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RESEARCH ARTICLE

Quality circles for quality improvement in primary health care: Their origins, spread, effectiveness and lacunae— A scoping review

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Abstract

Quality circles or peer review groups, and similar structured small groups of 6–12 health care professionals meet regularly across Europe to reflect on and improve their standard practice. There is debate over their effectiveness in primary health care, especially over their potential to change practitioners' behaviour. Despite their popularity, we could not identify broad surveys of the literature on quality circles in a primary care context. Our scoping review was intended to identify possible definitions of quality circles, their origins, and reported effectiveness in primary health care, and to identify gaps in our knowledge. We searched appropriate databases and included any relevant paper on quality circles published until December 2017. We then compared information we found in the articles to that we found in books and on websites. Our search returned 7824 citations, from which we identified 82 background papers and 58 papers about quality circles. We found that they originated in manufacturing industry and that many countries adopted them for primary health care to continuously improve medical education, professional development, and quality of care. Quality circles are not standardized and their techniques are complex. We identified 19 papers that described individual studies, one paper that summarized 3 studies, and 1 systematic review that suggested that quality circles can effectively change behaviour, though effect sizes varied, depending on topic and context. Studies also suggested participation may affirm self-esteem and increase professional confidence. Because reports of the effect of quality circles on behaviour are variable, we recommend theory-driven research approaches to analyse and improve the effectiveness of this complex intervention.

Introduction

Quality circles (QCs) or peer review groups, and other similar small groups of health care professionals meet regularly across Europe to reflect on and improve their standard practice. QCs

Competing interests: The authors report no conflicts of interest. AR works as a general practitioner at medbase Health Care Centres, a network providing primary health care services in Switzerland. As a member of the committee for quality improvement in the Swiss Society of General Internal Medicine, he supervises and trains facilitators. GW, SM, KT, and JH independently contributed their academic and methodological experience to this project. This does not alter our adherence to PLOS ONE policies on sharing data and materials.

are rooted in two fundamental concepts that shaped them from the beginning: the framework of the Plan-Do-Check-Act cycle, and the social context in which the group functions [1]. QCs use didactic methods like brain-storming and reflective thinking, and quality improvement (QI) techniques like audit and feedback or purposeful use of local experts. In several European countries, QCs support quality initiatives in primary health care (PHC) [2–11], as in Scotland and Wales, where structured small groups for QI were introduced to replace a pre-existing outcomes-driven incentive scheme [12, 13]. Many techniques QCs employ have been systematically reviewed but it is not clear if these techniques (alone or in combination) improve the practice of participants. This scoping review was intended to help us define QCs, describe their origin and intentions, explore their effectiveness in the context of PHC, and identify areas where there are gaps in our knowledge.

Methods

Method of the scoping search

Unlike systematic reviews, which are based on strictly defined research problems, scoping reviews usually address broadly formulated questions. They map literature on a broad topic to identify and describe studies, to look for definitions and identify and describe key concepts [14]. This approach relies on stepwise and iterative search techniques to develop a strategy to retrieve adequate literature. Inclusion and exclusion criteria and data extraction templates are not predetermined; instead, they develop gradually in tandem with the search [15, 16]. Scoping reviews do not formally assess the methodological quality of studies or data. They instead cast a broad net, capturing enough papers to begin to answer the broad questions they ask, laying the groundwork for later systematic reviews that can exclude papers of low methodological quality to improve validity [14, 17]. This broad focus allowed us to include and consult selected books and websites to supplement our literature search results [18].

The scoping search was conducted in several steps, following the guidelines for conducting systematic scoping reviews [19]:

- Identify literature on QCs and determine what kind of studies described and defined them;
- Determine the origin of QCs and how they spread;
- Describe their intentions and reported benefits;
- Review their reported effectiveness on behaviour change; and,
- Summarize questions unanswered in the literature.

Information sources and search

The literature search was carried out by AR, who included all published articles up to December 2017. AR ran a limited search on the term ‘quality circle’ in PubMed to identify the first papers and then collaborated with an experienced librarian to expand the search. Together, they analysed text in the title and abstract and the article’s indexing terms to generate a broader list of terms. Iterative searching revealed descriptive terminology like ‘quality improvement’, ‘group functions’ and ‘primary care’ (S1 File). We retrieved literature from Medline, Embase, PsycInfo, and CINAHL without language or time restrictions and downloaded the citations to Endnote X8.

To check whether and how the definitions and processes described in the literature were implemented, AR searched websites in countries where the literature described active QCs [2–

[11]. If a website was not accessible to the public, AR contacted the authors or organisations to ask for access. AR, SM, and JH compared and discussed information from the literature and from the websites that described the definitions and processes of real-world QCs.

Because background information on underlying intentions, origin, and spread of QCs was scarce in published papers, AR looked for books published in countries where QC activities had been reported, searching in SOLO (Search Oxford Libraries Online: 'quality circle' and 'peer review group'). Because QCs were introduced to PHC in the 1980s, we limited our search to books published after 1980, without language restrictions. We used filters including 'education', 'knowledge management' and 'medical care' to identify candidate books. Since few were available online, AR went to libraries to leaf through tables of contents, and, in consultation with SM and JH, selected those books that described the origin, definition, and processes of QCs. Books were included if they contained information on the origin and intentions of QC and if they described the basic characteristics of PHC QCs. We halted the search when we reached saturation and it was clear additional sources were no longer providing new information. We ultimately included 12 textbooks and used them to verify information retrieved from the literature identified in our database search (S2 File) [20–31].

Eligibility criteria

We considered for inclusion any paper on QCs within PHC, in any language, with qualitative or quantitative outcomes, or background information. AR screened all papers identified by the search and SM, JH and GW cross-checked them to ensure eligibility criteria were consistently applied.

Paper selection

We checked only to see if papers provided relevant information about QCs in PHC. AR assessed relevance and then discussed his findings with SM, JH and GW. Papers were relevant if they met criterium A or B:

- A. The paper contained information about the background of QCs in PHC.
- B. The paper described the process in these small groups and contained data to allow to evaluate QCs in PHC.

The flow diagram (Fig 1) shows the number of papers included and excluded at each stage.

Data collection and reporting

We identified the aspects of the publications specific to study types and categorized them according to the Cochrane Manual [32]:

- randomized controlled trials, whether or not the nature of the intervention made blinding impossible
- non-randomised controlled trials, further grouped into controlled before-and-after studies, interrupted time series, historically controlled studies, cohort studies and case series (uncontrolled longitudinal studies)

AR extracted the following data: authors; publication year and location; descriptions of QC background; definitions of QCs; their underlying processes; their possible effectiveness; historical development; and, their spread. We used this data to generate a narrative and tables that describe the aspects of QCs. In parallel, we generated our data extraction template in Microsoft Excel 2016, taking an incremental approach. We then charted data for each topic, one at a time, to meet our objectives.

PRISMA Flow Diagram: 28/12/2017

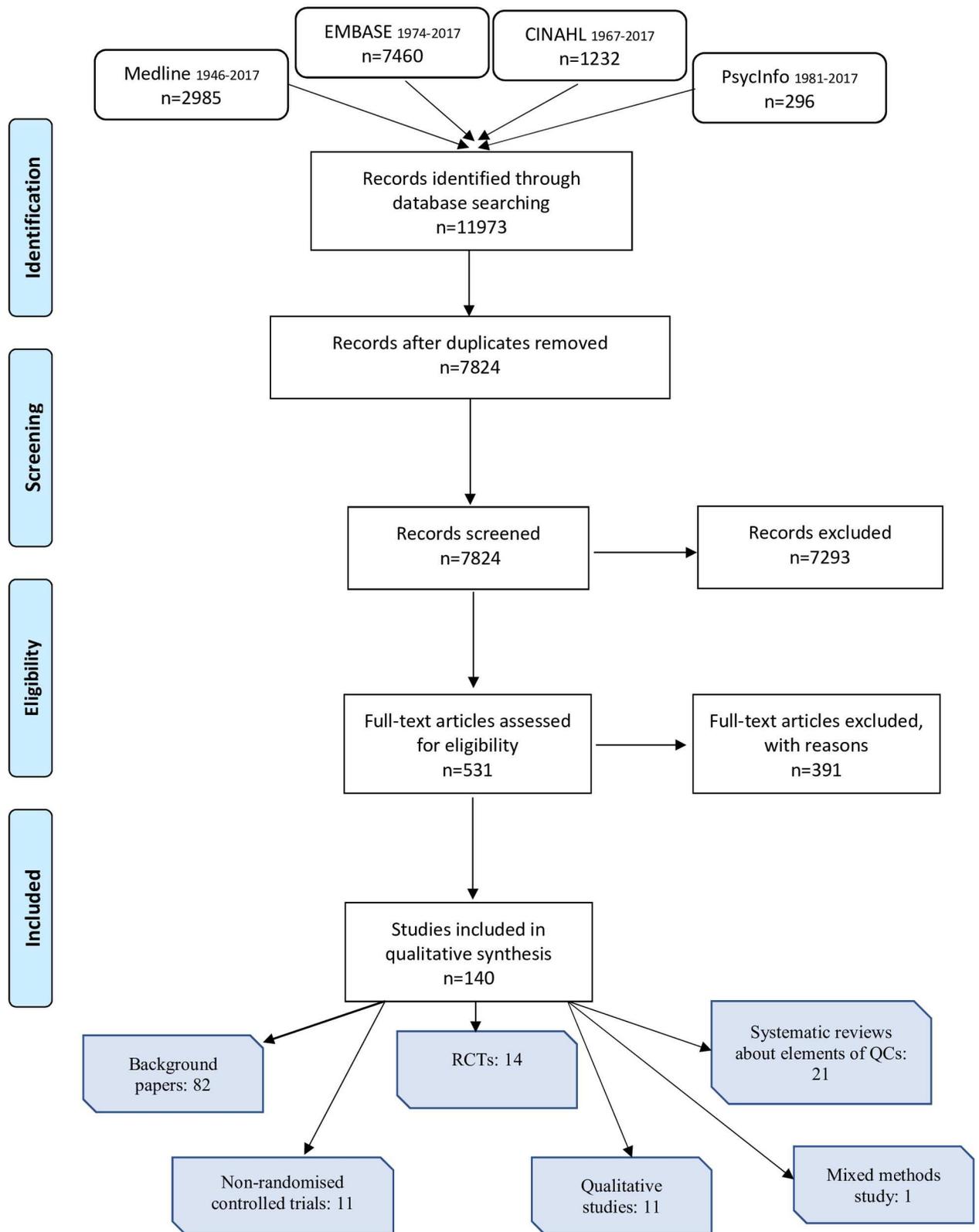


Fig 1. Paper flow diagram.

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Results

Our iterative searches returned 82 background papers (S3 File). Among retrieved papers, we deemed eligible and relevant 21 systematic reviews [33–53], 14 randomised controlled trials [54–67], 11 non-randomised controlled studies [68–78], 11 qualitative studies [79–89], and one mixed methods study [90] (S4 File). The systematic reviews, randomised controlled trials, cohort and controlled before-and-after studies each described and evaluated the processes or techniques QCs used. Qualitative studies and background papers described their processes and additional benefits. Background papers and the books and web resources we identified provided complementary information on the origin, definition, and spread of QCs.

What quality circles are

We used the included papers to identify concurrent key concepts about QCs. All sources confirmed that QCs comprise small groups of 6–12 health care professionals who meet regularly to reflect on and improve their standard practice [2, 5–7, 9–11, 20, 22–29, 31, 71, 72, 78, 82, 91–97]. The terms Practice Based Small Group Work, Peer Review Group, Problem Based Small Group Learning, Practice Based Research Group, Quality Circle, Continuous Medical Education (CME) Group, and Continuous Professional Development (CPD) Group were used interchangeably and varied among countries. The labels suggest the basic, original intent of the group. We decided to use the umbrella term Quality Circle to describe all of them.

Terms like ‘peer review group’ or ‘*entre pairs*’ reflect the principle of equity in a group without a hierarchy. This group of equals creates a climate of trust that promotes a free speech culture where discussions of everyday problems are founded on collective expertise [10, 25, 95, 98]. It is similar to collegial counselling (intervision), where equals seek to solve an existing problem, e.g., when colleagues draw clinical cases and others help solve them. This is often the starting point for mutual learning [23, 96, 99]. Depending on the country’s tradition, QCs might not be limited to GPs but involve other professionals in PHC, including practice assistants (in the Netherlands and Germany) or practice teams (in Scotland), who add perspectives to the QC process [59, 67, 82, 100–102]. Interprofessional collaboration and mutual learning may also involve practice nurses [103] or specialists invited to QCs to share expertise on a specific topic, e.g., pharmacists who contribute to a discussion on prescription patterns [75, 104, 105].

Autonomy is another important principle [106]. The groups choose a topic they want to learn more about or an aspect of quality that they want to improve in their practice. They decide how to approach and solve the problem, and they create space to reflect on how to improve clinical practice [2, 6, 21, 28, 64, 78, 80, 84, 85, 98, 107–110]. The groups choose their own facilitators, who observe and lead the group through a QI cycle. QCs respect the contribution of each individual. They also consider group dynamics and try to keep members focused without controlling the discussion [25, 28, 43, 47, 79, 89, 111, 112].

QCs combine techniques, including discussing educational material in a workshop-like atmosphere, contact with local experts, auditing and feedback on clinical practice with or without outreach visits, facilitation, and local consensus processes [82, 84, 92, 93, 95, 97, 98, 113–118]. The group may also rehearse clinical skills and use active didactic methods to promote learning, including brain-storming, reflective thinking, self-monitoring and professionally reprocessing patient situations [2, 8, 9, 11, 24, 29, 31, 87].

Techniques and didactic methods are usually tailored to local contexts and circumstances. The number and difficulty of these techniques and didactic methods, and the outcomes and

the context of the group, all affect the process [84, 87, 104]. QCs are therefore complex social interventions [119, 120] that run in PHC systems, constantly changing in response to new economic situations, scientific developments, and cultural pressures. They incorporate social aspects of the workplace that affect team work, self-determination and involvement in management at a day-to-day level.

Origins and spread of quality circles

In 1924, Shewart created a table that depicted a cycle for continuous control of the QI process. Deming improved this model and introduced the Plan-Do-Check-Act cycle (Fig 2) [121]. The model was used by small groups of frontline workers instead of administrators because workers often know how to improve production. The assumption was that if workers volunteered to help develop the organization, they could improve both products and the work environment.

QCs spread first within manufacturing industry, then to the service industry, and finally to the medical sector. [20, 122]. Donabedian adopted the principles of QI to health care where there are also three interdependent quality dimensions: structure, process, and outcome [123]. His model of QI in health care was first implemented in in-patient settings and secondary-care clinics in the Netherlands. The development of QCs in health care was driven by a need for participative group problem-solving approaches and shared responsibility for decision-making in rapidly expanding and expensive health care systems [124]. QCs in PHC originated in two centres: McMaster University in Canada and the University of Nijmegen in the Netherlands. In their undergraduate programmes, both universities promoted Problem Based Learning (PBL), which confronts a group of learners with a problem they have to solve, so they must actively participate in learning about the related issues [125].

In 1974, at McMaster, Premi presented the results of 6 years' experience of GPs who met on a regular basis to exchange thoughts about clinical cases and increase and update their knowledge [126]. This programme mainly addressed GPs' needs for lifelong learning. As teachers, academics and policy makers built networks, the programme spread from McMaster, Canada, to Ireland, Scotland, and England and eventually to the USA, Australia and New Zealand as shown in Fig 3 [3, 7–9, 127].

In 1979, at the University of Nijmegen, Netherlands, PBL was implemented experimentally within small groups of GPs who met voluntarily on a regular basis to continuously and

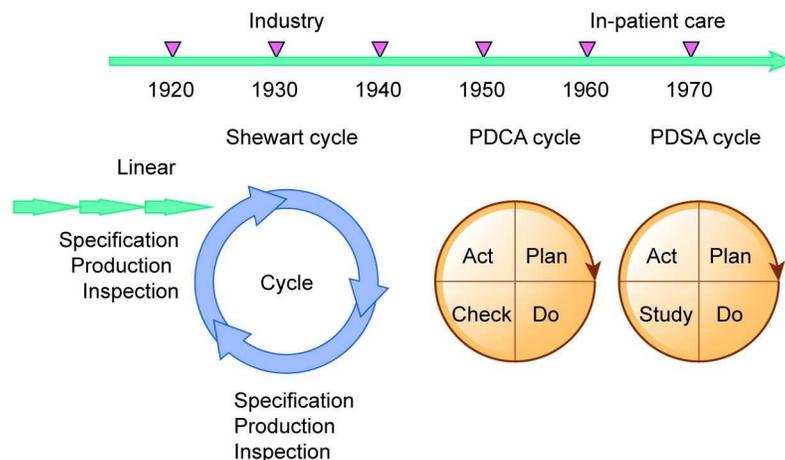


Fig 2. Development of the quality improvement process.

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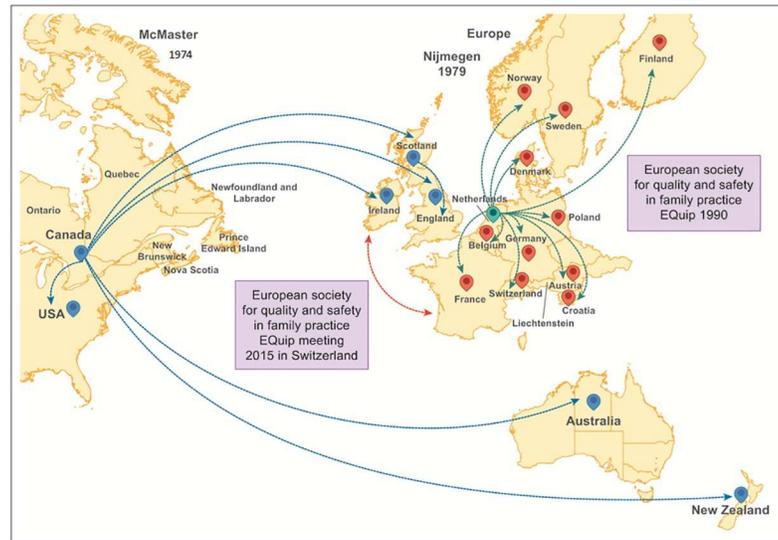


Fig 3. Spread of quality circles.

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autonomously improve their knowledge through peer interaction [94]. Like Dutch hospitals had adopted Donabedian’s dimensions of quality in health care, the Dutch GPs adopted them in their small group work. Gradually, they transformed the learning cycle into a QI cycle, as their focus shifted from learning to improving practice [128, 129]. They combined didactic techniques from PBL with communication skills and understanding of group dynamics from industrial small group work. When the European Society for Quality and Safety in Family Medicine (EQuIP) was founded, it became a communication channel through which developments like QCs were shared. QCs then spread rapidly from the Netherlands to many other European countries (Fig 3) [2–11, 54, 69, 81, 83, 94, 130–135]. In 2015, EQuIP organised a conference in Fischingen, Switzerland, on QCs in PHC where representatives of these very similar movements documented the range of components they used in QCs, characterised their underlying mechanisms, and explored the local context in which they were conducted.

Intentions and benefits of quality circles

Knowledge and skills acquired during early medical education must be regularly updated through continuous medical education, which helps medical professionals apply new knowledge via continuous professional development [33, 41, 136, 137]. CME and CPD are necessary prerequisites for QI [138–141]. QI is a data-guided activity that improves health care delivery by solving local problems like inefficient, harmful, or badly-timed health care [142, 143]. In some European countries, QCs seem to play a major role in QI; in others, they mainly serve CME and CPD [94].

The qualitative literature and background papers described the benefits of QCs. GPs seem to prefer learning in small groups [85, 103, 107, 140, 144] that help them to link evidence to everyday practice [79], learn to deal with uncertainty [81] and show them how to improve practice and feel secure in their professional roles [84]. QCs are a vehicle for discussing issues and reflecting on practice, which may raise self-esteem [83, 100]. Frequent participation strengthens team-based strategies for preventing errors [86]. When participants talk about their practice performance in groups, this can take them outside their comfort zone, causing anxiety and generating a stress response [83, 145]. But this stress response may improve

communication skills and provide a learning opportunity [88, 89]. Several groups of authors note that working in small groups may help prevent burnout and give general practitioners a sense of belonging that so they changed workplace less often [51, 80, 89, 146–148].

Reported effectiveness

We assessed 24 quantitative studies and one SR to determine if they claimed QCs promote behaviour change. Authors of four studies that examined guideline adherence reported their positive results had limited validity; four RCTs on the topic showed no effect, so the evidence on behaviour change concerning guideline adherence is not convincing. We found 15 papers, including one that summarized three studies and one SR, that suggest QCs may improve individual and group performance by reducing costs, encouraging professionals to order fewer but more appropriate tests, improving prescription habits, and reporting critical incidents. Reported effectiveness varied substantially within and among studies (Table 1).

SRs and one RCT show that facilitation enabled participants in QCs to introduce changes [43, 47] and that multifaceted interventions, peer review, audit, and feedback reinforce behaviour change [149] (Table 2).

Summary of unanswered questions on quality circles addressed in the literature

Every author of an SRs that found QC techniques changed behaviour noted considerable variation within and between studies. They could document behaviour change in a SR, but not explain why it happened. SRs and RCTs that studied QC techniques only evaluated the impact or effectiveness of individual techniques but QCs often combine techniques and, in these cases, it is not clear how much each contributes to the overall effect [34, 36, 53].

To determine how and why techniques do or do not work, each step in the intervention process needs to be described in detail [38, 41, 44, 49] so we can evaluate the effectiveness of each step and each intervention, individually and in combination. For example, steps could include combining printed educational material with input from local opinion leaders, CME workshops, or outreach visits [48, 49].

We also need to account for the different contextual features of health care systems, and the roles these features play at each level. For instance, at the group level, professionals with different backgrounds may not all be equally involved in QI. At the institutional level, support for QC groups may vary. At the policy level, not all countries may leave QI to locally organised small groups [150]. We do not yet know which techniques should be used or what circumstances encourage QC participants to change their behaviour [52]. For example, audit and feedback interventions typically produce heterogeneous effects, and we would need to identify the underlying reasons for behaviour change after audit and feedback before we could know when to deliver this intervention, how best to design it, and how to optimise it in routine practice [50].

Small group work succeeds in continuous medical education, but we must ask how and why it could work or fail for quality projects [84]. What resources can small groups offer GPs to support changing their behaviour [73]? What is it about QCs that can improve the clinical performance of GPs? What group factors are crucial to better outcomes [74]. How frequently should group process should be repeated [50, 64, 65]? In their SR, Cadogan et al. argue that future research should be designed to improve our understanding of when, how, and why interventions like education or providing guidelines are likely to be effective and how these interventions can be improved. Such intervention studies should be based on a theory that can explain changes in clinical practice [53].

Table 1. Effectiveness of quality circles.

First author/year	Study type	Intervention	Effective
		<i>Guideline adherence improved</i>	
Hartmann 1995 [68]	Controlled before-and-after	Diabetes type 2	(Yes)
Ioannidis 2007 [71]	Case series	Osteoporosis, pilot	(Yes)
Ioannidis 2009 [73]	Interrupted time series	Osteoporosis	Yes
Mahlknecht 2016 [78]	Case series	Chronic diseases	(Yes)
Elward 2014 [7]	controlled before-and-after	Asthma	(Yes)
Goldberg 1998 [54]	Randomised controlled	Hypertension and depression	No
Lagerlov 2000 [55]	Randomised controlled	Asthma and urinary tract infections	Yes
Schneider 2008 [60]	Randomised controlled	Asthma	No
Wilcock 2013 [64]	Randomised controlled	Dementia	No
Jager 2017 [67]	Randomised controlled	Polypharmacy	No
		<i>Prescription quality improved</i>	
Dyrkorn 2016 [77]	controlled before-and-after	for antibiotics	Yes
Welschen 2004 [59]	Randomised controlled	for antibiotics	Yes
Gjelstad 2013 [6]	Randomised controlled	for antibiotics	Yes
Vervloet 2016 [66]	Randomised controlled	for antibiotics	Yes
Rognstad 2013 [63]	Randomised controlled	in general, for elderly	Yes
Richards 2003 [69]	Historically controlled study	in general	Yes
		<i>Prescription quality improved and/or costs decreased</i>	
Wensing 2004 [70]	controlled before-and-after	prescription quality and costs	Yes
Wensing 2009 [7]	controlled before-and-after	prescription quality and costs	Yes
Niquille 2010 [75]	Cohort	prescription quality and costs	Yes
Riou 2007 [72]	Cohort	prescription costs	Yes
		<i>Test ordering quality improved and/or costs decreased</i>	
Verstappen 2003 [56]	Randomised controlled	test ordering quality	Yes
Verstappen 2004 [57]	Randomised controlled	test ordering quality	Yes
Verstappen 2004 [58]	Randomised controlled	test ordering quality and cost reduction	Yes
		<i>Patient safety improved</i>	
Verbakel 2015 [65]	Randomised controlled	reporting critical incidents	Yes
Zaher 2012 [51]	Systematic review	Behaviour change	Yes

() means that authors report limited validity of the results

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Discussion

Summary

QCs originated in industry and were implemented in health care after adapting aspects of quality critical for health care. QCs spread rapidly, since group work appears to meet GP expectations about CME, CPD and QI projects. As costs for health care have risen, so has the need for participatory, problem-solving group approaches and for shared responsibility. Reported benefits included giving participating professionals a better understanding of their roles, increasing their self-confidence and preventing burnout. But the reported effect of QCs on behaviour change varies substantially within and across studies, making interpretation of study results difficult.

Table 2. Systematic reviews and randomised controlled trials of techniques used in quality circles.

First author / year	Tool	Study type	Effect
Predisposing			
Davis 1999 [33]	Interactive CME meetings	SR	+
Davis 2006 [37]	Self-assessment	SR	-
O'Brien 2007 [38]	Educational outreach visits	SR	+
Bowie 2008 [39]	Significant event analysis	SR	+ / -
O'Brian 2001, Forsetlund 2009 [35, 41]	Educational meetings and workshops	SR	+
Harris 2011 [45]	Journal club	SR	+ / -
Flodgren 2011 [44]	Local opinion leaders	SR	+
Farmer 2008, Giguere 2012 [40, 48]	Printed educational materials	SR	+ / -
Enabling			
Grimshaw 2012 [49]	Clinical guidelines	SR	+ / -
Dogherty 2010, Baskerville 2012 [43, 47]	Facilitation	SR	++
Baker 2010, Baker 2015 [42, 52]	Tailored interventions	SR	+
Parmelli 2011 [46]	Change in organisational culture	SR	+/-
Reinforcing			
Gill 1999 [34]	Multifaceted interventions to improve prescribing	SR	+
Arnold 2005 [36]	Multifaceted interventions to improve antibiotic prescribing	SR	+
Roberts 2012 [61]	Peer review	RCT	+
Ivers 2012 [50]	Audit and feedback	SR	++
Cadogan 2015 [53]	Multifaceted interventions to improve test ordering	SR	+

+ / —no conclusive evidence

+ small effect

++ significant effect

<https://doi.org/10.1371/journal.pone.0202616.t002>

Limitations of retrieved papers

Most of the papers we reviewed found QCs had positive effects. This may suggest publication bias or outcome reporting bias [32]. Researcher allegiance could be one of the reasons for outcome reporting bias as it is likely that researchers and participants may have had a special interest in and were favourably disposed towards the QCs they examined. We found only one study that examined the performance of everyday activities of QCs [75], so data were mostly limited to interventions in newly formed groups. In existing QCs, researchers did not usually measure planned change, but performance after an intervention researcher introduced.

Implications

Since QCs are a non-standardized complex intervention that varies by the topic and context of a group, inconsistent outcomes are unsurprising [151]. Complex interventions are hard to study, but realist approaches like realist review and realist evaluation could help us to make sense of QC outcomes [152–154]. These methods are designed to explain empirical outcomes and not just to quantify effect size. Since why and how QCs work is just as important as whether they can work, we need to understand the theoretical basis of interventions before we can explain why performance differs depending on the context, content, and application of QCs. Theoretical models from other research fields like psychology and sociology could aid this exploration, since these also evolved to analyse complex events and actions in different contexts. We have begun a realist review to fill some of these knowledge gaps [155].

Strengths and limitations

Our review conforms to standard methods for scoping reviews and summarizes literature in all languages so it can guide future search and research strategies. Consulting varied sources allowed us to cross-check the information we gleaned from the articles. Because scoping reviews do not assess the methodological quality of included studies, our results are suggestive rather than conclusive.

Conclusion

Quality circles originated in industry and migrated to health care where they meet the demands of general practitioners for continuous medical education, continuous professional development, and quality improvement. Quality circles may positively influence professional role perception and self-esteem, which could explain their broad, international adoption. But reported effects on prescribing behaviour or process changes vary substantially between studies, so we suggest a realist approach to exploring the constituents and contextual features of quality circles that improve performance

Supporting information

S1 File. Search strings.

(DOCX)

S2 File. Text books.

(DOCX)

S3 File. Background papers.

(DOCX)

S4 File. Papers examining quality circles.

(DOCX)

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References

1. Onglatco MU, Matsui T. The Anatomy of Japanese Quality Circles 1991 [Les cercles de Qualité]. Available from: <http://civilisations.revues.org/index1666.html>.
2. Diel F. Qualitätszirkel 2013 [German Definition of Structured Small Group Work]. Available from: <http://www.kbv.de/html/qualitaetszirkel.php>. German.
3. Garbutt D, Dunion L, Walker S, Ford L, Steele D, Tannahill A, et al. Welcome to the Practice Based Small Group Learning (PBSGL) Glasgow: National Health Service Scotland; 2015 [cited 2015 10/09]. PBSGL Home Page]. Available from: [http://www.nes.scot.nhs.uk/education-and-training-by-theme-initiative/patient-safety-and-clinical-skills/safe-results/practice-based-small-group-learning-\(pbsgl\).aspx](http://www.nes.scot.nhs.uk/education-and-training-by-theme-initiative/patient-safety-and-clinical-skills/safe-results/practice-based-small-group-learning-(pbsgl).aspx).
4. Kirk UB. European Society of Quality and Safety in Primary Health Care (EQuIP): a network organisation within WONCA Region Europe 2015 [Available from: <http://equip.woncaeurope.org/outputs/72-peer-reviewed-activities-2015-2011>].
5. Arvidsson GA, Elmroth U. PrimärvårdsKvalitet—lanseringen fortsätter! [Quality in primary health care—the launch continues]. Allmän Medicin [Internet]. 2016 25/10/2016 [cited 2016 10/8]; 2. Available from: <http://sfam.se/artiklar/primarvardskvalitet-lanseringen-fortsatter>. Swedish.
6. Hockl W. Qualitätszirkel 2016 [Austrian Definition of Structured Small Group Work]. Available from: <https://oegam.at/qualitaetssicherung-und-qualitaetszirkel>. German.
7. Finnegan H. CME Small Group Meetings Dublin: Irish College of General Practitioners (ICPC); 2017 [Irish Structured Small Group Work]. Available from: https://www.icgp.ie/go/courses/cme_small_group_meetings.
8. Elmslie T, Armson H, McLeod E, Bordma R, Shaw E, Teeple L, et al. Practice Based Small Group Learning (PBSGL) Hamilton: McMaster; 2017 [Canadian Structured Small Group Work]. Available from: <https://www.fmpe.org/>.
9. Rial J. Practice Based Small Group Learning (PBSGL) Southampton2017 [English Structured Small Group Work]. Available from: <https://www.pbsgl.co.uk/>.
10. Dressarts T, Martin C. Les Groups de Pairs Paris: SGMF; 2017 [French Structured Small Group Work]. Available from: http://www.sfmf.org/groupe_de_pairs/. French.
11. Rohrbasser A. Qualitätszirkel Bern: SSIM; 2017 [Swiss Definition of Structured Small Group Work]. Available from: <http://www.sgaim.ch/de/qualitaet/qualitaetszirkel.html>. German/French.
12. Smith GI, Mercer SW, Gillies JC, McDevitt A. Improving together: a new quality framework for GP clusters in Scotland. *British Journal of General Practice*. 2017; 67(660):294–5. <https://doi.org/10.3399/bjgp17X691601> PMID: 28663413
13. Rohrbasser A, Guthrie B, Gillies G, Mercer S. Collaborative Quality Improvement in General Practice Clusters. Report. Glasgow: Scottish School of Primary Care; 2017 03/08/2017. Contract No.: 12.
14. Pham MT, Rajić A, Greig JD, Sargeant JM, Papadopoulos A, McEwen SA. A scoping review of scoping reviews: advancing the approach and enhancing the consistency. *Research Synthesis Methods*. 2014; 5(4):371–85. <https://doi.org/10.1002/jrsm.1123> PMID: 26052958
15. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implementation Science: IS*. 2010; 5:69–. <https://doi.org/10.1186/1748-5908-5-69> PMID: 20854677
16. Moher D, Stewart L, Shekelle P. All in the Family: systematic reviews, rapid reviews, scoping reviews, realist reviews, and more. *Systematic Reviews*. 2015; 4(1):183.
17. Armstrong R, Hall BJ, Doyle J, Waters E. 'Scoping the scope' of a cochrane review. *Journal of Public Health*. 2011; 33(1):147–50. <https://doi.org/10.1093/pubmed/fdr015> PMID: 21345890
18. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*. 2005; 8(1):19–32.
19. Peters MDJ, Godfrey CM, Khalil H, McInerney P, Parker D, Soares CB. Guidance for conducting systematic scoping reviews. *International Journal of Evidence-Based Healthcare*. 2015; 13(3):141–6. <https://doi.org/10.1097/XEB.000000000000050> PMID: 26134548
20. Ross JE, Ross WC. Japanese quality circles and productivity Reston, Va.: Reston Pub. Co; 1982.
21. Ishikawa K. How to Operate Quality Circle Activities. Tokyo: QC Headquarters, Union of Japanese Scientists and Engineers; 1985.

22. Lawrence M, Schofield T. *Medical Audit in Primary Health Care*. Press OU, editor: Oxford University Press; 1993.
23. Gerlach FM, Bahrs O. *Qualitätssicherung durch hausärztliche Qualitätszirkel: Strategien zur Etablierung*. Bibliothek DD, editor. Berlin: Ullstein Mosby; 1994.
24. Bahrs O, Gerlach FM, Szecsenyi J, editors. *Ärztliche Qualitätszirkel: Leitfaden für den niedergelassenen Arzt*. 2 ed. Köln: Deutscher Ärzteverlag; 1995.
25. Grol R, Lawrence M, editors. *Quality Improvement by Peer Review*. Oxford: Oxford University Press; 1995.
26. Marinker M, editor. *Medical Audit and General Practice* Second edition ed. London: BMJ Publishing Group; 1995.
27. Fraser R, Mayur L, Baker R. *Evidence-Based Audit in General Practice Science E*, editor: Butterworth Heinemann; 1999.
28. Tross O. *Qualitätszirkel als Form der Arbeitsorganisation: Planung und Gestaltung von Qualitätszirkeln als Variante der Teamarbeit in Unternehmen*. GRIN, editor. München: Verlag für Akademische Texte; 2003.
29. Elwyn G, Greenhalg T, Macfarlane F. *Groups. A guide to small group work in healthcare, management, education and research*: Radcliffe Medical Press; 2004.
30. Saltman R, Bankauskaite V, Vrangbaek K. *Primary care in the driver's seat?: Organizational reform in European primary care*: McGraw-Hill Education (UK); 2005.
31. Sommers LS, Launer J, editors. *Clinical uncertainty in primary care: the challenge of collaborative engagement*. London: Springer; 2013.
32. Green S, Higgins J. *Cochrane handbook for systematic reviews of interventions*. Version; 2005.
33. Davis D, O'Brien M, Freemantle N, Wolf FM, Mazmanian P, Taylor-Vaisey A. Impact of formal continuing medical education: Do conferences, workshops, rounds, and other traditional continuing education activities change physician behavior or health care outcomes? *JAMA*. 1999; 282(9):867–74. PMID: [10478694](https://pubmed.ncbi.nlm.nih.gov/10478694/)
34. Gill PS, Makela M, Vermeulen KM, Freemantle N, Ryan G, Bond C, et al. Changing doctor prescribing behaviour. *Pharmacy world & science: PWS*. 1999; 21(4):158–67.
35. O'Brien MA, Freemantle N, Oxman AD, Wolf F, Davis DA, Herrin J. Continuing education meetings and workshops: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*. 2001(2):CD003030. <https://doi.org/10.1002/14651858.CD003030> PMID: [11406063](https://pubmed.ncbi.nlm.nih.gov/11406063/)
36. Arnold SR, Straus SE. Interventions to improve antibiotic prescribing practices in ambulatory care. *Cochrane Database Syst Rev*. 2005(4):Cd003539. <https://doi.org/10.1002/14651858.CD003539.pub2> PMID: [16235325](https://pubmed.ncbi.nlm.nih.gov/16235325/)
37. Davis DA, Mazmanian PE, Fordis M, Van Harrison R, Thorpe KE, Perrier L. Accuracy of physician self-assessment compared with observed measures of competence: a systematic review. *JAMA*. 2006; 296(9):1094–102. <https://doi.org/10.1001/jama.296.9.1094> PMID: [16954489](https://pubmed.ncbi.nlm.nih.gov/16954489/)
38. O'Brien MA, Rogers S, Jamtvedt G, Oxman AD, Odgaard-Jensen J, Kristoffersen DT, et al. Educational outreach visits: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*. 2007(4):Cd000409. <https://doi.org/10.1002/14651858.CD000409.pub2> PMID: [17943742](https://pubmed.ncbi.nlm.nih.gov/17943742/)
39. Bowie P, Pope L, Lough M. A review of the current evidence base for significant event analysis. *Journal of Evaluation in Clinical Practice*. 2008; 14(4):520–36. <https://doi.org/10.1111/j.1365-2753.2007.00908.x> PMID: [18462290](https://pubmed.ncbi.nlm.nih.gov/18462290/)
40. Farmer AP, Legare F, Turcot L, Grimshaw J, Harvey E, McGowan JL, et al. Printed educational materials: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*. 2008 (3):Cd004398. <https://doi.org/10.1002/14651858.CD004398.pub2> PMID: [18646106](https://pubmed.ncbi.nlm.nih.gov/18646106/)
41. Forsetlund L, Bjorndal A, Rashidian A, Jamtvedt G, O'Brien MA, Wolf F, et al. Continuing education meetings and workshops: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*. 2009(2):Cd003030. <https://doi.org/10.1002/14651858.CD003030.pub2> PMID: [19370580](https://pubmed.ncbi.nlm.nih.gov/19370580/)
42. Baker R, Camosso-Stefinovic J, Gillies C, Shaw EJ, Cheater F, Flottorp S, et al. Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*. 2010(3):Cd005470. <https://doi.org/10.1002/14651858.CD005470.pub2> PMID: [20238340](https://pubmed.ncbi.nlm.nih.gov/20238340/)
43. Dogherty EJ, Harrison MB, Graham ID. Facilitation as a Role and Process in Achieving Evidence-Based Practice in Nursing: A Focused Review of Concept and Meaning. *Worldviews on Evidence-Based Nursing*. 2010; 7(2):76–89. <https://doi.org/10.1111/j.1741-6787.2010.00186.x> PMID: [20180826](https://pubmed.ncbi.nlm.nih.gov/20180826/)

44. Flodgren G, Parmelli E, Doumit G, Gattellari M, O'Brien MA, Grimshaw J, et al. Local opinion leaders: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2011(8): Cd000125. <https://doi.org/10.1002/14651858.CD000125.pub4> PMID: [21833939](#)
45. Harris J, KK, Henegan C, ME, N. R, R. P. Are journal clubs effective in supporting evidence-based decision making? A systematic review. *BEME Guide No. 16. Medical Teacher.* 2011; 33(1):9–23. <https://doi.org/10.3109/0142159X.2011.530321> PMID: [21182379](#)
46. Parmelli E, Flodgren G, Schaafsma ME, Baillie N, Beyer FR, Eccles MP. The effectiveness of strategies to change organisational culture to improve healthcare performance. *Cochrane Database Syst Rev.* 2011(1):Cd008315. <https://doi.org/10.1002/14651858.CD008315.pub2> PMID: [21249706](#)
47. Baskerville NB, Liddy C, Hogg W. Systematic Review and Meta-Analysis of Practice Facilitation Within Primary Care Settings. *The Annals of Family Medicine.* 2012; 10(1):63–74. <https://doi.org/10.1370/afm.1312> PMID: [22230833](#)
48. Giguere A, Legare F, Grimshaw J, Turcotte S, Fiander M, Grudniewicz A, et al. Printed educational materials: effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev.* 2012; 10:CD004398. <https://doi.org/10.1002/14651858.CD004398.pub3> PMID: [23076904](#)
49. Grimshaw JM, Schunemann HJ, Burgers J, Cruz AA, Heffner J, Metersky M, et al. Disseminating and implementing guidelines: article 13 in Integrating and coordinating efforts in COPD guideline development. An official ATS/ERS workshop report. *Proceedings of the American Thoracic Society.* 2012; 9(5):298–303. <https://doi.org/10.1513/pats.201208-066ST> PMID: [23256174](#)
50. Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, et al. Audit and feedback: effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev.* 2012(6): Cd000259. <https://doi.org/10.1002/14651858.CD000259.pub3> PMID: [22696318](#)
51. Zaher E, Ratnapalan S. Practice-based small group learning programs: systematic review. *Can Fam Physician.* 2012; 58(6):637–42, e310-6. PMID: [22859626](#)
52. Baker R, Camosso-Stefinovic J, Gillies C, Shaw EJ, Cheater F, Flottorp S, et al. Tailored interventions to address determinants of practice. *Cochrane Database Syst Rev.* 2015(4):Cd005470. <https://doi.org/10.1002/14651858.CD005470.pub3> PMID: [25923419](#)
53. Cadogan SL, Browne JP, Bradley CP, Cahill MR. The effectiveness of interventions to improve laboratory requesting patterns among primary care physicians: a systematic review. *Implement Sci.* 2015; 10:167. <https://doi.org/10.1186/s13012-015-0356-4> PMID: [26637335](#)
54. Goldberg HI, Wagner EH, Fihn SD, Martin DP, Horowitz CR, Christensen DB, et al. A randomized controlled trial of CQI teams and academic detailing: can they alter compliance with guidelines? *Joint Commission Journal on Quality Improvement.* 1998; 24(3):130–42. PMID: [9568553](#)
55. Lagerlov P, Loeb M, Andrew M, Hjortdahl P. Improving doctors' prescribing behaviour through reflection on guidelines and prescription feedback: a randomised controlled study. *Qual Health Care.* 2000; 9(3):159–65. <https://doi.org/10.1136/qhc.9.3.159> PMID: [10980076](#)
56. Verstappen WH, van der Weijden T, Sijbrandij J, Smeele I, Hermsen J, Grimshaw J, et al. Effect of a practice-based strategy on test ordering performance of primary care physicians: a randomized trial. *JAMA.* 2003; 289(18):2407–12. <https://doi.org/10.1001/jama.289.18.2407> PMID: [12746365](#)
57. Verstappen WH, van der Weijden T, Dubois WI, Smeele I, Hermsen J, Tan FE, et al. Improving test ordering in primary care: the added value of a small-group quality improvement strategy compared with classic feedback only. *Ann Fam Med.* 2004; 2(6):569–75. <https://doi.org/10.1370/afm.244> PMID: [15576543](#)
58. Verstappen WH, van Merode F, Grimshaw J, Dubois WI, Grol RP, van der Weijden T. Comparing cost effects of two quality strategies to improve test ordering in primary care: a randomized trial. *Int J Qual Health Care.* 2004; 16(5):391–8. <https://doi.org/10.1093/intqhc/mzh070> PMID: [15375100](#)
59. Welschen I, Kuyvenhoven MM, Hoes AW, Verheij TJ. Effectiveness of a multiple intervention to reduce antibiotic prescribing for respiratory tract symptoms in primary care: randomised controlled trial. *BMJ.* 2004; 329(7463):431. <https://doi.org/10.1136/bmj.38182.591238.EB> PMID: [15297305](#)
60. Schneider A, Wensing M, Biessecker K, Quinzler R, Kaufmann-Kolle P, Szecsenyi J. Impact of quality circles for improvement of asthma care: results of a randomized controlled trial. *J Eval Clin Pract.* 2007; 14(2):185–90. <https://doi.org/10.1111/j.1365-2753.2007.00827.x> PMID: [18093108](#)
61. Roberts CM, Stone RA, Buckingham RJ, Pursey NA, Lowe D, Potter JM. A randomized trial of peer review: the UK National Chronic Obstructive Pulmonary Disease Resources and Outcomes Project: three-year evaluation. *J Eval Clin Pract.* 2012; 18(3):599–605. <https://doi.org/10.1111/j.1365-2753.2011.01639.x> PMID: [21332611](#)
62. Gjelstad S, Hoye S, Straand J, Brekke M, Dalen I, Lindbaek M. Improving antibiotic prescribing in acute respiratory tract infections: cluster randomised trial from Norwegian general practice (prescription peer academic detailing (Rx-PAD) study). *BMJ.* 2013; 347:f4403. <https://doi.org/10.1136/bmj.f4403> PMID: [23894178](#)

63. Rognstad S, Brekke M, Fetveit A, Dalen I, Straand J. Prescription peer academic detailing to reduce inappropriate prescribing for older patients: a cluster randomised controlled trial. *Br J Gen Pract.* 2013; 63(613):e554–62. <https://doi.org/10.3399/bjgp13X670688> PMID: [23972196](https://pubmed.ncbi.nlm.nih.gov/23972196/)
64. Wilcock J, Iliffe S, Griffin M, Jain P, Thune-Boyle I, Lefford F, et al. Tailored educational intervention for primary care to improve the management of dementia: The EVIDEM-ED cluster randomized controlled trial. *Trials.* 2013; 14 (1) (no pagination)(397).
65. Verbakel NJ, Langelaan M, Verheij TJM, Wagner C, Zwart DLM. Effects of patient safety culture interventions on incident reporting in general practice: A cluster randomised trial a cluster randomised trial. *British Journal of General Practice.* 2015; 65(634):e319–e29. <https://doi.org/10.3399/bjgp15X684853> PMID: [25918337](https://pubmed.ncbi.nlm.nih.gov/25918337/)
66. Vervloet M, Meulepas MA, Cals JW, Eimers M, van der Hoek LS, van Dijk L. Reducing antibiotic prescriptions for respiratory tract infections in family practice: results of a cluster randomized controlled trial evaluating a multifaceted peer-group-based intervention. *NPJ Primary Care Respiratory Medicine.* 2016; 26:15083. <https://doi.org/10.1038/hnpjcrm.2015.83> PMID: [26845640](https://pubmed.ncbi.nlm.nih.gov/26845640/)
67. Jager C, Freund T, Steinhäuser J, Stock C, Krisam J, Kaufmann-Kolle P, et al. Impact of a tailored program on the implementation of evidence-based recommendations for multimorbid patients with polypharmacy in primary care practices—results of a cluster-randomized controlled trial. *Implementation Science.* 2017; 12(1):8. <https://doi.org/10.1186/s13012-016-0535-y> PMID: [28086976](https://pubmed.ncbi.nlm.nih.gov/28086976/)
68. Hartmann P, Grusser M, Jorgens V. Strukturierte kassenärztliche Qualitätszirkel zum Thema Diabetikerbetreuung in der Praxis [Structured public health quality circle on the topic of diabetes management in general practice]. *Zeitschrift für ärztliche Fortbildung.* 1995; 89(4):415–8. German. PMID: [7571745](https://pubmed.ncbi.nlm.nih.gov/7571745/)
69. Richards D, Toop L, Graham P. Do clinical practice education groups result in sustained change in GP prescribing? *Family Practice.* 2003; 20(2):199–206. PMID: [12651796](https://pubmed.ncbi.nlm.nih.gov/12651796/)
70. Wensing M, Broge B, Kaufmann-Kolle P, Andres E, Szecsenyi J. Quality circles to improve prescribing patterns in primary medical care: what is their actual impact? *J Eval Clin Pract.* 2004; 10(3):457–66. <https://doi.org/10.1111/j.1365-2753.2004.00517.x> PMID: [15304146](https://pubmed.ncbi.nlm.nih.gov/15304146/)
71. Ioannidis G, Papaioannou A, Thabane L, Gafni A, Hodsman A, Kvern B, et al. Canadian Quality Circle pilot project in osteoporosis: rationale, methods, and feasibility. *Can Fam Physician.* 2007; 53(10):1694–700. PMID: [17934033](https://pubmed.ncbi.nlm.nih.gov/17934033/)
72. Riou F, Piette C, Durand G, Chaperon J. Results of a 12-month quality-circle prescribing improvement programme for GPs. *Br J Gen Pract.* 2007; 57(540):574–6. PMID: [17727751](https://pubmed.ncbi.nlm.nih.gov/17727751/)
73. Ioannidis G, Papaioannou A, Thabane L, Gafni A, Hodsman A, Kvern B, et al. The utilization of appropriate osteoporosis medications improves following a multifaceted educational intervention: the Canadian quality circle project (CQC). *BMC Medical Education.* 2009; 9:54. <https://doi.org/10.1186/1472-6920-9-54> PMID: [19660103](https://pubmed.ncbi.nlm.nih.gov/19660103/)
74. Wensing M, Broge B, Riens B, Kaufmann-Kolle P, Akkermans R, Grol R, et al. Quality circles to improve prescribing of primary care physicians. Three comparative studies. *Pharmacoepidemiology and drug safety.* 2009; 18(9):763–9. <https://doi.org/10.1002/pds.1778> PMID: [19507170](https://pubmed.ncbi.nlm.nih.gov/19507170/)
75. Niquille A, Ruggli M, Buchmann M, Jordan D, Bugnon O. The nine-year sustained cost-containment impact of swiss pilot physicians-pharmacists quality circles. *Ann Pharmacother.* 2010; 44(4):650–7. <https://doi.org/10.1345/aph.1M537> PMID: [20215496](https://pubmed.ncbi.nlm.nih.gov/20215496/)
76. Elward K, Blackburn B, Peterson LE, Greenawald M, Hagen MD. Improving quality of care and guideline adherence for asthma through a group self-assessment module. *Journal of the American Board of Family Medicine.* 2014; 27(3):391–8. <https://doi.org/10.3122/jabfm.2014.03.130241> PMID: [24808118](https://pubmed.ncbi.nlm.nih.gov/24808118/)
77. Dyrkorn R, Gjelstad S, Espnes KA, Lindbaek M. Peer academic detailing on use of antibiotics in acute respiratory tract infections. A controlled study in an urban Norwegian out-of-hours service. *Scandinavian Journal of Primary Health Care.* 2016; 34(2):180–5. <https://doi.org/10.3109/02813432.2016.1163035> PMID: [27054812](https://pubmed.ncbi.nlm.nih.gov/27054812/)
78. Mahlknecht A, Abuzahra ME, Piccoliori G, Enthaler N, Engl A, Sonnichsen A. Improving quality of care in general practices by self-audit, benchmarking and quality circles. *Wiener klinische Wochenschrift.* 2016; 128(19–20):706–18. <https://doi.org/10.1007/s00508-016-1064-z> PMID: [27599700](https://pubmed.ncbi.nlm.nih.gov/27599700/)
79. Watkins C, Timm A, Gooberman-Hill R, Harvey I, Haines A, Donovan J. Factors affecting feasibility and acceptability of a practice-based educational intervention to support evidence-based prescribing: a qualitative study. *Fam Pract.* 2004; 21(6):661–9. <https://doi.org/10.1093/fampra/cmh614> PMID: [15528289](https://pubmed.ncbi.nlm.nih.gov/15528289/)
80. Jenson CM, Hutchins AJ, Rowlands G. Is small-group education the key to retention of sessional GPs? *Education for Primary Care.* 2006; 17(3):218–26. <https://doi.org/10.1080/14739879.2006.11864065> PMID: [28240104](https://pubmed.ncbi.nlm.nih.gov/28240104/)

81. Sommers LS, Morgan L, Johnson L, Yatabe K. Practice inquiry: clinical uncertainty as a focus for small-group learning and practice improvement. *J Gen Intern Med.* 2007; 22(2):246–52. <https://doi.org/10.1007/s11606-006-0059-2> PMID: 17356994
82. Overton GK, McCalister P, Kelly D, MacVicar R. The Practice-based Small Group Learning programme: experiences of learners in multi-professional groups. *J Interprof Care.* 2009; 23(3):262–72. <https://doi.org/10.1080/13561820802697628> PMID: 19415563
83. Frich J, Høye S, Lindbaek M, Straand J. General practitioners and tutors' experiences with peer group academic detailing: a qualitative study. *BMC Family Practice.* 2010; 11(1):12.
84. Fisher DM, Brenner CJ, Cheren M, Stange KC. Engagement of groups in family medicine board maintenance of certification. *Journal of the American Board of Family Medicine: JABFM.* 2013; 26(2):149–58. <https://doi.org/10.3122/jabfm.2013.02.120262> PMID: 23471928
85. Francois P, Philibert AC, Esturillo G, Sellier E. Groupes d'échange de pratique entre pairs: un modèle pour le développement professionnel continu en médecine générale [Peer groups: a model for the continuous professional development in general practice]. *Presse Medicale.* 2013; 42(1):e21–7. French.
86. Gehring K, Schwappach DLB, Battaglia M, Buff R, Huber F, Sauter P, et al. Safety climate and its association with office type and team involvement in primary care. *International Journal for Quality in Health Care.* 2013; 25(4):394–402. <https://doi.org/10.1093/intqhc/mzt036> PMID: 23667155
87. Andres E, Ludt S, Mainz A, Peters-Klimm F. 20 years of quality circles for family practitioners—Stock-taking and perspectives: A workshop report. [German]. *Zeitschrift für Allgemeinmedizin.* 2015; 91(2):66–70.
88. Gehring SC, Kandzora J, Jeske-Saathoff E, Laag S, Hofmann W, Steinhauser J. Structured pharmacotherapy in multimorbid seniors—A pilot project. [German]. *Zeitschrift für Allgemeinmedizin.* 2017; 93(6):266–70.
89. Nielsen HG, Davidsen AS. Witnesses in the consultation room—Experiences of peer group supervision. *Education for Primary Care.* 2017; 28(5):258–64. <https://doi.org/10.1080/14739879.2017.1300510> PMID: 28317462
90. Ter Brugge BPH, Bartelink MEL, Damoiseaux R, de Groot E. The use of evidence during group meetings of Dutch general practitioners. *Education for Primary Care.* 2017; 28(6):307–12. <https://doi.org/10.1080/14739879.2017.1344934> PMID: 28701105
91. Schillemans L, Grande LD, Remmen R. Using quality circles to evaluate the efficacy of primary health care. *New Directions for Program Evaluation.* 1989; 1989(42):19–27.
92. Gerlach FM, Beyer M, Romer A. Quality circles in ambulatory care: state of development and future perspective in Germany. *Int J Qual Health Care.* 1998; 10(1):35–42. PMID: 10030785
93. Ennis K, Harrington D. Quality management in Irish health care. *Int J Health Care Qual Assur Inc Leadersh Health Serv.* 1999; 12(6–7):232–43. PMID: 10724566
94. Beyer M, Gerlach FM, Flies U, Grol R, Krol Z, Munck A, et al. The development of quality circles/peer review groups as a method of quality improvement in Europe. Results of a survey in 26 European countries. *Fam Pract.* 2003; 20(4):443–51. PMID: 12876119
95. Chop I, Eberlein-Gonska M. Übersichtsartikel zum Peer Review Verfahren und seine Einordnung in der Medizin [Overview on peer review techniques]. *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen.* 2012; 106(8):547–52. German. <https://doi.org/10.1016/j.zefq.2012.08.017> PMID: 23084858
96. Armson H, Elmslie T, Roder S, Wakefield J. Encouraging Reflection and Change in Clinical Practice: Evolution of a Tool. *Journal of Continuing Education in the Health Professions.* 2015; 35(3):220–31. <https://doi.org/10.1002/chp.21299> PMID: 26378428
97. Fuchs S, Parthier K, Wienke A, Mau W, Klement A. Fostering needs assessment and access to medical rehabilitation for patients with chronic disease and endangered work ability: Protocol of a multilevel evaluation on the effectiveness and efficacy of a CME intervention for general practitioners. *Journal of Occupational Medicine and Toxicology.* 2017; 12(1) (no pagination)(21).
98. Shears MR. Peer group learning in the context of an innovative postgraduate certificate for GP trainers: enhancing collaborative learning. *Education for Primary Care.* 2013; 24(6):404–9. PMID: 24196596
99. Eliasson G, Mattsson B. From teaching to learning. Experiences of small CME group work in general practice in Sweden. *Scand J Prim Health Care.* 1999; 17(4):196–200. PMID: 10674295
100. Overton GK, McCalister P, Kelly D, Macvicar R. Practice-based small group learning: how health professionals view their intention to change and the process of implementing change in practice. *Med Teach.* 2009; 31(11):e514–20. <https://doi.org/10.3109/01421590902842425> PMID: 19909029

101. Vollmar HC, Ostermann T, Hinz A, Rieger MA, Butzlaff ME. Hausärzte, Internet und Fortbildungsmedien. Nutzung und Effizienzeinschätzung durch Allgemeinärzte und hausärztlich tätige Internisten im 6-jahres-vergleich [Primary care physicians, internet and educational media. Preferences, usages and appraisal in a 6-year comparison] *Medizinische Klinik*. 2008; 103(6):425–32. German.
102. Jager C, Freund T, Steinhäuser J, Joos S, Wensing M, Szecsenyi J. A tailored implementation intervention to implement recommendations addressing polypharmacy in multimorbid patients: Study protocol of a cluster randomized controlled trial. *Trials*. 2013; 14 (1) (no pagination)(420).
103. Overton GK, Kelly D, McCalister P, Jones J, MacVicar R. The practice-based small group learning approach: making evidence-based practice come alive for learners. *Nurse Education Today*. 2009; 29 (6):671–5. <https://doi.org/10.1016/j.nedt.2009.02.009> PMID: [19321240](https://pubmed.ncbi.nlm.nih.gov/19321240/)
104. Davis MM, Keller S, DeVoe JE, Cohen DJ. Characteristics and lessons learned from practice-based research networks (PBRNs) in the United States. *Journal of Healthcare Leadership*. 2012; 4:107–16. <https://doi.org/10.2147/JHL.S16441> PMID: [26213481](https://pubmed.ncbi.nlm.nih.gov/26213481/)
105. Cunningham DE, Ferguson J, Wakeling J, Zlotos L, Power A. GP and pharmacist inter-professional learning—a grounded theory study. *Education for Primary Care*. 2016; 27(3):188–95. <https://doi.org/10.1080/14739879.2016.1163645> PMID: [27022853](https://pubmed.ncbi.nlm.nih.gov/27022853/)
106. Hömberg R, Voßschulte P. Qualitätszirkel: Selbstbestimmung geht verloren [Structured small group work: loss of autonomy]. *Dtsch Arztebl International*. 2010; 107(36):1690–2. German.
107. Lesmes-Anel J, Robinson G, Moody S. Learning preferences and learning styles: a study of Wessex general practice registrars. *British Journal of General Practice*. 2001; 51(468):559–64. PMID: [11462316](https://pubmed.ncbi.nlm.nih.gov/11462316/)
108. Dahinden A, Rohrbasser A, Ryser O, Zoller M. Definition medizinischer Qualitätszirkel—ein Vernehmlassungstext Eine Neuorientierung der Empfehlungen für die medizinische Qualitätsarbeit in der Schweiz [Definition of structured small group work—acknowledged recommendations for quality improvement in Switzerland]. *Primary Care*. 2005; 5(16):370–2. German.
109. Jensen PM, Trollope-Kumar K, Waters H, Everson J. Building physician resilience. *Can Fam Physician*. 2008; 54(5):722–9. PMID: [18474706](https://pubmed.ncbi.nlm.nih.gov/18474706/)
110. Zwald E. Die ARGOMED-Qualitätszirkel 2013 [Definition of Quality Circle in Networks]. Available from: <http://www.argomed.ch/qualitaetszirkel.html>.
111. Weiss-Plumeyer m. Was sollte ein Moderator machen. In: Bahrs O, Gerlach FM, Szecsenyi J, editors. *Ärztliche Qualitätszirkel*. 2 ed. Köln: Deutscher Ärzte-Verlag; 1995. p. 97–108.
112. MacVicar R, Guthrie V, O'Rourke J, Sneddon A. Supporting educational supervisor development at the interface: evaluation of a pilot of PBSGL for faculty development. *Education for Primary Care*. 2013; 24(3):178–84. PMID: [23676873](https://pubmed.ncbi.nlm.nih.gov/23676873/)
113. Davis DA, Thomson MA, Oxman AD, Haynes RB. Changing physician performance. A systematic review of the effect of continuing medical education strategies. *JAMA*. 1995; 274(9):700–5. PMID: [7650822](https://pubmed.ncbi.nlm.nih.gov/7650822/)
114. Oxman AD, Thomson MA, Davis DA, Haynes RB. No magic bullets: a systematic review of 102 trials of interventions to improve professional practice. *CMAJ*. 1995; 153(10):1423–31. PMID: [7585368](https://pubmed.ncbi.nlm.nih.gov/7585368/)
115. Gerlach FM, Bahrs O, Weiss-Plumeyer M. [Quality circles in family practice—roots, concepts, perspectives]. *Fortschr Med*. 1994; 112(8):56–61. PMID: [8194823](https://pubmed.ncbi.nlm.nih.gov/8194823/)
116. Wakefield J, Herbert CP, Maclure M, Dormuth C, Wright JM, Legare J, et al. Commitment to change statements can predict actual change in practice. *J Contin Educ Health Prof*. 2003; 23(2):81–93. <https://doi.org/10.1002/chp.1340230205> PMID: [12866327](https://pubmed.ncbi.nlm.nih.gov/12866327/)
117. Anwar H, Batty H. Continuing Medical Education Strategy for Primary Health Care Physicians in Oman: Lessons to be learnt. *Oman Medical Journal*. 2007; 22(3):33–5. PMID: [22400090](https://pubmed.ncbi.nlm.nih.gov/22400090/)
118. Niquille A, Ruggli M, Buchmann M, Jordan D, Bugnon O. The nine-year sustained cost-containment impact of Swiss pilot physicians-pharmacists quality circles. *Annals of Pharmacotherapy*. 2008; 44 (4):650–7.
119. Egan M, Bamba C, Thomas S, Petticrew M, Whitehead M, Thomson H. The psychosocial and health effects of workplace reorganisation. 1. A systematic review of organisational-level interventions that aim to increase employee control. *Journal of Epidemiology and Community Health*. 2007; 61(11):945–54. <https://doi.org/10.1136/jech.2006.054965> PMID: [17933951](https://pubmed.ncbi.nlm.nih.gov/17933951/)
120. Mennin S. Small-group problem-based learning as a complex adaptive system. *Teaching and Teacher Education*. 2007; 23(3):303–13.
121. Best M, Neuhauser D. Walter A Shewhart, 1924, and the Hawthorne factory. *Qual Saf Health Care*. 2006; 15(2):142–3. <https://doi.org/10.1136/qshc.2006.018093> PMID: [16585117](https://pubmed.ncbi.nlm.nih.gov/16585117/)
122. Deming WE. Deming's 1950 Lecture to Japanese Management 1950 [Origin of PDSA Cycle]. Available from: <http://hclecures.blogspot.com/1970/08/demings-1950-lecture-to-japanese.html>.

123. Donabedian A. 20 years of research on the quality of medical care, 1964–1984. *Salud Publica Mex.* 1988; 30(2):202–15. PMID: [3137664](#)
124. Schmele JA, Allen ME, Butler S, Gresham D. Quality Circles in the Public Health Sector: Implementation and Effect. *Public Health Nursing.* 1991; 8(3):190–5. PMID: [1946155](#)
125. Wood DF. Problem based learning. *BMJ.* 2003; 326(7384):328–30. PMID: [12574050](#)
126. Premi JN. Continuing medical education in family medicine: a report of eight years' experience. *Can Med Assoc J.* 1974; 111(11):1232–3. PMID: [4434295](#)
127. Walsh AE, Armson H, Wakefield JG, Leadbetter W, Roder S. Using a novel small-group approach to enhance feedback skills for community-based teachers. *Teaching and learning in medicine.* 2009; 21(1):45–51. <https://doi.org/10.1080/10401330802574025> PMID: [19130386](#)
128. Grol R, Baker R, Wensing M, Jacobs A. Quality Assurance in General Practice: the State of the Art in Europe. *Family Practice.* 1994; 11(4):460–7. PMID: [7895977](#)
129. Newton J, Hutchinson A, Steen N, Russell I, Haimes E. Educational potential of medical audit: observations from a study of small groups setting standards. *Quality in health care: QHC.* 1992; 1(4):256–9. PMID: [10136875](#)
130. Thesen J. Kvalitetsverktøp prosjektet 2010 [Quality improvement project 2010] Oslo: NFA; 2010 [updated 10/01/2010. Available from: <http://legeforeningen.no/PageFiles/55104/120213%20Kvalitetsverkt%C3%B8yprosjektet.pdf>. Norwegian.
131. Goldberg HI, Rund DA, Hopkins JR. The Midpeninsula Health Service: action research using small primary care groups to provide evidence-based medicine that empowers patients while continuously improving quality and lowering costs. *Medical care.* 2002; 40(4 Suppl):I132–9.
132. Parker LE, de Pillis E, Altschuler A, Rubenstein LV, Meredith LS. Balancing participation and expertise: a comparison of locally and centrally managed health care quality improvement within primary care practices. *Qualitative Health Research.* 2007; 17(9):1268–79. <https://doi.org/10.1177/1049732307307447> PMID: [17968043](#)
133. Williamson M, Cardona-Morrell M, Elliott JD, Reeve JF, Stocks NP, Emery J, et al. Prescribing Data in General Practice Demonstration (PDGPD) project—a cluster randomised controlled trial of a quality improvement intervention to achieve better prescribing for chronic heart failure and hypertension. *BMC Health Services Research.* 2012; 12:273. <https://doi.org/10.1186/1472-6963-12-273> PMID: [22913571](#)
134. Griem C, Kleudgen S, Diel F. Qualitätssicherung: Instrumente der kollegialen Qualitätsförderung [Quality assurance: tool for collaborative quality improvement]. *Dtsch Arztebl International.* 2013; 110(26):1310–3. German.
135. McKnight A, Mills K. Continuing medical education for general practitioners—a Northern Ireland plan. *Ulster Med J.* 1992; 61(2):157–62. PMID: [1481306](#)
136. Nambiar RM. Professional development—in a changing world. *Singapore medical journal.* 2004; 45(12):551–7. PMID: [15568115](#)
137. Davis D. Continuing education, guideline implementation, and the emerging transdisciplinary field of knowledge translation. *J Contin Educ Health Prof.* 2006; 26(1):5–12. <https://doi.org/10.1002/chp.46> PMID: [16557510](#)
138. Czabanowska K, Klemenc-Ketis Z, Potter A, Rochfort A, Tomasiak T, Csiszar J, et al. Development of a competency framework for quality improvement in family medicine: a qualitative study. *J Contin Educ Health Prof.* 2012; 32(3):174–80. <https://doi.org/10.1002/chp.21142> PMID: [23008079](#)
139. Quasdorf I. Experience exchange in quality circles: No routine approach without recognized training [Erfahrungsaustausch in qualitätszirkeln: Kein Stammtisch, sondern anerkannte Fortbildung]. *Deutsches Arzteblatt.* 2008; 105(5):A206–A9. German.
140. Renschler HE. Methoden für professionelles Weiterlernen: Ergebnis orientierender Umfragen bei Ärzten. [Methods in continuing professional education: results of a pilot survey of physicians] *Schweizerische Rundschau für Medizin Praxis = Revue suisse de médecine Praxis.* 1992; 81(52):1574–85. German. PMID: [1475560](#)
141. Renschler HE. Systematic aspects of problem-based, case-related, practice-oriented, professional continuing education. [German] *Systematik des problemorientierten, fallbezogenen, praxisgebundenen, professionellen Weiterlernens.* *Zeitschrift für ärztliche Fortbildung.* 1995; 89(4):392–6.
142. Ogrinc G, Mooney SE, Estrada C, Foster T, Goldmann D, Hall LW, et al. The SQUIRE (Standards for QUality Improvement Reporting Excellence) guidelines for quality improvement reporting: explanation and elaboration. *Qual Saf Health Care.* 2008; 17(Suppl_1):i13–32.
143. Glasziou P, Ogrinc G, Goodman S. Can evidence-based medicine and clinical quality improvement learn from each other? *BMJ Qual Saf.* 2011; 20 Suppl 1:i13–7.

144. Vollmar HC, Rieger MA, Butzlaff ME, Ostermann T. General Practitioners' preferences and use of educational media: a German perspective. *BMC Health Serv Res.* 2009; 9:31. <https://doi.org/10.1186/1472-6963-9-31> PMID: [19220905](https://pubmed.ncbi.nlm.nih.gov/19220905/)
145. Henriksen K, Hansen EH. The threatened self: general practitioners' self-perception in relation to prescribing medicine. *Soc Sci Med.* 2004; 59(1):47–55. <https://doi.org/10.1016/j.socscimed.2003.10.004> PMID: [15087142](https://pubmed.ncbi.nlm.nih.gov/15087142/)
146. Brondt A, Sokolowski I, Olesen F, Vedsted P. Continuing medical education and burnout among Danish GPs. *British Journal of General Practice.* 2008; 58(546):15–9. <https://doi.org/10.3399/bjgp08X263767> PMID: [18186991](https://pubmed.ncbi.nlm.nih.gov/18186991/)
147. Kjaer NK, Steenstrup AP, Pedersen LB, Halling A. Continuous professional development for GPs: experience from Denmark. *Postgraduate medical journal.* 2014; 90(1065):383–7. <https://doi.org/10.1136/postgradmedj-2012-131679> PMID: [24864203](https://pubmed.ncbi.nlm.nih.gov/24864203/)
148. Peterson U, Bergstrom G, Samuelsson M, Asberg M, Nygren A. Reflecting peer-support groups in the prevention of stress and burnout: randomized controlled trial. *Journal of advanced nursing.* 2008; 63(5):506–16. <https://doi.org/10.1111/j.1365-2648.2008.04743.x> PMID: [18727753](https://pubmed.ncbi.nlm.nih.gov/18727753/)
149. Woodward CA. Improving provider skills. In: Organization WH, editor. *Strategies for assisting health workers to modify and improve skills: Developing quality health care—a process of change.* Geneva: Evidence and Information for Policy, Department of Organization of Health Services Delivery, World Health Organization; 2000.
150. Rubenstein LV, Parker LE, Meredith LS, Altschuler A, DePillis E, Hernandez J, et al. Understanding Team-based Quality Improvement for Depression in Primary Care. *Health Services Research.* 2002; 37(4):1009–29. <https://doi.org/10.1034/j.1600-0560.2002.63.x> PMID: [12236381](https://pubmed.ncbi.nlm.nih.gov/12236381/)
151. Walshe K. Understanding what works—and why—in quality improvement: the need for theory-driven evaluation. *Int J Qual Health Care.* 2007; 19(2):57–9. <https://doi.org/10.1093/intqhc/mzm004> PMID: [17337518](https://pubmed.ncbi.nlm.nih.gov/17337518/)
152. Wong G. Getting to grips with context and complexity—the case for realist approaches. *Gac Sanit.* 2018; 32(2):109–10. <https://doi.org/10.1016/j.gaceta.2017.05.010> PMID: [28735621](https://pubmed.ncbi.nlm.nih.gov/28735621/)
153. Wong G. Making theory from knowledge syntheses useful for public health. *International Journal of Public Health.* 2018.
154. Keith RE, Crosson JC, O'Malley AS, Cromp D, Taylor EF. Using the Consolidated Framework for Implementation Research (CFIR) to produce actionable findings: a rapid-cycle evaluation approach to improving implementation. *Implement Sci.* 2017; 12(1):15. <https://doi.org/10.1186/s13012-017-0550-7> PMID: [28187747](https://pubmed.ncbi.nlm.nih.gov/28187747/)
155. Rohrbasser A, Mickan S, Harris J. Exploring why quality circles work in primary health care: a realist review protocol. *Systematic Reviews.* 2013; 2(1):110.