health services uptake (screening rates)

Outcome: 1 Breast cancer screening

Study or subgroup	ATCS n/N	Usual care n/N	Risk Ratio M- H,Random,95% CI	Weight	Risk Ratio M- H,Random,95% CI
1 Multimodal/complex interventions					
Fiscella 2011	55/134	23/137		62.7 %	2.44 [1.60, 3.74]
Hendren 2014	30/101	15/90		37.3 %	1.78 [1.03, 3.09]
Subtotal (95% CI)	**235**	**227**		**100.0 %**	**2.17 [1.55, 3.04]**
Total events: 85 (ATCS), 38 (Usual care)					
Heterogeneity: Tau² = 0.0; Chi² = 0.79, df = 1 (P = 0.37); I² =0.0%					
Test for overall effect: Z = 4.52 (P < 0.00001)					
2 IVR					
DeFrank 2009	960/1355	574/847		97.9 %	1.05 [0.99, 1.11]
Phillips 2015	43/199	37/198		2.1 %	1.16 [0.78, 1.71]
Subtotal (95% CI)	**1554**	**1045**		**100.0 %**	**1.05 [0.99, 1.11]**
Total events: 1003 (ATCS), 611 (Usual care)					
Heterogeneity: Tau² = 0.0; Chi² = 0.26, df = 1 (P = 0.61); I² =0.0%					
Test for overall effect: Z = 1.60 (P = 0.11)					
Test for subgroup differences: Chi² = 17.59, df = 1 (P = 0.00), I² =94%					

```
           0.2     0.5     1     2     5

         Favours usual care     Favours ATCS
```

Analysis 2.2. Comparison 2 ATCS vs control for improving health services uptake (screening rates), Outcome 2 Colorectal cancer screening.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 2 ATCS vs control for improving health services uptake (screening rates)

Outcome: 2 Colorectal cancer screening

Study or subgroup	ATCS	Usual care	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
1 Multimodal/complex intervention					
Baker 2014	191/225	90/225		80.5 %	2.12 [1.79, 2.51]
Fiscella 2011	47/163	16/160		8.4 %	2.88 [1.71, 4.87]
Hendren 2014	43/114	21/126		11.1 %	2.26 [1.43, 3.57]
Subtotal (95% CI)	**502**	**511**		**100.0 %**	**2.19 [1.88, 2.55]**
Total events: 281 (ATCS), 127 (Usual care)					
Heterogeneity: Tau² = 0.0; Chi² = 1.29, df = 2 (P = 0.52); I² =0.0%					
Test for overall effect: Z = 10.14 (P < 0.00001)					
2 IVR (shorter follow-up)					
Cohen-Cline 2014	801/8005	234/3005		36.9 %	1.28 [1.12, 1.48]
Mosen 2010	662/2943	474/2962		63.1 %	1.41 [1.26, 1.56]
Subtotal (95% CI)	**10948**	**5967**		**100.0 %**	**1.36 [1.25, 1.48]**
Total events: 1463 (ATCS), 708 (Usual care)					
Heterogeneity: Tau² = 0.00; Chi² = 1.01, df = 1 (P = 0.31); I² =1%					
Test for overall effect: Z = 7.07 (P < 0.00001)					
3 IVR (longer follow-up)					
Phillips 2015	43/199	37/198		1.1 %	1.16 [0.78, 1.71]
Simon 2010a	3192/10432	3194/10506		98.9 %	1.01 [0.97, 1.05]
Subtotal (95% CI)	**10631**	**10704**		**100.0 %**	**1.01 [0.97, 1.05]**
Total events: 3235 (ATCS), 3231 (Usual care)					
Heterogeneity: Tau² = 0.0; Chi² = 0.47, df = 1 (P = 0.49); I² =0.0%					
Test for overall effect: Z = 0.38 (P = 0.70)					
Test for subgroup differences: Chi² = 120.65, df = 2 (P = 0.00), I² =98%					

0.2   0.5   1   2   5

Favours usual care   Favours ATCS

Analysis 3.1.   Comparison 3 ATCS vs control for reducing body weight, Outcome 1 BMI adults.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 3 ATCS vs control for reducing body weight

Outcome: 1 BMI adults

Study or subgroup	ATCS N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Bennett 2012	180	36.5 (2.01)	185	36.8 (1.9)		48.8 %	-0.30 [-0.70, 0.10]
Bennett 2013	91	29.8 (1.9)	94	30.3 (1.93)		43.3 %	-0.50 [-1.05, 0.05]
Goulis 2004	45	33.7 (5.2)	77	37.2 (8.7)		7.8 %	-3.50 [-5.97, -1.03]
Total (95% CI)	**316**		**356**			**100.0 %**	**-0.64 [-1.38, 0.11]**

Heterogeneity: Tau² = 0.25; Chi² = 6.41, df = 2 (P = 0.04); I² =69%

Test for overall effect: Z = 1.68 (P = 0.093)

Test for subgroup differences: Not applicable

```
          -4    -2     0     2     4
        Favours ATCS      Favours control
```

Analysis 4.1. Comparison 4 ATCS vs usual care for managing diabetes mellitus, Outcome 1 Glycated haemoglobin.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 4 ATCS vs usual care for managing diabetes mellitus

Outcome: 1 Glycated haemoglobin

Study or subgroup	ATCS		Control		Mean Difference	Weight	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Random,95% CI		IV,Random,95% CI
Graziano 2009	61	7.8 (1.09)	58	7.8 (1.14)		17.5 %	0.0 [-0.40, 0.40]
Khanna 2014	23	9.1 (1.9)	26	8.6 (1.3)		5.8 %	0.50 [-0.42, 1.42]
Kim 2014	50	9 (2)	50	9.9 (2.2)		7.0 %	-0.90 [-1.72, -0.08]
Lorig 2008	179	7 (1.4)	173	7.3 (1.5)		22.0 %	-0.30 [-0.60, 0.00]
Piette 2001	132	8.1 (1.15)	140	8.2 (1.18)		23.3 %	-0.10 [-0.38, 0.18]
Schillinger 2009	101	8.7 (1.9)	103	9 (2.2)		12.0 %	-0.30 [-0.86, 0.26]
Williams 2012	60	7.9 (1.2)	60	8.7 (1.8)		12.5 %	-0.80 [-1.35, -0.25]
Total (95% CI)	**606**		**610**			**100.0 %**	**-0.26 [-0.50, -0.01]**

Heterogeneity: Tau² = 0.05; Chi² = 11.48, df = 6 (P = 0.07); I² =48%

Test for overall effect: Z = 2.07 (P = 0.038)

Test for subgroup differences: Not applicable

```
        -1   -0.5    0    0.5    1
       Favours ATCS      Favours control
```

Analysis 4.2. Comparison 4 ATCS vs usual care for managing diabetes mellitus, Outcome 2 Self-monitoring of diabetic foot.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 4 ATCS vs usual care for managing diabetes mellitus

Outcome: 2 Self-monitoring of diabetic foot

Study or subgroup	ATCS+		Usual care		Std. Mean Difference	Weight	Std. Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Random,95% CI		IV,Random,95% CI
Piette 2001	132	4.6 (1.14)	140	4.4 (1.18)		54.8 %	0.17 [-0.07, 0.41]
Schillinger 2009	112	5.1 (1.4)	114	4.6 (1.7)		45.2 %	0.32 [0.06, 0.58]
Total (95% CI)	**244**		**254**			**100.0 %**	**0.24 [0.06, 0.42]**

Heterogeneity: Tau² = 0.0; Chi² = 0.67, df = 1 (P = 0.41); I² =0.0%

Test for overall effect: Z = 2.65 (P = 0.0080)

Test for subgroup differences: Not applicable

```
                    -2   -1    0    1    2
              Favours usual care   Favours ATCS+
```
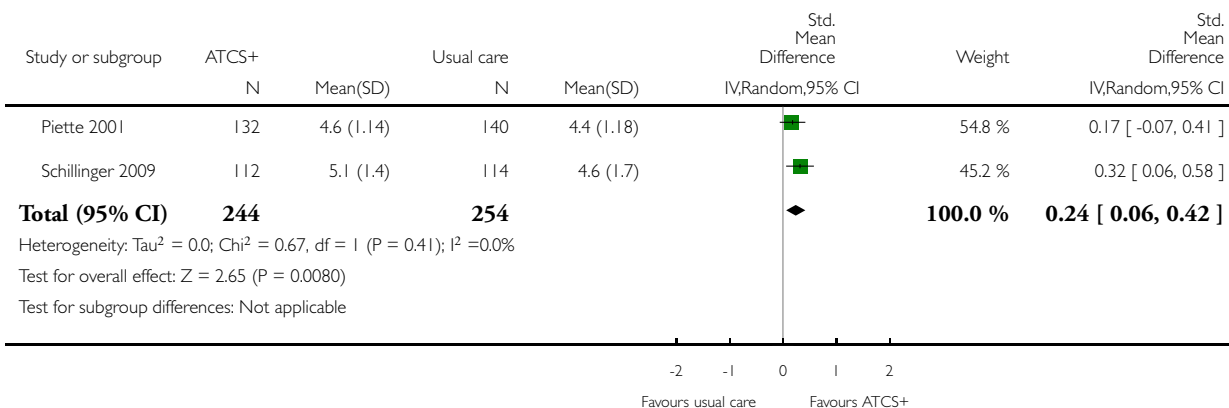
Analysis 5.1. Comparison 5 ATCS vs usual care for reducing healthcare utilisation in patients with heart failure, Outcome 1 Cardiac mortality.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 5 ATCS vs usual care for reducing healthcare utilisation in patients with heart failure

Outcome: 1 Cardiac mortality

Study or subgroup	ATCS	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
Capomolla 2004	2/67	6/66		43.1 %	0.33 [0.07, 1.57]
Kurtz 2011	3/32	5/50		56.9 %	0.94 [0.24, 3.66]
Total (95% CI)	**99**	**116**		**100.0 %**	**0.60 [0.21, 1.67]**

Total events: 5 (ATCS), 11 (Control)

Heterogeneity: Tau² = 0.0; Chi² = 0.99, df = 1 (P = 0.32); I² =0.0%

Test for overall effect: Z = 0.99 (P = 0.32)

Test for subgroup differences: Not applicable

```
          0.01   0.1    1    10   100
          Favours ATCS      Favours usual care
```
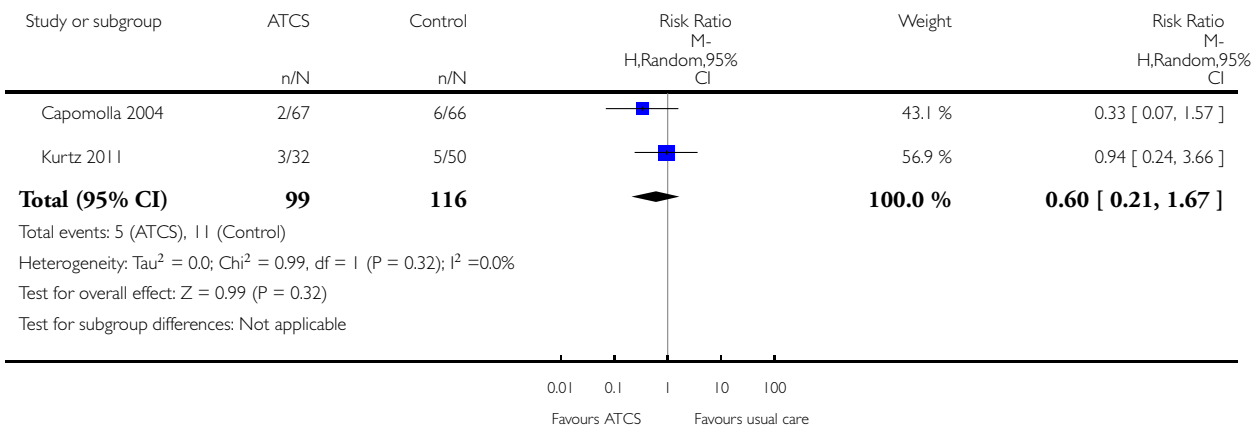
Analysis 5.2. Comparison 5 ATCS vs usual care for reducing healthcare utilisation in patients with heart failure, Outcome 2 All-cause mortality.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 5 ATCS vs usual care for reducing healthcare utilisation in patients with heart failure

Outcome: 2 All-cause mortality

Study or subgroup	ATCS	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
Capomolla 2004	5/67	7/66		4.9 %	0.70 [0.24, 2.11]
Chaudhry 2010	92/826	94/827		81.1 %	0.98 [0.75, 1.28]
Krum 2013	17/170	16/209		14.0 %	1.31 [0.68, 2.51]
Total (95% CI)	**1063**	**1102**		**100.0 %**	**1.00 [0.79, 1.28]**

Total events: 114 (ATCS), 117 (Control)

Heterogeneity: Tau^2 = 0.0; Chi^2 = 1.06, df = 2 (P = 0.59); I^2 =0.0%

Test for overall effect: Z = 0.03 (P = 0.98)

Test for subgroup differences: Not applicable

```
        0.2   0.5   1    2    5
      Favours ATCS    Favours usual care
```
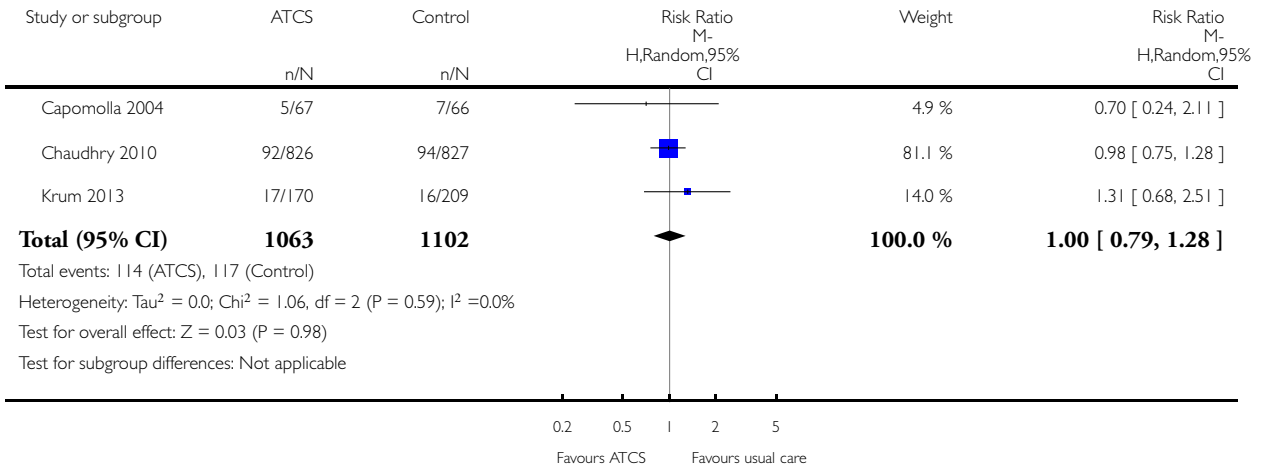
Analysis 6.1. Comparison 6 ATCS vs usual primary care and education or usual care for managing hypertension, Outcome 1 Systolic blood pressure.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 6 ATCS vs usual primary care and education or usual care for managing hypertension

Outcome: 1 Systolic blood pressure

Study or subgroup	ATCS		Usual care		Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
	N	Mean(SD)	N	Mean(SD)			
Harrison 2013	31619	141.2 (15.1)	33154	143.1 (14.6)		99.6 %	-1.90 [-2.13, -1.67]
Magid 2011	138	137.4 (19.4)	145	136.7 (17)		0.3 %	0.70 [-3.56, 4.96]
Piette 2012	99	142.5 (22.88)	101	143.6 (24.11)		0.1 %	-1.10 [-7.61, 5.41]
Total (95% CI)	**31856**		**33400**			**100.0 %**	**-1.89 [-2.12, -1.66]**

Heterogeneity: Tau² = 0.0; Chi² = 1.48, df = 2 (P = 0.48); I² =0.0%

Test for overall effect: Z = 16.23 (P < 0.00001)

Test for subgroup differences: Not applicable

```
        -4    -2    0    2    4
     Favours ATCS      Favours usual care
```
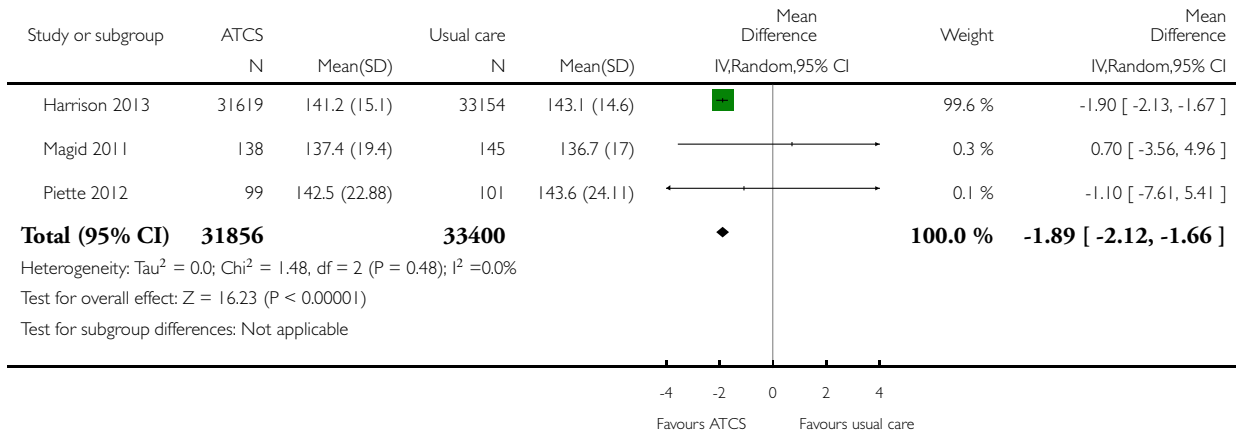
Analysis 6.2. Comparison 6 ATCS vs usual primary care and education or usual care for managing hypertension, Outcome 2 Diastolic blood pressure.

Review: Automated telephone communication systems for preventive healthcare and management of long-term conditions

Comparison: 6 ATCS vs usual primary care and education or usual care for managing hypertension

Outcome: 2 Diastolic blood pressure

Study or subgroup	ATCS		Control		Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
	N	Mean(SD)	N	Mean(SD)			
Harrison 2013	31619	80.3 (12.6)	33154	81.3 (12.5)		63.6 %	-1.00 [-1.19, -0.81]
Magid 2011	138	82.9 (12.9)	145	81.1 (11.7)		36.4 %	1.80 [-1.07, 4.67]
Total (95% CI)	**31757**		**33299**			**100.0 %**	**0.02 [-2.62, 2.66]**

Heterogeneity: Tau² = 2.84; Chi² = 3.63, df = 1 (P = 0.06); I² =72%

Test for overall effect: Z = 0.01 (P = 0.99)

Test for subgroup differences: Not applicable

```
        -4    -2    0    2    4
     Favours ATCS      Favours usual care
```