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Extended Research Article

Proactive Integrated Consultation-Liaison Psychiatry for older medical inpatients: The HOME Study RCT of its effectiveness and cost-effectiveness

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Abstract

Background: Older medical inpatients have complex biopsychosocial problems, which often lead to prolonged hospital stays. Proactive Integrated Consultation-Liaison Psychiatry was designed to help ward teams manage biopsychosocial complexity and thereby reduce the time that older medical inpatients spend in hospital.

Objectives: To assess the experience, effectiveness and cost-effectiveness of enhancing medical care with Proactive Integrated Consultation-Liaison Psychiatry in The HOME Study.

Design and setting: A parallel-group, multicentre, individually randomised controlled trial with process and economic evaluations in 24 medical wards of three National Health Service hospitals.

Participants: Patients aged ≥ 65 years, admitted in an emergency and expected to remain in hospital for at least 2 days from the time of enrolment.

Interventions: Proactive Integrated Consultation-Liaison Psychiatry clinicians (consultation-liaison psychiatrists supported by assisting clinicians) made proactive biopsychosocial assessments of patients' problems, then delivered discharge-focused care as integrated members of ward teams. Usual care was provided by ward teams.

Process evaluation: Observations on training Proactive Integrated Consultation-Liaison Psychiatry clinicians and the care they provided; Proactive Integrated Consultation-Liaison Psychiatry clinicians' experiences of working in the new service model; patients' and ward staff members' experiences of Proactive Integrated Consultation-Liaison Psychiatry.

Primary outcome: Time spent as an inpatient (during the index admission and any emergency re-admissions) in the 30 days post randomisation.

Secondary outcomes: Rate of discharge for the total length of the index admission; discharge destination; length of the index admission post randomisation truncated at 30 days; number of emergency re-admissions, number of days in hospital and rate of death in the year post randomisation; the patient's experience of the hospital stay and view on its length; anxiety; depression; cognitive function; independent functioning; health-related quality of life; overall quality of life.

Economic evaluation: Cost-effectiveness of Proactive Integrated Consultation-Liaison Psychiatry over 1, 3 and 12 months from a hospital perspective.

Results: Two thousand seven hundred and forty-four participants were enrolled (1399 male, 1345 female; mean age 82.3 years; 2565 White; 1373 Proactive Integrated Consultation-Liaison Psychiatry, 1371 usual care). Proactive Integrated Consultation-Liaison Psychiatry was experienced positively by patients (43 interviews) and ward staff (54 interviews). The mean time spent in hospital in the 30 days post randomisation was 11.37 days (standard deviation 8.74) with Proactive Integrated Consultation-Liaison Psychiatry and was 11.85 days (standard deviation 9.00) with usual care; adjusted mean difference −0.45 (95% confidence interval −1.11 to 0.21; $p = 0.18$). The only statistically and clinically significant difference in secondary outcomes was the rate of discharge, which was 8.5% higher [rate ratio 1.09 (95% confidence interval 1.00 to 1.17); $p = 0.042$] with Proactive Integrated Consultation-Liaison Psychiatry – a difference most apparent in patients who stayed for > 2 weeks. Compared with usual care, Proactive Integrated Consultation-Liaison Psychiatry was estimated to be modestly cost saving and cost-effective over 1 and 3, but not 12, months.

Main limitation: Uncertain generalisability to other populations, hospitals and healthcare systems.

Conclusions: This is the first randomised controlled trial of Proactive Integrated Consultation-Liaison Psychiatry. Proactive Integrated Consultation-Liaison Psychiatry is experienced by older medical inpatients and ward staff as enhancing medical care. It is also likely to be cost saving in the short term. Although the trial does not provide strong evidence that Proactive Integrated Consultation-Liaison Psychiatry reduces time in hospital, it does support and inform its future development and evaluation.

Future research: Effectiveness of different forms of Proactive Integrated Consultation-Liaison Psychiatry; predictors of long hospital stays; barriers to and facilitators of the implementation of biopsychosocial medical care.

Study registration: This study is registered as Current Controlled Trials ISRCTN86120296.

Funding: This award was funded by the National Institute for Health and Care Research (NIHR) Health and Social Care Delivery Research programme (NIHR award ref: 15/11/16) and is published in full in *Health and Social Care Delivery Research*; Vol. 13, No. 41. See the NIHR Funding and Awards website for further award information.

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List of abbreviations

DMC	Data Monitoring Committee
EQ-5D	EuroQol-5 Dimensions
EQ-5D-3L	EuroQol-5 Dimensions, three-level version
EQ-5D-5L	EuroQol-5 Dimensions, five-level version
GAD-2	Generalised Anxiety Disorder-2
HRG	Healthcare Resource Group
ICER	incremental cost-effectiveness ratio
IMD	Index of Multiple Deprivation
ISRCTN	International Standard Randomised Controlled Trial Register
MoCA-T	Montreal Cognitive Assessment – Telephone Version
PHQ-2	Patient Health Questionnaire-2
PICLP	Proactive Integrated Consultation-Liaison Psychiatry
PPI	patient and public involvement
PSSRU	Personal Social Services Research Unit
QALY	quality-adjusted life-year
RUC	Rural–Urban Classification
SAE	serious adverse event
SAP	statistical analysis plan
TSC	Trial Steering Committee

Plain language summary

Older patients, admitted to hospital in an emergency, usually have a complex mixture of medical, psychological and social problems. This often leads to long hospital stays.

The HOME Study compared two types of care for older patients to see if we could reduce the time they spend in hospital.

Two thousand seven hundred and forty-four patients took part. Half of the patients got usual National Health Service medical care. The other half got usual National Health Service medical care plus care from psychiatric clinicians. These clinicians worked with them, their family and their medical team to help with their psychological and social problems. The type of care that each patient got was chosen randomly (by chance, using a computer) to make the comparison fair.

Patients, and their medical teams, told us that it was helpful to have the psychiatric clinicians involved in their care. We also found that this type of care may be cost saving for the medical service in the short term. However, our results did not provide enough evidence to recommend it to reduce the time older patients spend in hospital. We still need to develop ways to improve care for older patients and avoid them having to stay in hospital for longer than necessary.

Scientific summary

Background

Older people, who are admitted to acute medical wards in an emergency, often remain there for long periods. These prolonged hospital stays are bad for patients because they increase their risk of hospital-acquired illnesses and lead to mental and physical deterioration and loss of independence after discharge. They are also bad for health services because they increase the cost of care and reduce the availability of hospital beds for new admissions.

Growing evidence suggests that the biopsychosocial complexity of older patients' problems is crucial in prolonging hospital stays. This complexity typically includes an interaction of multiple medical illnesses, psychiatric and psychological conditions (including cognitive impairment, depression and anxiety) and care needs resulting from functional dependency. Ward teams often struggle to manage this complexity. The result is less-efficient medical treatment, difficulty in arranging postdischarge care and consequently, prolonged inpatient stays.

Objectives

Proactive Integrated Consultation-Liaison Psychiatry (PICLP) was specifically designed to help ward teams manage biopsychosocial complexity and thereby reduce the time that older medical inpatients spend in hospital. In PICLP-enhanced medical care, senior consultation-liaison psychiatrists, aided by assisting clinicians, make proactive and comprehensive biopsychosocial assessments of all newly admitted older patients. This assessment informs their work as integrated members of the ward team, delivering ongoing expert biopsychosocial care and ensuring safe and timely discharge.

The HOME Study aimed to assess the experience, effectiveness and cost-effectiveness of enhancing medical care with PICLP.

Methods

We did a parallel-group, multicentre, individually randomised controlled trial in 24 medical wards of three UK hospitals. The trial included a process evaluation and a health economic evaluation. Participants were randomised to PICLP or usual care (1 : 1 ratio), with stratification (by hospital, sex and age) and allocation concealment.

Our process evaluation included: observations on training PICLP clinicians and the care they provided; PICLP clinicians' experiences of working in the new service model and patients' and ward staff members' experiences of PICLP.

We measured the following outcomes using data collected from participants' medical records, the NHS Hospital Episode Statistics database and the Office for National Statistics civil registration database: number of days spent as an inpatient (during the index admission and any emergency re-admissions to acute general hospitals) in the 30 days post randomisation (primary outcome); rate of discharge from hospital (discharges per day) during the total length of the index admission; discharge destination (for participants who had been admitted from a private residence); length of the index admission (post randomisation) truncated at 30 days; number of emergency re-admissions to hospital in the year post randomisation; number of days spent as an inpatient (in an acute general hospital) in the year post randomisation and rate of death in the year post randomisation.

We measured the following outcomes using data collected from participants: experience of the hospital stay (0–10 scale from terrible to excellent); view on the length of the hospital stay ('too short', 'about right' or 'too long'); anxiety (Generalised Anxiety Disorder-2); depression (Patient Health Questionnaire-2); cognitive function (Montreal Cognitive Assessment – Telephone Version); independent functioning (Barthel Index of Activities of Daily Living); health-related

quality of life [EuroQol-5 Dimensions, five-level version (EQ-5D-5L)] and overall quality of life (0–10 scale). We collected these data using telephone interviews (supplemented by in-person visits when necessary) at 1 month and 3 months post randomisation. When possible, we collected data from participants themselves. If a participant was unable to provide data, even with help, we asked a proxy (the consultee, or another family member, friend or clinician) to provide data on their behalf.

Using pre-trial data from the 3 hospitals, we estimated that 2 trial groups of 1794 participants each would give 90% statistical power (and 2 groups with 1340 participants each would give 80% statistical power) at the 5% significance level (two-sided test) to detect a difference of at least 1 day [from 9 to 8 days, standard deviation (SD) 9 days] in the mean number of days spent in hospital in the 30 days post randomisation, allowing for 5% loss to follow-up. We sought to detect a 1-day difference because this amount of time was considered to be meaningful by patients and clinicians. Statisticians and data collectors were masked to treatment allocation, whereas participants and ward staff could not be masked. Analyses were done by intention to treat.

We evaluated the cost-effectiveness of PICLP, from the hospital perspective, over three time horizons (1, 3 and 12 months) using data described above on hospital admissions, deaths and health-related quality of life. The total cost of inpatient care was estimated for each time horizon and was expressed in Great British pounds (2020–1 price year). Health outcomes were expressed in quality-adjusted life-years (QALYs), derived from EQ-5D-5L (valued using the van Hout *et al.*'s crosswalk algorithm) and death data. We present the probabilities of PICLP being cost saving and cost-effective at a range of cost-effectiveness thresholds commonly used in the UK health system.

There was patient and public involvement at all stages of this research with the aim of ensuring that: (1) the research addressed important questions for the NHS; (2) the PICLP intervention was acceptable to patients, families, ward staff and hospital managers; (3) the research procedures captured important information while minimising participant burden; (4) the research was completed effectively and (5) our findings are disseminated widely and rapidly.

The HOME Study included people who were very old, those with multimorbidity and those who lacked the capacity to consent for themselves, groups which are all under-represented in research. The research was conducted in hospitals which all serve urban and rural areas. Our initial research plan also included hospitals in large cities, which would have increased the ethnic diversity of the sample; however, these hospitals were unable to participate.

Results

The HOME Study was successful in recruiting a large representative sample of older patients, who had recently been admitted in an emergency to an acute general hospital; 2744 participants (1399 male, 1345 female) were enrolled between 2 May 2018 and 5 March 2020; 1373 were randomised to PICLP and 1371 to usual care. The trial participants had severe and complex biopsychosocial problems, with a high prevalence of cognitive impairment, depressive and anxiety symptoms, functional dependency and medical multimorbidity.

We found that it was possible to implement PICLP in 24 medical wards across three hospitals over the 2-year period of the trial. PICLP delivery took a surprisingly modest amount of clinical time, totalling a mean of < 2.5 hours over an average patient stay of 11 days.

The 15 PICLP clinicians' experience was that delivering the new service model was both clinically valuable and professionally rewarding. In qualitative interviews with 97 patients, family members and ward staff, it was reported to be a helpful addition to medical care and discharge planning. Interviewees reported that it enhanced the ward team's ability to address psychological, psychiatric and social needs and to provide patient-centred care.

The mean time spent in hospital in the 30 days post randomisation was 11.37 days (SD 8.74) with PICLP and 11.85 days (SD 9.00) with usual care; adjusted mean difference −0.45 [95% confidence interval (CI) −1.11 to 0.21; $p = 0.18$]. The only statistically and clinically significant difference in secondary outcomes was the rate of discharge, which was

8.5% higher [rate ratio 1.09 (95% CI 1.00 to 1.17); $p = 0.042$] with PICLP – a difference most apparent in patients who stayed for > 2 weeks.

In our health economic evaluation, we found that PICLP was likely to be modestly cost saving compared with usual care over the 1- and 3-month (but not the 12-month) time horizons. Similarly, we estimated it to be cost-effective over the 1- and 3-month (but not the 12-month) time horizons at thresholds of ≤ £20,000 per QALY.

Discussion

There are a number of possible reasons why we did not find a larger and statistically significant effect of PICLP on our primary outcome. First, our conceptualisation of how PICLP could reduce time in hospital might have been inadequate. Although patients and ward staff reported that it did help with the management of biopsychosocial complexity, the PICLP clinicians described additional obstacles to prompt discharge that they found difficult to overcome. These included difficulty in achieving a ward team consensus that a patient could go home and challenges in arranging adequate and timely out-of-hospital social care for those patients who needed help with daily tasks. Second, the intensity of PICLP might have been suboptimal as the PICLP clinicians spent only a modest amount of time delivering it. Third, the trial included patients unlikely to benefit from PICLP. Many patients had relatively short hospital stays, whereas our findings suggest that PICLP might be more effective in achieving discharge in those with longer stays. Fourth, trial procedures could have inadvertently impaired the effectiveness of PICLP. Fifth, there could have been contamination of usual care. There was no evidence of increased referrals to consultation-liaison psychiatry in usual care, but the daily presence of the PICLP clinicians on the wards could have changed practice by increasing ward team members' awareness of psychosocial problems and the negative consequences of prolonged hospital stays. Sixth, the trial was underpowered to detect the 1-day difference in time in hospital sought. We recruited 2744 participants, but this was fewer than the planned sample size as recruitment was curtailed by the COVID-19 pandemic. Although our best estimate of the treatment effect is a 0.45-day difference, the CIs around this are wide and include the 1-day difference we sought – thus, this trial cannot exclude a treatment effect of this size.

Strengths and limitations

The strengths of this study include: recruitment of a large and representative sample of older acutely ill medical inpatients, including those with cognitive impairment; a high participation rate; good adherence to the PICLP service manual; a primary outcome that included both the index admission and early re-admissions; the use of routinely collected data for the primary and other outcomes, limiting any potential bias; a high follow-up rate, with few missing patient-reported outcome data apart from those due to deaths; analyses that included pre-planned sensitivity analyses that addressed effects of the COVID-19 pandemic and a process evaluation that studied the experiences of representative samples of patients and medical ward staff across three hospitals.

The limitations of this study include: uncertain generalisability of the findings to other patient populations, hospitals and healthcare systems; a primary outcome that was restricted to the time spent in hospital in the 30 days post randomisation; potential changes in the behaviour of ward staff as a result of PICLP and therefore altered usual care; a main analysis of the primary outcome that did not distinguish patients who were in hospital for < 30 days because they had been discharged from those who were in hospital for < 30 days because they had died; an economic evaluation that took an acute hospital perspective and did not include potential costs to other services, such as community and social care, or to patients and their families and the use of proxies to provide some of the secondary outcome data.

Conclusions

The findings of The HOME Study indicate that PICLP can be delivered at scale, is seen by older inpatients and ward staff as enhancing medical care and may be cost saving in the short term. However, we found insufficient evidence to recommend its implementation to reduce time in hospital. We conclude that further development of PICLP, with more

intensive delivery, a focus on patients at especially high risk of longer stays and greater influence on the wider aspects of care, is warranted.

Areas for future research

Future research could include studies of: the effectiveness and cost-effectiveness of different forms of PICLP; the predictors of long hospital stays to enable interventions to be targeted at those at the highest risk; the barriers to and facilitators of implementing biopsychosocial medical care and the outcomes that are most important to older medical inpatients and their families.

Study registration

This study is registered as Current Controlled Trials ISRCTN86120296 (www.isrctn.com).

Funding

This award was funded by the National Institute for Health and Care Research (NIHR) Health and Social Care Delivery Research programme (NIHR award ref: 15/11/16) and is published in full in *Health and Social Care Delivery Research*; Vol. 13, No. 41. See the NIHR Funding and Awards website for further award information.

Chapter 1 Introduction

Time spent in hospital by older medical inpatients

Older people, who are admitted to acute medical wards in an emergency, often remain there for long periods.[1] These prolonged hospital stays are bad for patients because they increase their risk of hospital-acquired illnesses and lead to mental and physical deterioration and loss of independence after discharge.[1–3] They are also bad for health services because they increase the cost of care and reduce the availability of hospital beds for new admissions.[1]

Although the problem of prolonged stays is set to worsen as the number of older people increases, an effective solution remains elusive. A rapid evidence assessment, funded by National Institute for Health Research and published in 2014, reviewed the effectiveness of organisational interventions designed to reduce length of stay.[4] The authors found that, while many of the initiatives showed promise, none were of proven effectiveness. More recently, in 2021, a meta-review summarised the evidence for all interventions that aimed to reduce time in hospital for older inpatients and found none to be consistently effective.[5] This review included evaluations of discharge planning interventions and of geriatric assessment.

Growing evidence suggests that the biopsychosocial complexity of older patients' problems is crucial in prolonging hospital stays. This complexity typically includes an interaction of multiple medical illnesses, psychiatric and psychological conditions (including cognitive impairment, depression and anxiety) and care needs resulting from functional dependency.[6–10] Ward teams often struggle to manage this complexity. The result is less-efficient medical treatment, difficulty in arranging postdischarge care and consequently, prolonged inpatient stays.[11–14]

Proactive Integrated Consultation-Liaison Psychiatry

Proactive Integrated Consultation-Liaison Psychiatry (PICLP) is a novel way of enhancing the care of patients in acute medical wards.[15] PICLP was specifically designed to help ward teams manage biopsychosocial complexity and thereby reduce the time that older medical inpatients spend in hospital.

Proactive Integrated Consultation-Liaison Psychiatry was inspired by the 'proactive psychiatric consultation' and 'integrated psychiatric care' service innovations from the USA.[16,17] Proactive psychiatric consultation was designed to ensure that all general hospital inpatients who might benefit from a psychiatric assessment actually receive one. To achieve this goal, a process of proactive and systematic screening of all patients is used rather than relying on referrals. Integrated psychiatric care was designed to ensure that patients who might benefit from psychiatric intervention receive them rather than relying on ward teams for their implementation. To achieve this goal, consultation-liaison psychiatrists (psychiatrists who specialise in adding a psychological/psychiatric and social dimension to medical care) are directly involved in the patients' ongoing care. We combined and built on these service innovations in the development of PICLP in order to better address the complex needs of older medical inpatients.

In PICLP-enhanced medical care, senior (consultant grade) consultation-liaison psychiatrists make proactive and comprehensive biopsychosocial assessments of all newly admitted older patients. This assessment informs their work as integrated members of the ward team, delivering ongoing expert biopsychosocial care and ensuring safe and timely discharge. Their specific contribution includes providing a discharge-focused biopsychosocial management plan; delivering pharmacological and psychological treatments; working systemically with families and ward team members and liaising with providers of out-of-hospital care, including social care. Senior consultation-liaison psychiatrists are needed because the assessment and management of older patients' complex problems require a high level of both medical and psychiatric expertise. They are aided by assisting clinicians in order to make their work more efficient.

Aims

We studied the effects of PICLP-enhanced care (hereafter referred to as PICLP) for older medical inpatients in a randomised controlled trial (The HOME Study). The aims of The HOME Study were:

1. to describe the experiences of PICLP, as reported by the clinicians who delivered it in the trial, staff of the medical wards in which it was provided and patients who received it
2. to determine whether PICLP reduces time in hospital for older medical inpatients
3. to determine the cost-effectiveness of PICLP compared with usual care.

Chapter 2 Methods

Study design

The HOME Study was a parallel, two-group, multicentre, randomised controlled superiority trial. The trial included a process evaluation and a health economic evaluation. The trial protocol and the statistical analysis plan (SAP) for the main analysis of the primary and secondary outcomes and for the health economic evaluation have been published.[21,22]

Ethical approval and research governance

Approval for the study was given by the South-Central Research Ethics Committee (17/SC/0497, 2 November 2017) and the NHS Health Research Authority. Confidentiality Advisory Group approval was obtained (17/CAG/0160, 27 October 2017) for the researchers to access patients' medical records to identify those who were eligible to participate in the study.

Local approvals were obtained from Oxford University Hospitals NHS Foundation Trust (26 April 2018), Royal Devon and Exeter NHS Foundation Trust (1 May 2018) and Cambridge University Hospitals NHS Foundation Trust (18 September 2018).

The trial was registered with the International Standard Randomised Controlled Trial Register (ISRCTN) under the reference number ISRCTN86120296.

The trial was overseen by a Trial Steering Committee (TSC), a Data Monitoring Committee (DMC) and a patient and public involvement (PPI) panel.

Setting

We conducted The HOME Study in 24 acute medical wards of three English NHS general hospitals: the John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust; the Royal Devon and Exeter Hospital, Royal Devon University Healthcare NHS Foundation Trust; and Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust. Each of these three hospitals provides emergency and elective care for a geographically defined population living in both urban and rural areas.

Trial participants

We took an inclusive approach to recruitment and enrolled older people who had been admitted in an emergency (non-electively) to hospital for any medical problem.

Inclusion criteria

We recruited patients who were:

1. aged ≥ 65 years
2. expected (by their clinical team) to remain a hospital inpatient for at least 2 days
3. willing and able to give informed consent to participate in the study, or had a consultee who advised that their participation was appropriate.

Exclusion criteria

We excluded patients if:

1. They had already been in hospital continuously for ≥ 7 days.
2. Their clinicians predicted that they were likely to die before discharge from hospital.
3. They were unable to read or speak English.
4. They had already been referred to the traditional consultation-liaison psychiatry team.
5. They had already been enrolled in the trial (e.g. during a previous admission).
6. Their participation was considered to be clinically or practically inappropriate (e.g. the patient was not from the local area served by the hospital).

Recruitment procedure

We identified potential trial participants by screening all consecutive admissions to the acute medical wards for eligibility. Researchers assessed whether patients met the eligibility criteria described above using information from their medical records and ward clinicians. They then approached all eligible patients. They provided patients with a participant information leaflet that described the research and gave them the opportunity to ask any questions and discuss any concerns about it.

Informed consent and consultee agreement

The researchers obtained written informed consent from patients who had capacity to make their own decision about taking part in the trial. Patients who lacked capacity to make the decision whether to participate in the trial were recruited in accordance with the principles of the Mental Capacity Act 2005 (England and Wales).[23] A personal consultee (a family member, carer, friend, attorney under a Lasting Power of Attorney or a court-appointed deputy providing they had a relationship with, or personal knowledge of, the person lacking capacity before their appointment as deputy) was identified for the patient where possible. The personal consultee was asked to advise on the patient's likely thoughts and feelings about the research and whether they should be enrolled in the trial. If a personal consultee could not be identified or could not be contacted within 24 hours, a nominated consultee (usually the patient's senior physician) was approached for advice regarding the patient's participation in the trial.

Baseline data

We collected the following baseline data from participants, medical records, the NHS Hospital Episode Statistics database and the Office for National Statistics civil registration database:

1. age
2. sex
3. ethnic group
4. relationship status (whether the participant was married or had a long-term partner)
5. employment status (e.g. retired or working)
6. usual place of residence (e.g. private residence or care home)

7. postcode (to calculate deprivation index and urban/rural residence)
8. whether the participant lived alone
9. reason for hospital admission (presenting complaint or working diagnosis)
10. current diagnoses (medical and psychiatric) recorded on admission
11. medication prescribed at the time of enrolment
12. date of hospital admission
13. date of admission to the acute medical ward
14. days in hospital prior to enrolment
15. cognitive function
16. independent functioning
17. health-related quality of life
18. depression and anxiety symptoms
19. overall quality of life
20. number of emergency admissions to hospital in the year prior to randomisation.

We collected data from participants using a brief face-to-face interview (these data were not made available to the PICLP clinicians or medical ward staff). When possible, we collected data from participants themselves. If a participant was unable to provide data, even with help, we asked a proxy (the consultee, or another family member, friend or clinician) to provide data on their behalf. For details of data coding, see *Appendix 3*.

Randomisation and allocation concealment

Participants were individually randomised to PICLP or usual care in a 1 : 1 ratio by a database software algorithm [the program was written by the senior trial statistician based on the 'ralloc' command in Stata® (StataCorp LP, College Station, TX, USA) software and was implemented with a changed seed by the Oxford Clinical Trials Unit].

Individual randomisation (rather than cluster randomisation of medical wards) was used because PICLP was designed to affect care predominantly at the patient level and because natural clusters do not exist as patients and staff move between wards.

Randomisation was conducted by a local member of the research team using the Oxford Clinical Trials Unit's online randomisation system. Researchers accessed the system via a secure website and received the participant's treatment allocation after entering key baseline data. The randomisation sequence was stratified by hospital, sex and age (65–74, 75–84 and ≥ 85 years) and used randomly selected block sizes to ensure allocation concealment.

Blinding

Trial statisticians and staff who collected outcome data were masked to allocated interventions; however, participants and ward clinicians could not be masked due to the nature of PICLP.

Experimental intervention: Proactive Integrated Consultation-Liaison Psychiatry

Proactive Integrated Consultation-Liaison Psychiatry delivery

Participants allocated to PICLP received this in addition to their usual medical care.

PICLP is delivered by senior (consultant grade) consultation-liaison psychiatrists supported by assisting clinicians (doctors or allied health professionals). The PICLP clinicians proactively assess patients soon after their admission to the ward. They see every older medical inpatient as nearly all will have complex biopsychosocial problems. The assessment informs their work as integrated members of the ward team, comanaging the patients' care and discharge planning. As well as directly contributing to the patients' care with pharmacological and psychological interventions,

the PICLP clinicians work systemically with families, ward team members and out-of-hospital care providers. To ensure consistency, the PICLP service model is operationalised in a service manual (see *Appendix 1*) and a clinicians' workbook with checklists (see *Appendix 2*). The manual specifies four stages of PICLP delivery, as described in *Table 1*. The PICLP service model differs substantially from traditional consultation-liaison psychiatry practice, in which psychiatrists see the small proportion of patients referred to them and only provide advice on their care.[24]

In The HOME Study, PICLP started after randomisation and continued for a maximum of 30 days. During the study, PICLP was delivered only on weekdays.

TABLE 1 The PICLP stages of delivery

Stage	Actions
Stage 1: the proactive biopsychosocial clinical assessment	• The consultant psychiatrist interviews the patient soon after their admission to the medical ward, and the assisting clinician gathers information from the patient's family, ward team and medical records • The psychiatrist then makes a comprehensive list of the patient's problems, including any psychiatric diagnoses. They use this information to identify and prioritise the problems most likely to increase the time that the patient will spend in hospital
Stage 2: formulation and communication of the discharge-focused action plan	• The psychiatrist formulates an action plan designed to address the prioritised problems • They discuss the action plan with the patient, their family and the ward team and agree on how it will be implemented

Stage 3: integrated implementation of the discharge-focused action plan	• The psychiatrist and assisting clinicians work with the ward team to implement the action plan and deliver interventions, including:
	  • Enabling the ward team to provide biopsychosocial care
	  • Collaborating with the patient, ward team, family, primary care and social care to plan effective discharge
	  • Giving specific advice on the management of psychiatric disorders and other psychological problems (e.g. the diagnosis and treatment of depression) and the use of medications (e.g. when to prescribe drugs for symptoms of dementia)
	  • Discussing the need for, and timing of, medical investigations that would prolong the patient's hospital stay (e.g. suggesting the deferral of a non-urgent scan until after discharge)
	  • Providing psychological interventions directly to the patient (e.g. doing graded exposure therapy to help the patient to overcome anxiety about rehabilitation after a fall)
	  • Helping the patient's family and other carers to accurately anticipate the patient's needs after discharge (e.g. by explaining the difference between transient delirium and progressive dementia)
	  • The assisting clinicians monitor the patient's progress daily. They review and establish which problems are currently impeding the patient's discharge so that the action plan can be updated as needed

Stage 4: communication with out-of-hospital care providers at the time of discharge	• The psychiatrist and assisting clinicians communicate with out-of-hospital care providers about unresolved problems and make recommendations for further care, including:
	  • Specific medical advice to the patient's primary care provider
	  • Referral to a community psychiatric service
	  • Advice to social care providers

Source
Reproduced with permission from Sharpe *et al.*[18] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The table includes minor additions and formatting changes to the original text.

Proactive Integrated Consultation-Liaison Psychiatry clinicians and training

In The HOME Study, PICLP was delivered by a total of seven consultation-liaison psychiatrists and eight assisting clinicians working in three hospital-based teams. The consultation-liaison psychiatrists each had at least 5 years of clinical experience after specialist training. Six of the assisting clinicians were psychiatrists in training, and two were experienced psychiatric occupational therapists.

The PICLP clinicians' training took place on a part-time basis over several months and comprised practice and workshops.[18] The clinicians practised aspects of PICLP on their hospital wards before delivering it in the trial. This practice was supplemented by whole-day group workshops that focused on challenges that the clinicians encountered when practicing PICLP and included role plays with peer feedback.

Each clinician's training was judged to be complete when they had demonstrated adherence to the PICLP service manual during an observed assessment. After completing this initial training, the clinicians met weekly for peer supervision by videoconferencing across the three hospitals. The supervision sessions focused on challenges in the delivery of PICLP to individual patients and included discussions about: (1) how best to intervene in complex clinical problems; (2) which problems could be deferred to postdischarge care and (3) how to overcome obstacles to discharge.

Adherence to the Proactive Integrated Consultation-Liaison Psychiatry service manual

The PICLP clinicians' adherence to the service manual was reassessed every 3–6 months and additional training was provided if required.

Comparator: usual care

Usual care was provided by the ward teams, and this was not specified or restricted in the trial to ensure that it represented current practice. The hospitals each had a traditional consultation-liaison psychiatry service (also called 'liaison psychiatry' and 'psychological medicine'). These services provide psychiatric assessment and advice on the small proportion of patients referred to them (typically < 5%).[24,25]

Proactive Integrated Consultation-Liaison Psychiatry process evaluation

We conducted a process evaluation to describe:

1. observations on the training of clinicians to deliver PICLP
2. the care provided by the PICLP clinicians
3. the PICLP clinicians' experiences of working in the new service model
4. patients' experiences of PICLP
5. ward staff members' experiences of PICLP.

Observations on the training of clinicians to deliver Proactive Integrated Consultation-Liaison Psychiatry

The training was overseen by the two consultation-liaison psychiatrists who led the design of the PICLP service model. The PICLP trainers kept contemporaneous records during the training process. They were also interviewed by a clinical researcher about their observations on training (the interviews were audio-recorded and transcribed verbatim).

Two researchers analysed the combined data from the contemporaneous records and interviews using inductive thematic analysis and discussed discrepancies in their coding until they achieved consensus.

The care provided by the Proactive Integrated Consultation-Liaison Psychiatry clinicians

We obtained data on the care provided by the PICLP clinicians from the clinician-completed PICLP patient workbooks. The workbooks had a section for each stage of PICLP, which included a checklist and space for additional notes. For stage 1, there was a checklist of 12 problem categories grouped into biomedical, psychological and social domains. The

clinicians recorded whether patients had problems in each of these categories and, if so, whether they were impeding discharge. The stage 2 checklist prompted the clinicians to make an action plan for each problem that was impeding discharge. For stage 3, a monitoring checklist reminded the clinicians to review the patient daily; record whether they had biomedical, psychological and social problems impeding their discharge and modify the action plan as needed. The final checklist, used in stage 4, was intended to ensure that the clinicians had communicated any relevant information with out-of-hospital providers at the time of discharge. During The HOME Study, the PICLP clinicians also completed a study-specific recording sheet of what they did for each patient. The workbooks were developed using a process of iterative testing by the PICLP clinicians. Paper workbooks were used in preference to electronic ones in order to facilitate their use at the bedside.

We analysed the quantitative data from the checklists and recording sheets using descriptive statistics. We also used the clinicians' handwritten notes in the workbooks to give examples of: (1) problems/diagnoses in each of the 12 problem categories and (2) specific interventions in each of the intervention categories.

The Proactive Integrated Consultation-Liaison Psychiatry clinicians' experiences of working in the new service model

The 15 clinicians were each interviewed after they had spent substantial time (median 4 months) delivering PICLP. These semistructured interviews were conducted by clinical researchers, audio-recorded and transcribed verbatim. The reported experiences of the senior psychiatrists and assisting clinicians were similar and are therefore reported together.

To analyse the interview data, we used a hybrid of the deductive and inductive approaches to thematic analysis.[25] Three researchers initially used the deductive approach to code data into the four major pre-defined themes. These were experiences of: (1) the proactive approach, (2) the integrated approach, (3) the biopsychosocial perspective and (4) the discharge focus. This process provided a framework for grouping data that was aligned with the semistructured interviews and also allowed the researchers to quickly familiarise themselves with the data. They then inductively coded data within these themes. In order to enhance the quality of the analysis, researcher triangulation was carried out and any discrepancies in the process of coding were discussed until consensus was achieved.

Patients' experiences of Proactive Integrated Consultation-Liaison Psychiatry

We conducted a qualitative study of patients' experiences of PICLP towards the end of the trial, when PICLP had been established on the medical wards for > 12 months. We aimed to include a representative sample of patients (from all three hospitals) who had received PICLP.

Patients were eligible to participate in the qualitative study if:

1. they had been discharged from hospital between 19 September 2019 and 16 March 2020
2. taking part in the qualitative study would not interfere with their trial follow-up
3. they had consented to an interview or (for patients who were unable take part in an interview due to significant cognitive impairment) a family member consented to act as a 'proxy' and to be interviewed about the patient's experience on their behalf.

The interviews were done over the telephone between 23 January 2020 and 26 March 2020. The interview topic guides consisted of open-ended questions about the experience of PICLP, with prompts about its perceived helpful and unhelpful aspects. All interviews were audio-recorded and were then transcribed verbatim. We analysed the interview data using a hybrid of deductive and inductive approaches to thematic analysis.[26] We initially used the deductive approach to categorise comments using pre-defined themes. These were: (1) what was helpful about PICLP and (2) what was unhelpful about PICLP. We then inductively coded data (into codes and then subthemes) within these themes. Any discrepancies in the process of coding were discussed until consensus was achieved.

Ward staff members' experiences of Proactive Integrated Consultation-Liaison Psychiatry

We conducted a qualitative study of ward staff members' experiences of PICLP towards the end of the trial, when PICLP had been established on the medical wards for > 12 months. We aimed to include a representative sample of

staff (from all three hospitals and all relevant disciplines) who were working on the medical wards where PICLP was implemented for patients allocated to it in the trial.

Staff members were eligible to consent and participate in this study if:

1. they were working on a relevant ward in November 2019
2. they were a physician, nurse, allied health professional (physical therapist or occupational therapist) or care co-ordinator (healthcare professional whose primary focus was discharge co-ordination).

The interviews were done face to face between 11 November 2019 and 29 November 2019. The interview topic guides consisted of open-ended questions about the experience of PICLP, with prompts about its perceived helpful and unhelpful aspects. All interviews were audio-recorded and were then transcribed verbatim. We analysed the interview data using a hybrid of deductive and inductive approaches to thematic analysis.[26] We initially used the deductive approach to categorise comments using pre-defined themes. These were: (1) what was helpful about PICLP and (2) what was unhelpful about PICLP. We then inductively coded data (into codes and then subthemes) within these themes. Any discrepancies in the process of coding were discussed until consensus was achieved.

Main trial outcomes

Outcomes using data collected from medical records and databases

We measured the following outcomes using data collected from the participants' medical records, the NHS Hospital Episode Statistics database and the Office for National Statistics civil registration database:

1. number of days spent as an inpatient (during the index admission and any emergency re-admissions to acute general hospitals) in the 30 days post randomisation (primary outcome). This time period was chosen because patients are usually discharged within 14 days, and 30 days would therefore capture early re-admissions.
2. rate of discharge from hospital (discharges per day) for the total length of the index admission (this outcome is referred to as 'total length of index admission' in the trial protocol and its fuller description is explained in the SAP).
3. discharge destination (for participants who had been admitted from a private residence).
4. length of the index admission (post randomisation) truncated at 30 days (recommended by the TSC after SAP publication).
5. number of emergency re-admissions to hospital in the year post randomisation.
6. number of days spent as an inpatient (in an acute general hospital) in the year post randomisation.
7. rate of death in the year post randomisation.

Outcomes using data collected from participants

We measured the following outcomes using data collected from participants:

1. experience of the hospital stay (0–10 scale from terrible to excellent)
2. view on the length of the hospital stay ('too short', 'about right' or 'too long')
3. anxiety [Generalised Anxiety Disorder-2 (GAD-2)][27]
4. depression [Patient Health Questionnaire-2 (PHQ-2)][27]
5. cognitive function [Montreal Cognitive Assessment – Telephone Version (MoCA-T)][28]
6. independent functioning (Barthel Index of Activities of Daily Living)[29,30]
7. health-related quality of life [EuroQol-5 Dimensions, five-level version (EQ-5D-5L])[31]
8. overall quality of life (0–10 scale).

We collected these data using telephone interviews (supplemented by in-person visits when necessary) at 1 month (30–75 days) and 3 months (90–135 days) post randomisation. When possible, we collected data from participants themselves. If a participant was unable to provide data, even with help, we asked a proxy (the consultee, or another family member, friend or clinician) to provide data on their behalf.

Serious adverse event recording

A serious adverse event (SAE) is any untoward medical occurrence that results in death, is life-threatening, requires inpatient hospitalisation or prolongation of existing hospitalisation, results in persistent or significant disability/incapacity or consists of a congenital anomaly or birth defect. Other 'important medical events' may also be considered to be serious if they jeopardise the participant or require an intervention to prevent one of the above consequences. The term 'life-threatening' in the definition of 'serious' refers to an event in which the participant was at risk of death at the time of the event; it does not refer to an event which hypothetically might have caused death if it was more severe. The participants in this study were patients aged ≥ 65 years, who had been admitted to an acute ward of a general hospital – these patients were, by definition, very unwell. The SAEs recorded and reported in this study were deaths by any cause in the 30 days post randomisation. Rehospitalisations, life-threatening illness and significant disability were to be expected in this group of patients and were not, therefore, recorded as SAEs.

Sample size calculation

Using pre-trial data from the 3 hospitals, we estimated that 2 trial groups of 1794 participants each would give 90% statistical power (and 2 groups with 1340 participants each would give 80% statistical power) at the 5% significance level (two-sided test) to detect a difference of at least 1 day [from 9 to 8 days, standard deviation (SD) 9 days] in the mean number of days spent in hospital in the 30 days post randomisation, allowing for 5% loss to follow-up. We sought to detect a 1-day difference as there is no agreed minimally important difference on this measure and this amount of time was considered to be meaningful by both patients and clinicians.

Statistical analysis

All analyses were conducted by original assigned groups (intention to treat). The effect of PICLP on each outcome is a weighted mean of the three hospital-specific treatment effects, weighted according to number of participants per hospital. We analysed the primary outcome using linear regression. We did not do a per-protocol analysis because 99% of participants allocated to PICLP received it (defined as having had at least stages 1 and 2 of PICLP delivery). We used Cox models to compare rates of discharge (censoring deaths) and rates of death (censored at time of last contact for participants whose mortality status was missing) in the year after random allocation, and Poisson regression with robust standard errors for number of emergency re-admissions. The remaining secondary outcomes were analysed using linear and logistic regressions. We included the stratification variables, medical ward and hospital-by-treatment interaction terms as fixed-effects in all our models. Anxiety, depression, cognitive function, independent functioning, health-related quality of life and overall quality of life were also adjusted for corresponding baseline scores.

For the primary outcome, we explored effects in subgroups by adding, one at a time, interactions between treatment and each of the stratification factors. In the main analysis of the primary outcome, a patient may be in hospital for < 30 days because they have been discharged or because they have died. To complement this hospital-centred analysis, we conducted two supplementary analyses which took a more patient-centred approach. These considered time spent in hospital as a proportion of the time alive in the 30 days post randomisation and time spent in hospital in the 30 days post randomisation only including participants who were alive for all 30 days. To complement the hospital-centred analyses of re-admissions and days in hospital in the year post randomisation, we also conducted two supplementary analyses which took a more patient-centred approach. These considered number of emergency re-admissions to hospital in the year post randomisation modelled using the number of re-admissions scaled by time alive (measured in years) and time (days) spent in hospital in the year post randomisation modelled using the number of days participants spent in hospital as a proportion of time alive.

We used multiple imputation, using chained equations with 100 replications, to handle missing patient-reported data. The imputation models included variables in the main model, values of the variable being analysed at other time points and pre-defined auxiliary variables. We made no assumptions regarding patient-reported outcomes for those who had died and therefore discarded any imputed values for deceased participants.

We used a two-sided significance level of 0.05 throughout, with the only exception being the overall comparison of deaths, which used 0.045 to take account of interim analyses done by the DMC.

Statistical analyses were done using Stata version 17; full details are given in the published SAP.[22]

The COVID-19 pandemic had a major effect on hospital admissions and on deaths from March 2020 onwards. We therefore did sensitivity analyses (pre-specified after the SAP was published and before the end of the trial) to address effects of the pandemic on the outcomes that were measured over the year post randomisation. We split the follow-up period into before (and including) and after 1 March 2020, for number of emergency re-admissions and number of days in hospital, and censored at this date for deaths (see *Appendix 4* for details).

Economic evaluation

We evaluated the cost-effectiveness of PICLP, from the hospital perspective (i.e. an NHS perspective limited to secondary care resource use), over three time horizons (1, 3 and 12 months) using the aforementioned data on hospital admissions, deaths and health-related quality of life. Costs and health outcomes were undiscounted as the range of time horizons did not exceed 12 months.

Resource use and costs

For each time horizon, we calculated the total cost of inpatient care (valued at 2020–1 prices and expressed in Great British pounds). This comprised the costs of:

- The PICLP delivery [£123 per hour for consultant psychiatrist time using the Personal Social Services Research Unit (PSSRU) Unit Costs of Health and Social Care, 2021, for a hospital-based consultant psychiatrist; £52 per hour for assisting clinician time, using PSSRU Unit Costs of Health and Social Care, 2021, for a hospital-based specialist registrar].[32]
- The index admission [£364.35 per day, using National Schedule of NHS Costs, 2018–9, cost of a non-elective excess bed day across all Healthcare Resource Groups (HRGs), inflated from £337.36 to 2020–1 costs using the NHS cost inflation pay and prices index].[32,33]
- Subsequent emergency admissions to acute general hospitals (cost varying by HRG currency code, using the National Schedule of NHS Costs, 2020–1).[34]

Health outcomes

Health outcomes were expressed in quality-adjusted life-years (QALYs), which we calculated using data on deaths and EuroQol-5 Dimensions, three-level version (EQ-5D-3L) scores at baseline, 1 month and 3 months (because no data were collected from participants at 12 months, EQ-5D-3L scores were assumed to remain constant after 3 months for participants who were alive beyond that time point). EQ-5D-3L scores were derived from EQ-5D-5L questionnaire responses using the algorithm by van Hout *et al.*[35]

Analysis

We estimated the incremental cost-effectiveness ratios (ICERs) (incremental cost per QALY) for PICLP compared to usual care. The mean differences in healthcare costs incurred and QALYs accrued between treatment groups were estimated using generalised linear models and ordinary least squares regression analyses, respectively.[36] In a sensitivity analysis, seemingly unrelated regression was used as an alternative regression method. The mean difference in QALYs was adjusted by the baseline EQ-5D-3L score to address any baseline imbalance between groups.[37] Both QALY and cost regression analyses were adjusted for sex, hospital and age, in line with the primary outcome analysis. Analyses were also performed for the pre-defined subgroups.

Missing data on EuroQol-5 Dimensions (EQ-5D) scores were handled using multiple imputation with chained equations and predictive mean matching (over 10 iterations); the imputation model included the same covariates as those included in the QALY regressions, and the missing EQ-5D scores were imputed conditional on survivor status.[38] There was no missingness on cost data, and therefore, these were not imputed.

We estimated the additional cost per QALY gained (ICER) of PICLP compared with usual care. This ICER was compared to a range of cost-effectiveness thresholds commonly used in the UK health system.[39] Probabilistic sensitivity analysis was used to estimate decision uncertainty, and we present the probabilities of PICLP being cost saving and cost-effective at the range of cost-effectiveness thresholds considered. The analysis was performed by simulating random draws of incremental mean costs and QALYs over 1000 iterations, from a multivariate normal distribution, and estimating the proportion of those draws that corresponded to a cost-effective use of resources at the cost-effectiveness threshold range considered.[40]

Patient and public involvement

We involved stakeholders at all stages of this research with the aim of ensuring that: (1) the research addressed important questions for the NHS; (2) the PICLP intervention was acceptable to patients, families, ward staff and hospital managers; (3) the research procedures captured important information while minimising participant burden; (4) the research was completed effectively and (5) our findings are disseminated widely and rapidly.

Involvement in the funding application

The research team conducted meetings with 24 key stakeholders, 1 of whom became a co-applicant, when preparing the application for funding. These included older inpatients, families of older people, members of the public, hospital managers and ward staff. Patients said that long hospital stays made them worry about their health and loss of independence. Family members were concerned that their knowledge of the patient was not always valued by hospital staff when decisions were being made about their treatment and discharge. Ward staff reported low confidence in assessing and managing psychosocial problems. Managers confirmed that length of stay, in particular for older patients, was a major concern.

All stakeholder groups identified the pressing need to better address psychological problems in older inpatients and to reduce the time they spend in hospital. They also highlighted the need to facilitate discharge and to minimise the risk of hospital re-admission. When we described PICLP, patients and their families told us that this would be an acceptable change to medical care.

Our meetings led to a number of changes in our research plan. These included:

1. development of the PICLP service manual to ensure active involvement of family members at all stages
2. the use of a primary outcome that included both the index admission and early re-admissions
3. the addition of a secondary outcome to measure independent functioning
4. the inclusion of qualitative interviews with ward staff about their experience of PICLP in the process evaluation (as well as patients' and families' experiences).

Involvement in preparatory work before the trial started

Our PPI panel was involved in the development of the study protocol, consent and consultee agreement procedures, PICLP service manual and participant information leaflets. Members of the panel all had experience of being an older medical inpatient or a family member of an older patient. They told us that they expected older medical inpatients would be happy to take part in The HOME Study because many patients would welcome being part of research that may help other people and because the research focused on patients' wider worries and concerns rather than solely on the reason for hospital admission. They also highlighted some potential challenges and made suggestions about how we might address these.

We revised our research procedures and documentation in light of these comments. These revisions included:

1. better explanation of the nature of PICLP in the patient information leaflet
2. ensuring that patients were given a summary information leaflet as well as the full one
3. the addition of stage 4 to PICLP
4. moving the cognitive function assessment to be the final part of the follow-up data collection.

Involvement throughout the trial

The PPI panel met with senior members of the research team and with the TSC to oversee the trial progress. In addition, a number of older people, including members of the PPI panel, were involved in training members of the research team. These volunteers played a particularly valuable role in training the research assistants who collected outcome data by taking part in practice telephone calls and giving feedback to the research assistants and their supervisors. This practice enabled the research assistants to build confidence and to become skilled at collecting information according to standard operating procedures while maintaining a positive connection with participants.

Involvement in interpreting and disseminating the research findings

The PPI panel convened for a final meeting with the chief investigators to help us interpret the research findings. We have also discussed the findings with other key stakeholders, including older people and their families, hospital managers, consultation-liaison psychiatrists and ward staff. Their comments on the main study findings, process evaluation and economic evaluation have been incorporated into the *Discussion* section of this report as well as the relevant publications.

Equality, diversity and inclusion

Patients

Patients who are very old, those with multimorbidity and those who lack capacity to consent for themselves are all under-represented in research. The HOME Study focused on the needs of older medical inpatients and therefore included participants with all of these characteristics. There was no upper age limit for inclusion; most participants had multimorbidity, and we had robust procedures to allow patients to participate via consultee agreements.

We also ensured that patients with impaired vision or reading difficulties were able to participate. Trained research staff explained the study in person, gave patients a summary patient information leaflet (which could be printed using large font) as well as a detailed one, and where needed, read the information aloud. We facilitated the participation of patients with restricted movement, who were unable to provide signatures, by allowing verbal consent verified by witnesses in these circumstances. Our procedures for the collection of outcome data were also designed to be inclusive. We used telephone calls and in-person visits, rather than postal or electronic questionnaires, in order to ensure that patients with hearing difficulties, those who were housebound and those without an internet connection could participate.

The research was conducted in three hospitals, which all serve urban and rural areas. Our initial research plan also included hospitals in large cities (London and Glasgow), which would have increased the ethnic diversity of the sample. However, these hospitals were unable to participate.

Research team

The research team had a wide range of expertise, professional backgrounds and experience and demographic characteristics. More junior team members were provided with training opportunities and were encouraged to take the lead in specific areas of work, resulting in new academic qualifications, career progression and peer-reviewed publications.

Chapter 3 Results

Recruitment and participant flow

Between 2 May 2018 and 5 March 2020, when recruitment was terminated early due to the COVID-19 pandemic, there were 21,828 admissions to the medical wards (*Figure 1*). Of the 4079 eligible patients, 2744 (67%) participated (1623 gave informed consent and 1121 had a consultee agree to their participation); 1373 participants were allocated to PICLP and 1371 to usual care.

Numbers analysed

We obtained data from medical records and databases (including the primary outcome data) for 2710 (99%) participants. We also collected data from 2105 participants (90% of 2332 alive) at 1 month and 1797 (85% of 2115 alive) at 3 months.

Participants' baseline characteristics

Participants' baseline characteristics are shown in *Tables 2–4* (additional data about the index admission are given in *Appendix 5*, *Table 18*).

The mean age was 82 years (range 65–102) (see *Table 2*); 51% (1399/2744) were male and 49% were female (1345/2744).

Ninety-one per cent (2492/2744) of participants had multimorbidity, defined as at least two current medical conditions recorded at the time of hospital admission (see *Table 3*). A substantial proportion of participants had clinically significant symptoms of anxiety and depression, and most were cognitively impaired (see *Table 4*).

Adherence to the Proactive Integrated Consultation-Liaison Psychiatry service manual

One thousand three hundred and seventy-three participants were randomly allocated to receive PICLP, and 1359 (99%) of these received at least the stage 1 initial assessment (the clinicians were not told about 2 patients, and 13 patients were discharged or died before being seen).

PICLP was delivered in the four stages, as outlined in *Table 1*, with good adherence to the service manual (*Table 5*).

Proactive Integrated Consultation-Liaison Psychiatry process evaluation

Observations on the training of clinicians to deliver Proactive Integrated Consultation-Liaison Psychiatry

Two main themes emerged from the thematic analysis of the training data (*Table 6*). These were barriers to, and facilitators of, successful clinician training; that is, achievement of adherence to the PICLP service manual

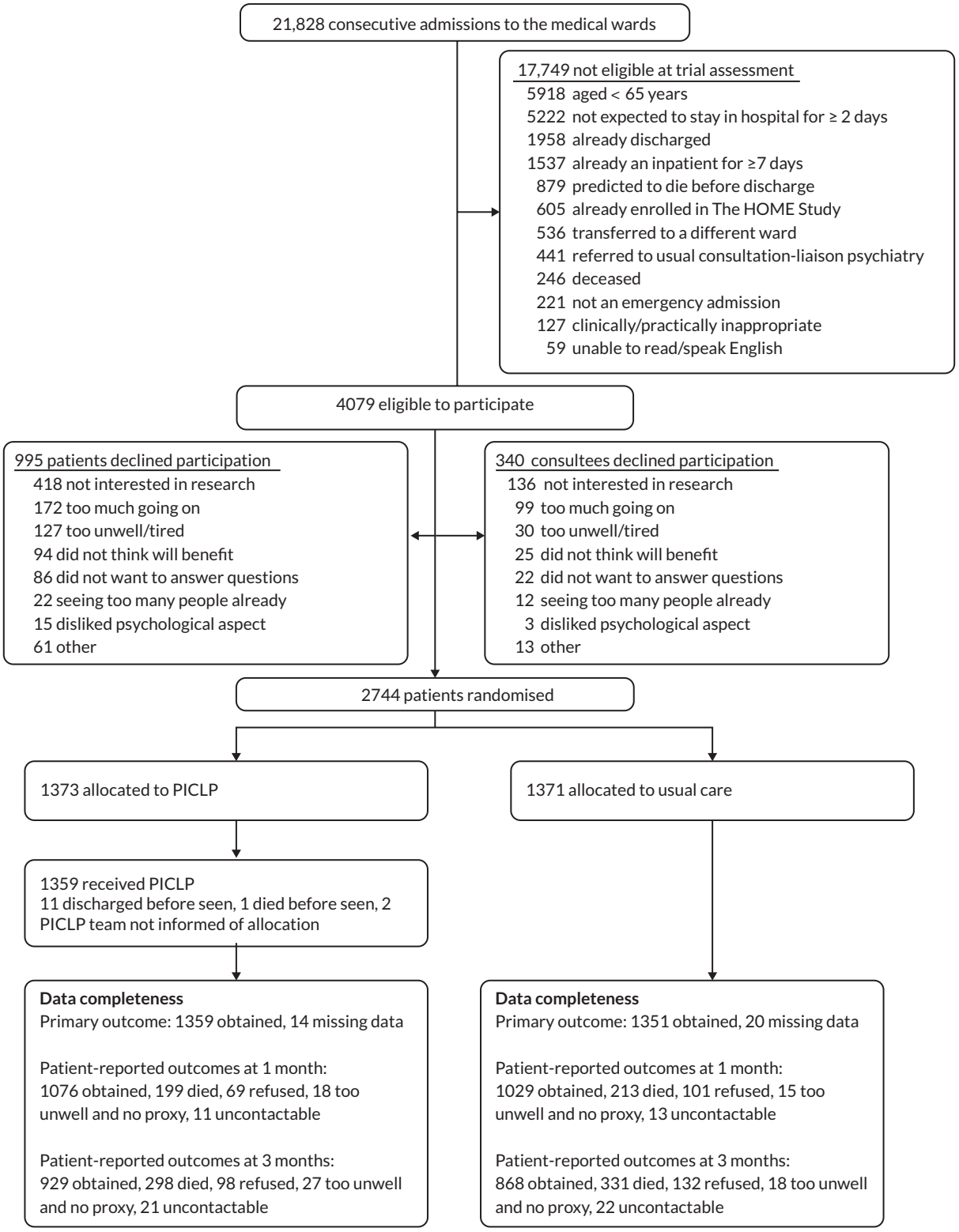

FIGURE 1 Trial profile. Reproduced with permission from Sharpe *et al.*[20] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.

TABLE 2 The HOME Study participants' baseline characteristics (demographic)

	PICLP (*n* = 1373)	Usual care (*n* = 1371)
Age (years)	82.3 (8.2)	82.3 (8.2)
Age group (years)		
65–74	308 (22%)	307 (22%)
75–84	484 (35%)	488 (36%)
≥ 85	581 (42%)	576 (42%)
Sex		
Female	673 (49%)	672 (49%)
Male	700 (51%)	699 (51%)
Ethnic group		
White/White British	1283 (93%)	1282 (94%)
Other[a]	8 (< 1%)	9 (< 1%)
Missing data	82 (6%)	80 (6%)
Married/has long-term partner	602 (44%)	615 (45%)
Retired/not working	1351 (98%)	1335 (97%)
Usual place of residence		
Private residence	1251 (91%)	1245 (91%)
Care home/nursing home	87 (6%)	95 (7%)
Sheltered accommodation/assisted living	35 (3%)	31 (2%)
Lives alone	616 (45%)	598 (44%)
Socioeconomic deprivation		
First quintile (most deprived)	39 (3%)	36 (3%)
Second quintile	161 (12%)	164 (12%)
Third quintile	309 (23%)	319 (23%)
Fourth quintile	404 (29%)	360 (26%)
Fifth quintile (least deprived)	460 (34%)	492 (36%)
Residence area		
Urban	794 (58%)	775 (57%)
Rural	579 (42%)	596 (43%)

a PICLP: Black/Black British (*n* = 3), Asian/Asian British (*n* = 2), mixed (*n* = 1), any other background (*n* = 2); usual care: Black/Black British (*n* = 1), Asian/Asian British (*n* = 5), mixed (*n* = 3).

Note
Data are *n* (%) or mean (SD), unless otherwise indicated.

TABLE 3 The HOME Study participants' baseline characteristics (clinical)

	PICLP (*n* = 1373)	Usual care (*n* = 1371)
Hospital		
Royal Devon and Exeter (Exeter)	637 (46%)	636 (46%)
John Radcliffe (Oxford)	530 (39%)	528 (39%)
Addenbrooke's (Cambridge)	206 (15%)	207 (15%)
Multimorbidity (≥ 2 current medical conditions)	1250 (91%)	1242 (91%)
Number of emergency admissions in the last year[a]	1, 0–38	0, 0–11
Main reason for hospital admission		
Cardio-respiratory symptoms	380 (28%)	374 (27%)
Falls and injuries	192 (14%)	204 (15%)
Gastrointestinal symptoms	166 (12%)	180 (13%)
Confusion, drowsiness and collapse	174 (13%)	159 (12%)
General weakness	88 (6%)	105 (8%)
Urinary symptoms	89 (6%)	81 (6%)
Fever and suspected infection	74 (5%)	69 (5%)
Cellulitis and ulcers	51 (4%)	61 (4%)
Neurological symptoms	43 (3%)	41 (3%)
Back and limb pain	27 (2%)	31 (2%)
Abnormal investigation findings	28 (2%)	14 (1%)
Other	61 (4%)	52 (4%)
Medications prescribed		
Number of medications prescribed at the time of enrolment[a]	10, 1–33	10, 0–36
Antidepressant	348 (25%)	319 (23%)
Anxiolytic/hypnotic	242 (18%)	219 (16%)
Dementia medication	74 (5%)	89 (6%)
Antipsychotic	89 (6%)	70 (5%)
Lithium	8 (1%)	4 (< 1%)
Anticholinergic burden score[a]	1, 0–14	1, 0–11
Number of medical conditions recorded at hospital admission[a]	4, 0–20	4, 0–20
Days in hospital pre-enrolment	3.5 (1.7)	3.4 (1.7)
Days in medical ward pre-enrolment	2.3 (1.5)	2.2 (1.5)

a Median, range.

Note
Data are *n* (%) or mean (SD), unless otherwise indicated.

TABLE 4 The HOME Study participants' baseline scores

	PICLP (*n* = 1373)	Usual care (*n* = 1371)
Anxiety (GAD-2, 0–6)		
Mean (SD)	2.5 (2.2)	2.6 (2.1)
Score ≥ 3 (clinically significant symptoms)	587 (43%)	604 (44%)
Missing data	32 (2%)	33 (2%)
Depression (PHQ-2, 0–6)		
Mean (SD)	2.6 (2.1)	2.5 (2.1)
Score ≥ 3 (clinically significant symptoms)	647 (47%)	629 (46%)
Missing data	43 (3%)	32 (2%)
Cognitive function (MoCA-T, 0–30)		
Mean (SD)	13.0 (8.4)	13.0 (8.6)
Score 26–30 (normal cognitive function)	78 (6%)	95 (7%)
Score 18–25 (mild cognitive impairment)	374 (27%)	344 (25%)
Score 10–17 (moderate cognitive impairment)	377 (27%)	384 (28%)
Score 0–9 (severe cognitive impairment)	409 (30%)	424 (31%)
Missing data	135 (10%)	124 (9%)
Independent functioning (Barthel, 0–100)		
Mean (SD)	46.6 (28.5)	45.1 (29.3)
Score < 40 (complete dependence on others)	564 (41%)	602 (44%)
Missing data	0 (0%)	1 (< 1%)
Health-related quality of life (EQ-5D-5L)		
Mean (SD)	0.3 (0.4)	0.3 (0.4)
Missing data	20 (1%)	18 (1%)
Overall quality of life (0–10)		
Mean (SD)	5.0 (2.8)	4.9 (2.8)
Missing data	21 (2%)	25 (2%)

Barthel, Barthel Index of Activities of Daily Living.

Note
Data are *n* (%) or mean (SD).

TABLE 5 Adherence to the PICLP service manual

Measure	Adherence
Biopsychosocial assessment completed	1357/1373 (99%)
Biopsychosocial assessment completed within 1 day of allocation	1312/1359 (97%)
All problem categories assessed	1359/1359 (100%)
Action plan made	1359/1359 (100%)
Action plan discussed with medical ward team	1307/1359 (96%)
Checklist fully completed	1359/1359 (100%)
Progress reviewed every weekday	924/1359 (68%)[a]

a Progress reviewed every working weekday; if only 1 working day was missed, 1307/1359 (96%).

Note
The PICLP adherence was measured using data from the PICLP checklists.

TABLE 6 Observations on the training of clinicians to deliver PICLP

Theme	Code	Sample quotes
Barriers to successful training	The need to unlearn a familiar way of working as well as learn a new one	*They've got to unlearn the way they did it before as well as learn the new way and … there is a constant risk they'll revert to the familiar*
	There is a tendency to revert to the usual practice of focusing on certain problems rather than being systematically biopsychosocial	*There is a tendency to focus on … personal expertise or interests*
	There is a tendency to revert to the usual practice of treating in hospital rather than being discharge-focused	*People will fall back to … treating every problem the patient has, before they leave hospital. In which case we could easily end up making length of stay much longer*
	The need to gain confidence in the new proactive role	*The psychiatrist being confident in their role on the ward is key to being proactive, and it's interesting how much, and surprising how much, this has flushed out lack of confidence*
	The need to become comfortable in the new integrated role	*We've actually challenged their identity. So what they normally do is react to another doctor … go in explicitly as a psychiatrist, an expert in mental illness, and they deliver an opinion … and then they go away, and they maintain an identity … as separate mental health people*
Facilitators of successful training	Involvement in refining the service manual and clinicians' workbook	*Everyone that's doing [PICLP] is comfortable both with the manual and the checklist. I think if we hadn't … allowed so much feedback and codevelopment, we might have not been in a good place*
	Working as a group over time	*I think one of the most helpful things was that they're now … bonding as a group*
	Using checklists	*I think having a checklist that reminds them every time, like a surgical checklist, even when people are very skilled, humans forget stuff and a reminder is very useful*
	Role-playing scenarios with feedback from peers	*Role play … provides a slightly threatening, but relatively safe space for the person to make a fool of themselves and get sympathetic feedback from colleagues*
	Observation of PICLP delivery on the wards with feedback from the trainers	*We definitely need the observation … Pretty much everyone who has had [an adherence assessment] has not met all the basic criteria for following the service model [first time]. With, clear and honest feedback they normally do [at the next assessment]*

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Theme 1: barriers to successful training

The trainers observed that, as the clinicians were all experienced in providing traditional, referral-based consultation-liaison psychiatry, they had to unlearn their usual way of working as well as learn the new way. The trainers also observed that gaining confidence in the new proactive role required practice. For example, the senior psychiatrists needed to practice initiating consultations with patients who had not been referred to them with an obvious psychiatric problem. In addition, they noted that it was necessary for the clinicians to spend time in their new integrated role before they became fully comfortable in it.

Theme 2: facilitators of successful training

The trainers found that involving the clinicians in the refinement of the service manual and clinicians' workbook facilitated their engagement in training. They also found that training them together in group workshops provided peer support for the necessary changes in role. They reported that checklists helped the clinicians to be systematic in their assessments and to stay focused on discharge from hospital. The trainers also noted that the clinicians benefited from role-playing scenarios which they found to be difficult and that this learning was reinforced by the observation of PICLP delivery on the wards with feedback from the trainers.

The care provided by the Proactive Integrated Consultation-Liaison Psychiatry clinicians

At the initial assessment (stage 1), the clinicians found that 90% (1225/1359) of the patients had problems in the biomedical domain, 76% (1027/1359) had problems in the psychological domain and 90% (1226/1359) had problems in the social domain. Most patients had problems in at least two of these three biopsychosocial domains (*Figure 2*).

In the biomedical domain, the most common problem was the patients' active medical conditions (*Table 7*). In the psychological domain, cognitive impairment (delirium with or without dementia) was highly prevalent and depression and anxiety were also common. Substance misuse and other psychiatric diagnoses (such as schizophrenia) were infrequent in this population. In the social domain, dependency on others for help with daily tasks was common.

The majority of problems were judged to be impeding the patients' discharge from hospital (*Figure 3* and *Appendix 6*, *Table 19*) and they were therefore prioritised in the initial action plans (stage 2).

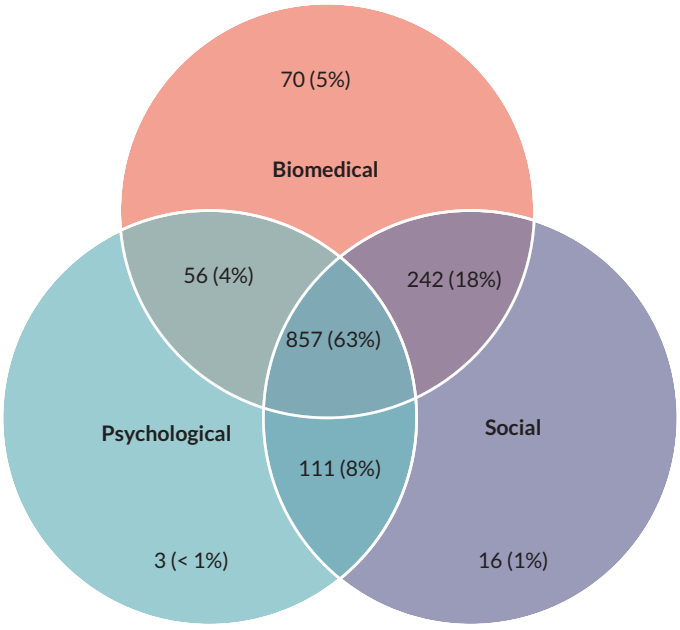

FIGURE 2 *N* (%) patients with problems in each of the biopsychosocial domains as recorded at the PICLP stage 1 assessment. Note: *N* = 1359. Four patients had no identified problems. Reproduced with permission from Sharpe *et al.*[18] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.

TABLE 7 Biopsychosocial problems identified at the PICLP stage 1 assessment

Domain	Problem category	Examples of problems/diagnoses in this category	Patients with at least one problem in this category, *n* (%)	Patients with at least one problem in this category impeding discharge, *n* (%)
Biomedical	Not medically safe for discharge	Active medical conditions requiring urgent treatment	1103 (81)	1089 (80)
	Sensory deficits	Impaired hearing or eyesight	436 (32)	58 (4)
	Medication-related problems	Non-concordance, polypharmacy, side effects	316 (23)	235 (17)
Psychological	Cognitive impairment	Delirium with or without dementia	737 (54)	487 (36)
	Other psychiatric conditions	Depression, anxiety[a]	291 (21)	165 (12)
	Psychological symptoms	Fear of falling, distress	318 (23)	167 (12)
	Behavioural problems	Agitation, aggression	185 (14)	140 (10)
	Substance misuse	Misuse of alcohol	118 (9)	64 (5)
Social	Dependency in basic activities of daily living	Unable to walk without assistance	1141 (84)	969 (71)
	Dependency in instrumental activities of daily living	Unable to drive or go shopping without assistance	1004 (74)	891 (66)
	Legal problems	Unclear capacity to make treatment or discharge decisions	256 (19)	108 (8)
	Accommodation problems	Accommodation isolated or inappropriate to needs	250 (18)	192 (14)

a Other psychiatric diagnoses, for example schizophrenia and bipolar disorder, were uncommon.

Note
N = 1359 patients. Four patients had no problems and 13 had problems but none impeding discharge (all 17 were discharged soon after assessment).

The PICLP clinicians' main activity during stage 3 was to champion a biopsychosocial, rather than a solely biomedical, approach to patients' care and to use this to drive discharge planning. The specific interventions they delivered are shown in *Table 8*.

The most common intervention was communicating with the ward team, patient and family about the patient's care and discharge plan. The PICLP clinicians also attended rounds and multidisciplinary meetings in order to discuss patients under their care. They gave advice on the management of psychiatric disorders (e.g. the diagnosis and treatment of depression), the use of medications (e.g. when to prescribe drugs for symptoms of dementia) and the need for and timing of medical investigations (e.g. organising a non-urgent scan for after discharge).

They also provided psychological interventions directly to the patients (e.g. graded exposure therapy to help patients overcome their anxiety about rehabilitation after a fall) and spent time with families helping them to anticipate patients' needs after discharge (e.g. by explaining the difference between transient delirium and progressive dementia).

During the clinicians' daily reviews, they monitored the patients' progress and identified the problems that were currently impeding discharge in order to update the action plans. These reviews revealed that the percentage of patients who had biomedical or psychological problems impeding their discharge fell with time in hospital, but the percentage with social problems impeding discharge did not (*Figure 4*).

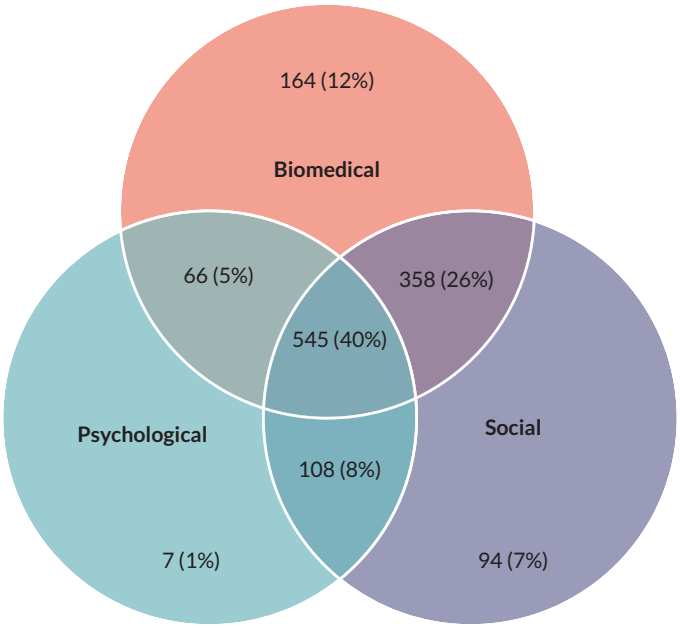

FIGURE 3 *N* (%) patients with problems judged to be impeding their discharge in each of the biopsychosocial domains as recorded at the PICLP stage 1 assessment. Note: *N* = 1359. Seventeen patients had no problems impeding discharge (all were discharged soon after the assessment). Reproduced with permission from Sharpe *et al.*[18] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.

TABLE 8 Interventions delivered by the PICLP clinicians

Intervention category	*n* (%)
Stage 3	
Regular communication with ward team	1245 (92)
Focused discharge planning with ward team	1233 (91)
Focused discharge planning with patient	1061 (78)
Driving implementation of management plan	1050 (77)
Advice to ward team about psychiatric diagnoses	825 (61)
Focused discharge planning with family and friends	742 (55)
Routine board round discussions	660 (49)
Advice to ward team about environmental and functional optimisation	633 (47)
Advice to ward team about medications	627 (46)
Psychological interventions with patient	623 (46)
Advice to ward team about psychological and behavioural interventions	554 (41)
Advice to ward team about investigations	477 (35)
Participating in multidisciplinary team meetings	443 (33)
Focused discharge planning with hospital staff other than ward team	397 (29)
Participating in discussions with other medical specialties	343 (25)
Psychological interventions with the patient's family	314 (23)
Focused discharge planning with out-of-hospital services	129 (10)

TABLE 8 Interventions delivered by the PICLP clinicians (*continued*)

Intervention category	*n* (%)
Seeing patient jointly with ward team members	124 (9)
Advice to ward team about risk minimisation on ward	119 (9)
Focused discharge planning with paid carers	113 (8)
Psychological interventions to ward team	89 (7)
Advice to ward team about the use of mental health legislation	86 (6)
Stage 4	
Advice to primary care physician	384 (28)
Referral to community psychiatry	97 (7)
Advice to other community healthcare professionals, e.g. palliative care	90 (7)
Advice to other out-of-hospital professionals, for example social services	42 (3)

Note
N = 1359.
Source
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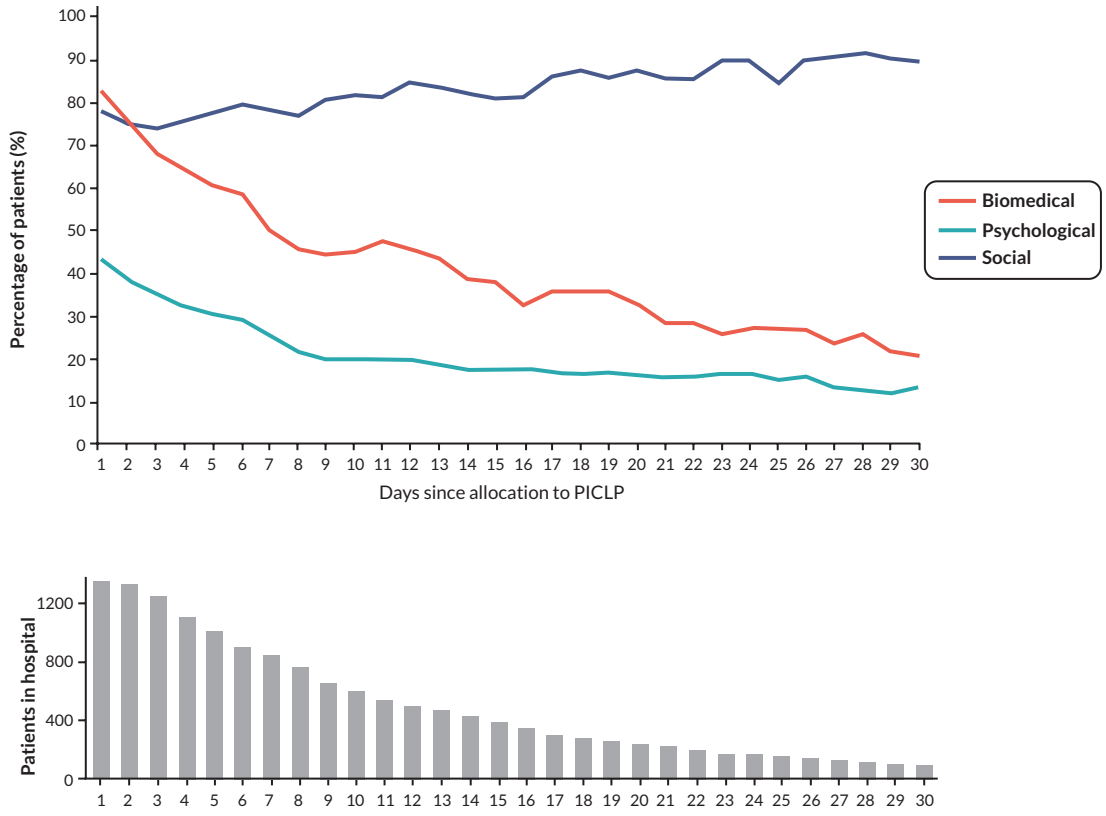

FIGURE 4 Percentage of patients with problems judged to be impeding their discharge in each of the biopsychosocial domains on each day following allocation to PICLP, with number of patients in hospital on each day in grey (bottom figure). Reproduced with permission from Sharpe *et al.*[18] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.

At the time of the patients' discharge (stage 4), the PICLP clinicians made recommendations and referrals to out-of-hospital care providers (see *Table 8*). For 28% (384/1359) of patients, this included specific advice (e.g. regarding medications) to their primary care physicians, and for 7% (97/1359), a referral to a community psychiatric service.

The senior psychiatrists spent a mean of 71 minutes (SD 42, range 0–370) in delivering PICLP to each patient, and the assisting clinicians spent a mean of 75 minutes (SD 70, range 0–540). This time included all PICLP activities (seeing the patient and their family, speaking with other clinicians, attending ward rounds and meetings, making telephone calls, completing the PICLP workbooks and other clinical records). *Figure 5* shows the mean time spent on each stage of PICLP. It can be seen that the senior psychiatrists spent only 31 minutes on the stage 1 biopsychosocial assessment and the assisting clinicians spent only 12 minutes. Most of the clinicians' time was spent on stage 3, working in an integrated way with the ward team to deliver interventions.

The Proactive Integrated Consultation-Liaison Psychiatry clinicians' experiences of working in the new service model

The PICLP clinicians' experiences are summarised in *Table 9*.

Theme 1: experience of the proactive approach

The PICLP clinicians found that, by working proactively, they saw patients with a much broader range of psychosocial and psychiatric problems than they did in their referral-based practice. They also reported that seeing patients earlier in the admission provided more opportunity to shape their care. They said that they found it liberating to be able to formulate their own clinical questions rather than being constrained by those of a referring clinician. While being generally positive about the proactive way of working, some PICLP clinicians expressed scepticism about whether every patient really needed to see a senior psychiatrist. Some also suggested that outside the context of the trial (where it took an average of 3.5 days from arrival at the hospital for patients to be recruited and allocated to PICLP), it might be helpful to assess patients even earlier in their stay.

Theme 2: experience of the integrated approach

The PICLP clinicians valued being a member of the ward team rather than a visiting specialist. They found that establishing themselves in their new role and gaining the trust of the ward team took time. As well as building new relationships, they had to challenge the view that they were only there to treat severe mental illness. The clinicians welcomed having greater responsibility for care and found that daily patient contact gave them a much richer, evolving perspective than that afforded by one-off consultations. It also allowed them to develop stronger and much more therapeutic relationships with both the patients and their family members. In fact, the PICLP clinicians often found

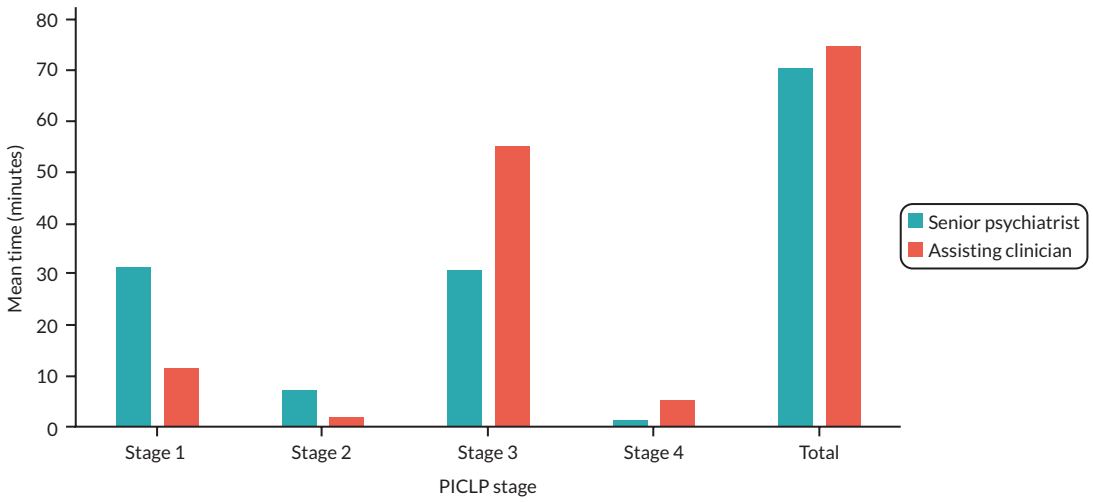

FIGURE 5 The mean time spent by the PICLP clinicians on each patient by stage. Reproduced with permission from Sharpe *et al.*[18] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.

TABLE 9 Clinicians' experiences of delivering PICLP

Theme	Code	Sample quotes
Experience of the proactive approach	Good to see patients with a broader range of problems than in referral-based practice	*You get a much broader view of the sorts of patients that come into the hospital. So I've enjoyed that*
	Useful to see patients earlier in their admission	*With regular consultation-liaison psychiatry, you're at the mercy of the clinicians on the ward … recognising people with problems and referring them … that can sometimes be several weeks … we see people a lot earlier* *I generally think [it would be better if we got involved] as early as possible … once they are on the emergency assessment unit*
	Seeing patients who have not been referred is quite different	*Superficially it looks like you're just doing psychiatry, but … eventually you will realise it is a radically new approach because you are seeing patients proactively, as in they haven't been referred, no-one is asking you to get involved … And you have to think about the patients in a totally new way* *What I really like about PICLP is that you find your own questions. You come to it … without the water being muddied by what other people are thinking, and that allows you to formulate your own judgements, and then to set your own questions with the relevant answers* *Other times it feels like we see patients that I think don't need us really*
Experience of the integrated approach	Feel part of the ward team	*You're really part of the ward community … you're there as a visitor in usual care, you're there as part of the team [in PICLP] … Rather than being there as an advisor you're there, you feel like actually you've got real responsibility to make the whole of this person's stay work*
	Need to establish role in ward team	*If you want to be part of the ward team, and be seen as just another ward member, you need to be doing what they're doing which is being on the ward all day every day* *I just think it's all about building relationships, I think that's the key to it* *There's definitely been times where people have raised eyebrows and thought … you're talking to us about their medical plan or talking to us about their occupational therapy plan or talking to us about their social care plan, that's not your job* *It's quite difficult to integrate oneself in wards where you're only involved in half the patients that are recruited to the study, and obviously not all the patients on the ward are recruited to the study either. In an ideal world you would be based on a ward where every single one of the patients was somebody that you took an interest in*
	Feel more responsibility for patient	*And being able to be more integrated you do have more of a sense that this is your patient, that you're responsible* *It's been a positive experience in having that level of responsibility and potential level of influence over when they go home and where they go. Especially when it comes to positive risk-taking and doing what the patient wants*
	Benefit of daily contact with patients	*Knowing what's happening day to day probably does make a really big difference because you can set a plan up one day and if you then go back to it 3 days later, if it's gone off track … well it's hard to pick up on those difficulties if you're only going back to these things very infrequently*
	Build relationships with patients and families	*It allows you the opportunity to really get to know patients during their time in hospital* *Often feels like we build up a good working relationship with … not just the patients but with the family members as well*
	Provide continuity of care	*My sense is … that a lot of the patients enjoy seeing us … every day, where … actually with the medical teams they don't get to see the same face every day*
	Help patients to understand their medical treatment	*Some of the work that we've done has been bridging that gap, saying actually this person has no understanding of what's going on for them regarding their diagnosis or their investigations or the plans for treatment*
	Help patients to actively engage in rehabilitation	*I feel we are … really pushing our patients to engage in therapy, get moving … it makes a big difference*
	Good to be involved in all aspects of care	*One does feel empowered to [intervene] in not only all the psychiatric care but the medical care and the social care*

continued

TABLE 9 Clinicians' experiences of delivering PICLP (*continued*)

Theme	Code	Sample quotes
	Help ward team to provide more holistic care	*One of the positives is being able to help the ward … see the patient from a more holistic point of view* *I think that one brings compassion to the general hospital ward in a way that it's distinctly lacking … and I think … that I have been able to model, kind, respectful care for patients*
Experience of the biopsy-chosocial perspective	Gratifying to do a quick but comprehensive biopsychosocial assessment	*It's quite an exciting, and I would say quite gratifying, way to be practising and it feels quite good. You can quite quickly … actually have quite an impact, you can be quite focused, you can come away after an hour, 45 minutes … you can kind of feel 'I've done a really comprehensive quick, and troubleshooting of course and focused, but I've really given a good … wide thought to this patient and really thought about a whole lot of things, and it's stretched what I would normally come up with*
	Pick up on problems that would otherwise be missed	*It's all about picking up on things that medics wouldn't see or the rest of the team wouldn't pick up on*
	Important that initial assessment is done by a senior consultation-liaison psychiatrist	*I think … it … probably leads to high quality … plans … and I think it's probably quite efficient in terms of time management in that … more experienced clinicians … don't spend a lot of time asking all the routine questions and they tend to hone in quite quickly on the important factors*
	Value the more systematic approach	*It's quite a good way of us doing what we should be doing in a more disciplined way* *I think the difference is that it makes me quite methodical. So, something like alcohol for example, is something that I've often got to the end of consultations with patients and gone 'I haven't asked you about alcohol'. it's not something that I was very good at remembering routinely … so I like having the prompts there … and I think my focus on the social aspects of people's lives has probably upped with the checklist*
Experience of the discharge focus	Important to challenge the idea that being in hospital is good	*It is a big change in mentality because often … the idea that being in hospital is not a good thing isn't something that is just in the public mindset, I think it's in the mindset of doctors, including the ones that should know better like the physicians that are running the medical wards. There is still this sense that if you keep the patient [in hospital] you're 'giving them a bit longer', you're giving them something good. Rather than you're taking away their chance to escape infections, you're taking [away] their time out of hospital* *I've always had an inkling that sometimes a hospital can be a bit of a vortex and, once you're in, it sucks you in, but sometimes it does feel like some professionals really don't want patients to leave. Even though I had a bit of an inkling about that, I've been surprised how ingrained the risk aversion is sometimes*
	Advocating for what patients want	*That's been their stated desire when they've come in, they've said 'I don't want to stay in' and we've been able to get them out quickly with the appropriate care* *The discharge system is not in tune with patients' interests … it's very hard for a patient to leave hospital if all they want to do is leave hospital*
	Requires a senior consultation-liaison psychiatrist	*There is something about a senior psychiatrist being able to take responsibility alongside the senior physician that makes a big difference* *You need that clinical authority that usually only senior doctors seem to be able to carry. Because a lot of it … involves positive risk-taking*
	Frustrated by discharge procedures	*I think there's a lack of mandated leadership on the discharge plan. It's too democratic. There is too much equal weight given to all the different members of the multidisciplinary team* *It's frustrating when we have the same problems come up over and over again, and it's a system problem rather than anything else and we are not able to make the changes to the system*
	Reservations about referring psychiatric problems to out-of-hospital providers	*Occasional sense of frustration that I can't actually get to the bottom of some of the psychiatric things because … they're not the reason that the person is really in hospital and therefore they're not my focus at this time* *I know that the community teams and the memory service are under huge pressure*

themselves providing continuity of care and helping patients understand the general medical as well as the psychiatric diagnoses and treatments. As they became increasingly secure in their integrated role, they found opportunities to model holistic patient care to the busy and task-focused ward staff. However, the clinicians also commented that working in the context of an individually randomised trial sometimes made it difficult to be fully integrated into the ward. For example, during rounds, they had to refrain from giving advice about patients who had not been allocated to PICLP.

Theme 3: experience of the biopsychosocial perspective

The PICLP clinicians found that adopting an explicitly biopsychosocial perspective, rather than focusing solely on diagnosing psychiatric disorders, was a rewarding and clinically appropriate way to work with older medical inpatients. They noted that the initial stage 1 assessments required a high level of skill, because patients typically had complex biopsychosocial problems, and were therefore best done by a senior consultation-liaison psychiatrist. They also noted that the use of checklists helped them achieve a consistent and comprehensive patient assessment.

Theme 4: experience of the discharge focus

The clinicians found that the longer they did PICLP, the more they became convinced that timely discharge benefited patients. However, they were frequently frustrated in achieving this by ward staff attitudes and bureaucratic processes. In particular, they observed that many ward staff underestimated the risks of lengthy inpatient stays and overestimated the risks of returning home. They noted that the senior psychiatrists' clinical expertise and authority were important in challenging these attitudes. They found themselves proselytising for the benefits of prompt discharge and being advocates for patients who said that they wanted to go home. The only times they wavered in this view was when they had concerns about the adequacy of out-of-hospital services for patients who needed ongoing psychiatric care.

Patients' experiences' of Proactive Integrated Consultation-Liaison Psychiatry

Of the 56 patients eligible for the qualitative study, 43 (77%) participated (6 were uncontactable and 7 declined). These patients were from all three hospitals and their demographic characteristics were similar to those of all the patients who received PICLP in the trial (*Table 10*).

The experiences reported by patients themselves (in 26 interviews) and by proxies (in 17 interviews) were similar; we therefore report them together (*Table 11*) and refer to them hereafter as 'patients' experiences'. We categorised patients' experiences into codes and subthemes within the two pre-defined themes ('what was helpful about PICLP' and 'what was unhelpful about PICLP') and a third theme ('no specific comments about PICLP'), which we added during analysis of the interviews.

Patients' experiences, theme 1: what was helpful about Proactive Integrated Consultation-Liaison Psychiatry

Patients reported that the explicit inclusion of psychological and social dimensions in their assessment and subsequent treatment was helpful. They observed this to be both different to and better than their previous experiences of hospital admissions, when PICLP had not been part of their care. Patients also valued their ongoing relationships with the PICLP clinicians. They experienced these as 'therapeutic', in that the clinicians expressed interest in them as people and enabled them to talk about their feelings. Some patients spoke positively about the expert help they received with the severe psychological complications of their life-threatening medical illness, including anxiety, depression and post-traumatic symptoms. Perhaps more surprisingly, a number of patients said that the PICLP clinicians helped them to understand their medical, as well as their psychiatric, diagnoses and to engage more in decisions about their treatment. In addition, patients welcomed the PICLP clinicians' help with planning discharge and aftercare, including for some specific referral to psychiatric and psychological services.

Patients' experiences, theme 2: what was unhelpful about Proactive Integrated Consultation-Liaison Psychiatry

The analysis revealed few unhelpful experiences of PICLP. One patient said that they disliked being asked about psychological symptoms during the proactive assessment, as they felt this questioned the veracity of their physical complaints. Another reported feeling burdened by having more clinicians involved in their medical care.

TABLE 10 Characteristics of patients who participated in the qualitative study

	N = 43
Hospital	
Addenbrookes Hospital, Cambridge	18 (42%)
John Radcliffe Hospital, Oxford	15 (35%)
Royal Devon and Exeter Hospital, Exeter	10 (23%)
Age (years)	
Mean (SD)	80.3 (8.3)
Sex	
Male	23 (53%)
Female	20 (47%)
Main reason for hospital admission	
Cardio-respiratory symptoms	15 (35%)
Falls and injuries	10 (23%)
Confusion, drowsiness and collapse	5 (12%)
Gastrointestinal symptoms	3 (7%)
General weakness	3 (7%)
Other	7 (16%)
Multimorbidity	
≥ 2 current medical conditions	40 (93%)
Days in hospital from start of PICLP to discharge	
Mean (SD)	10 (10)
Interviewee	
Patient	26 (60%)
Proxy[a]	17 (40%)
Days from hospital discharge to interview	
Mean (SD), range	92 (58), 2–183

a The proxy for each patient was their spouse (6), son or daughter (9) or other family member (2).

Patients' experiences, theme 3: no specific comments about Proactive Integrated Consultation-Liaison Psychiatry

There were some patients who, despite clearly remembering the hospital stay, were unable to differentiate their experience of PICLP clinicians from the many other medical ward staff. Others could remember the PICLP clinicians by name or profession but offered no specific comments about their experience.

Ward staff members' experiences of Proactive Integrated Consultation-Liaison Psychiatry

Of the 59 ward staff members eligible for the study, 54 (92%) participated (5 declined). These staff members were from all three hospitals and all relevant disciplines (*Table 12*). During The HOME Study, they provided care as they usually would and were therefore involved in the care of the patients allocated to PICLP as well as the patients allocated to usual care.

TABLE 11 Patients' experiences of PICLP

Theme	Subtheme	Code	Sample quotes
What was helpful about PICLP	Appreciated the psychosocial dimension to care	Appreciated holistic approach	*The thing that we (patient and family member) really appreciated was the holistic approach in which everything was really very fully co-ordinated – the physical side, the mental side, the psychological side and for giving total care overall*[a]
		Good to address psychological factors	*It's a good point of view to see a person's personal reaction to what's going on around them and how they're feeling, it's all part of the illness, well not part of the illness itself but the care and the getting better*
		Better than previous experience of medical care	*Most doctors don't really have time to do more than check you over and talk about your physical symptoms* *It's been very different from any previous experience I've ever had … when I've ever been in hospital before*
	Valued the ongoing therapeutic relationship	Felt listened to	*He had the time to listen and let me speak* *[PICLP clinician] was enquiring things of me [whereas] the others were telling me things … there was a difference in his approach*
		Interested in personal experiences	*It makes you feel that someone is interested in your personal circumstances* *She could talk about her experiences and people were interested in listening that was good for her she enjoyed that*[a]
		Felt able to talk about feelings	*I don't know where it all came from … I've got pulmonary fibrosis plus I keep getting recurrent chest infections which don't clear up … I was very low at the time and I felt really poorly. And it just all came pouring out … I was embarrassed but they didn't make me feel embarrassed*
		Valued ongoing contact	*[PICLP clinician] came to see me every day before I came home just to talk to me which was lovely*
	Valued expert help with severe psychological complications of illness	Helped with anxiety about illness experience	*I was there [in hospital] for quite a long time … I had to be fed intravenously … he [PICLP clinician] was asking me questions … it made you say things to people out-loud that you might be thinking … addressing any … anxiety one probably might have had internally, yes it helped to relieve feelings … so that one felt more comfortable with what was going on* *There are natural anxieties when something like that (a heart attack) has happened to you – so the professional contact was very reassuring, I think it was a morale booster*
		Helped cope with life-threatening illness	*I was in ICU for the first 4 days so I've really got no recollection of all of that … I was on, my wife said, life support so my first recollections of coming round … and starting to think well what's happened to me, am I having a nightmare? Am I going to come round from this? … So it was coming to terms with what had happened … I think their knowledge of what had happened to other people in that situation and what might happen to you, the after effects that you might have especially mentally, it was good to talk that through … especially the mental component like whether you will have flashbacks*
		Helped think differently about illness	*I ended up [in hospital for] nearly 4 weeks … it made me feel quite bad in the head … I felt a lot of pressure and depression … [Seeing the PICLP clinician] clarified things in my mind … because when you're on your own even in hospital … there's a lot of time to think and sometimes you think the wrong track … he was very helpful at just pointing me in a different way of looking at things*
	Helped to understand and engage with medical diagnosis and treatment	Helped question medical care	*[Talking with the PICLP clinician] made more determined to stick up for myself a bit … The key thing is that I persuaded them to change my medication as a result of that talk and that's meant I haven't actually had internal bleeding since then because it was the medication that was causing it*
		Helped engage in decision-making	*They tried to very much engage her in her own care and in her own decision-making. Because she has Alzheimer's that is very difficult*[a]
		Helped clarify understanding of illness	*I did actually find that quite nice to be able to have somebody to talk to just to check up on what I had actually been told as to what I had imagined I'd be told … I had queries of my own … that was helpful*

continued

TABLE 11 Patients' experiences of PICLP (*continued*)

Theme	Subtheme	Code	Sample quotes
		Talked through what had happened	*It was good to talk it through … it improved your understanding of what had happened to you [when you were in the ICU] and your rehabilitation*
		Explained medical treatments	*He was able to explain things to me … he was able to use his knowledge to put my mind at rest and to feel more confident about being in hospital and the treatment I received*
	Helped to plan discharge and aftercare	Helped co-ordinate complex discharge	*You know the doctors have a meeting every day … they went and joined in with that. There were … quite a few different doctors involved … They made sure they'd done everything to set everything in place … I've still got a PICC line in my arm … I know what to do … it made me feel safe*
		Arranged out-of-hospital care	*He referred my dad to a memory clinic*[a] *I'd been through quite a lot and different doctors were telling me different things … I'm going to have some counselling which they've helped me arrange through the [palliative care service]*
What was unhelpful about PICLP	Disliked talking about psychological symptoms	Disliked talking about psychological symptoms	*I was extremely disappointed, first and foremost, that I wasn't going [to a rehabilitation unit] … I was not depressed at all, and I'm not depressed now … my ailment was genuine … for some rather strange reason, the people involved were more interested in my mental state than my physical state which was completely wrong … I was not in there to talk about or be treated for my mental state. I was in there because I had fallen down the stairs*
	Added to number of people involved in care	Added to number of people involved in care	*The only thing was I had a lot of people coming to see me from all points of view … and it became a bit confusing*
No specific comments about PICLP	No specific recollection of PICLP clinicians	No specific recollection of PICLP clinicians	*I ended up in hospital and … I was comfortable as far as hospital standards went … I don't have any complaints … to be honest I had a team come round, two or three doctors … there was so much going on* *There were so many people there and so much was happening* *Different people were coming in … so that's fine and I'm open to anything like that*
	No specific positive or negative comments	No specific positive or negative comments	I *saw one [of the PICLP clinicians] … it was fine … he just asked me the questions and I just answered* *It was fine … it was okay, I don't know what to say* *They were very polite, not intrusive. It went very well I thought*

a Quote from proxy.

As the experiences of the different professional groups were similar, we report them together (*Table 13*). We categorised ward staff members' experiences into codes and subthemes within the two pre-defined themes ('what was helpful about PICLP' and 'what was unhelpful about PICLP').

Ward staff members' experiences, theme 1: what was helpful about Proactive Integrated Consultation-Liaison Psychiatry

The ward staff were enthusiastic about the proactive approach and they liked not having to go through the process of making referrals to consultation-liaison psychiatry. They reported that proactive assessments were helpful because they led to earlier psychiatric involvement in patients' care. They also found that that these assessments ensured that more patients could benefit from the involvement of consultation-liaison psychiatry and that the PICLP clinicians identified important problems that would otherwise have been missed.

Ward staff also welcomed the integration of PICLP clinicians into their teams. Their daily presence on the ward was seen to facilitate frequent, face-to-face discussions and ongoing involvement in each patient's care. They particularly

TABLE 12 Characteristics of ward staff members who participated in the qualitative study

	N = 54
Addenbrookes Hospital, Cambridge	20 (37%)
John Radcliffe Hospital, Oxford	17 (31%)
Royal Devon and Exeter Hospital, Exeter	17 (31%)
Profession	
Nurse	13 (24%)
Allied health professional (occupational or physical therapist)	13 (24%)
Senior physician	10 (19%)
Care co-ordinator[a]	9 (17%)
Junior physician	8 (15%)

a Healthcare professional whose primary focus is discharge co-ordination (social worker, non-clinical discharge co-ordinator and discharge liaison nurse).

TABLE 13 Ward staff members' experiences of PICLP

Theme	Subtheme	Code	Sample quotes
What was helpful about PICLP	Valued the proactive approach	Did not need to refer	*It's an automatic thing* *I don't need to call them to come see patients. It's great because getting hold of [usual] CONSULTATION-LIAISON psychiatry … it's really difficult at times*
		Saw patients much earlier in admission	*We have to identify a problem, and that might be days and days in [to the admission] and then [it's] dependent on the ward team making the referral. It's not always done in a timely way, so you've missed a big chunk of time for that person … this way of working captures it right at the start, right on admission, the minute they're on that ward*
		Saw patients not usually seen by consultation-liaison psychiatry	*Lots of patients … will be anxious … [being severely ill] just knocks their confidence … so what's really good about [PICLP] is picking up people who wouldn't normally come anywhere near consultation-liaison psychiatry*
		Identified problems that would otherwise be missed	*The PICLP psychiatrist saw them and thought they had a background of cognitive impairment. I don't think we would have picked that up*
	Welcomed the integration of PICLP clinicians into the ward team	Part of the same team	*People are in the muck and have rolled their sleeves up … where before, it was a little bit that's them and us and above the neck, below the neck, that's mental that's physical, this is a lot more integrated* *The PICLP clinicians come on ward rounds and have discussions, they don't do things in isolation … they communicate within the team*
		Presence on the ward	*We can discuss cases face-to-face, we don't need to wait for someone to come to the ward … when you've got new patients … you know you can talk to them straight away*
		Saw patients and families jointly with other team members	*Sometimes you can actually see patients together with them … which I've found is really helpful* *The [PICLP clinicians] came along and sat in with me for a long meeting with the family … I brought the medical side of things and they brought [the psychosocial] … there was huge family dynamics … we pulled it all together*
		Trained other team members	*The real difference … has been the number of [senior psychiatrists] that I've met or got to know here, day in day out, and it's that knowledge that you can ask questions and from the training perspective you learn from them*

continued

TABLE 13 Ward staff members' experiences of PICLP (*continued*)

Theme	Subtheme	Code	Sample quotes
		Had ongoing involvement in patients' care	*There are continual, as in often several, conversations or updates as the patient moves through their pathway and through their illness* *It tends to be more intensive and longitudinal rather than a requested and singular assessment … a more effective contribution*
	Added psychiatric expertise to ward team	Senior psychiatrist expertise	*Access to senior experts [is positive] … a lot of these [patients] are tricky and you're not quite sure* *I get good professional advice … in difficult cases of dementia, delirium or psychotic issues … on … the best way to manage that*
		Helped to make and clarify psychiatric diagnoses	*I've certainly seen a huge improvement in committing to diagnoses … it's made a big change in advance care planning and forward thinking for our older patients* *In patients who've had longstanding psychiatric histories with often a raft of diagnoses over the years, having that clarified … that's been very helpful … that level of clarity has changed how we approach both their medical and psychiatric treatment*
		Provided interventions for patients and families	*Several of our patients have had [psychological treatment from the PICLP clinicians] that helped motivate them to actually partake in occupational therapy … that made a very big difference to their eventual outcome* *The PICLP clinicians were able to take the time to go through those complex and difficult conversations with the patients and family which we would like to do but with the pressures we've got at the moment it's very difficult to find the time to have these complex conversations*
	Brought a biopsychosocial perspective to patient care	Holistic approach	*It's more holistic … there is a greater … whole person [approach] and taking everything into perspective … [more] than just a psychiatric assessment*
		Encouraged others to take biopsychosocial perspective	*It provides a good nudge sometimes for the clinicians to think more in terms of a biopsychosocial model rather than just biomedical which I guess we're all guilty of doing sometimes*
		Patient-centred approach to care and discharge	*They've … contributed in terms of discussion around how the patients feel, how the families feel* *They come up with an insight into how the patient was before they came in*
	Helped with discharge planning	Advocated for patients who want to go home	*It's been really helpful on the ward to have people who are … intelligent advocates and intelligent agitators on behalf of the patient … who are able to realise that once the simple biological mechanistic medicine is done that to try and actually get out of hospital is a bit like trying to overcome the gravitational pull of a planet*
		Understood the need to discharge patients in a timely fashion	*Usually their views are in accordance with mine. That is probably in quite big contrast to … other teams reaching in to medicine such as cardiology … not least around home versus hospital care*
		Made practical contributions to minimising delays	*Having their involvement especially with this clientele … they do have complex needs and they've been … helpful in facilitating discharges … they've been liaising with families, they've been able to chase scans and investigations and … it's actually happening a little bit quicker thanks to the [PICLP clinicians]*
		Arranged psychiatric follow-up	*It's always reassuring to know there's follow-up arranged for patients leaving our ward, that they'll be seen in the community, they won't be lost because the [PICLP clinicians] will put it in place*
		Helped the team to focus on maximising patients' independence post discharge	*What's been really helpful is just holding on to this idea of independence … or a degree of independence being achievable for every person who comes here … that's something the [PICLP clinicians] have made me quite aware of*
What was unhelpful about PICLP	Intruded into other professionals' roles	Intruded into other professionals' roles	*It's just too many people involved trying to do the same thing* *Sometimes it feels like they are trying to do all the jobs of the MDT rather than be focusing on the psychological* *There was a lot of pressure on me from the PICLP clinicians in trying to get [the patient] out*

TABLE 13 Ward staff members' experiences of PICLP (*continued*)

Theme	Subtheme	Code	Sample quotes
	Unclear who was in charge of care	Unclear who was in charge of care	*Where is the locus of control to determine what next and who's driving the bus?* *When there's been lots of professionals involved, families sometimes … don't know who to go to* *I wasn't quite sure why they were seeing some of them because there clearly wasn't a role … if I really wanted consultation-liaison psychiatry … I would have asked them to come*

Source
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valued opportunities to see patients and their families jointly with the PICLP clinicians, and they saw integrated working as creating opportunities for the education and training of ward staff of all disciplines. The staff especially welcomed the ready availability of senior psychiatric advice. In particular, they found that the team's newfound ability to make firm, as opposed to only tentative, psychiatric diagnoses helped with patient care and discharge planning. The ward staff also appreciated the psychotherapeutic interventions that the PICLP clinicians provided to patients and their families, for example, helping anxious patients to engage with their rehabilitation and families to resolve conflicts about postdischarge arrangements for their relative.

The ward staff were positive about the PICLP clinicians' biopsychosocial perspective on patient assessment and care. They said that this encouraged the whole team to take a more holistic approach; something that they aspired to but felt they often failed to deliver. They observed how a greater understanding of psychological and social factors helped them to make practical, realistic and patient-centred plans for care and discharge.

The PICLP clinicians' help with discharge planning and their advocacy for patients who wanted to go home were also seen as useful contributions to care. Some ward staff particularly appreciated the PICLP clinicians' understanding of the need for timely discharge and were glad to have their practical help in minimising unnecessary delays and arranging out-of-hospital care. They also appreciated the PICLP clinicians' focus on maximising patients' postdischarge independence as well as treating their disease.

Ward staff members' experiences, theme 2: what was unhelpful about Proactive Integrated Consultation-Liaison Psychiatry

Some ward staff felt that PICLP intruded unhelpfully into their professional roles. Others said that the presence of senior consultation-liaison psychiatrists on the wards led to lack of clarity about who was ultimately in charge of the patients' care and discharge planning.

Usual care

In usual care, only 4% (50/1371) of participants were referred to the traditional consultation-liaison psychiatry services during their hospital stay.

Primary outcome

The mean time spent as an inpatient in the 30 days post randomisation (primary outcome) was 11.37 (SD 8.74) with PICLP and 11.85 (SD 9.00) with usual care (*Table 14*); 92% of these days were during the index admission and 8% were during re-admissions (*Figure 6*).

TABLE 14 The HOME Study trial outcomes: analyses of data collected from medical records and databases

	PICLP	Usual care	Adjusted treatment effect estimate (95% CI)[a]	*p*-value
Number of days spent as an inpatient in the 30 days post randomisation (primary outcome)[b] *Mean (SD)*	11.37 (8.74)	11.85 (9.00)	Difference between means −0.45 (−1.11 to 0.21)	0.18
Rate of discharge from hospital for the total length of the index admission	–	–	RR 1.09 (1.00 to 1.17)	0.042
Discharge destination was a private residence[c] *N (%)*	843 (75%)	802 (73%)	Odds ratio 1.12 (0.91 to 1.38)	0.29
Length of the index admission (post randomisation) truncated at 30 days *Mean (SD)*	10.40 (8.63)	10.98 (8.83)	Difference between means −0.53 (−1.17 to 0.12)	0.11
Number of emergency re-admissions to hospital in the year post randomisation *Mean (SD)*	1.04 (1.77)	1.00 (1.61)	Mean count ratio 1.02 (0.91 to 1.14)	0.75
Number of days spent as an inpatient in the year post randomisation[d] *Mean (SD)*	21.31 (23.48)	21.41 (22.33)	Difference between means −0.17 (−1.87 to 1.53)	0.84
Rate of death in the year post randomisation	–	–	RR 0.91 (0.81 to 1.03)	0.12
Number of emergency re-admissions to hospital in the year post randomisation[e] *Mean (SD)* Before the start of the COVID-19 pandemic After the start of the COVID-19 pandemic	–	–	Mean count ratio 1.38 (0.76 to 2.52) 0.82 (0.31 to 2.12)	0.29 0.68
Number of days spent as an inpatient in the year post randomisation[d,e] *Mean (SD)* Before the start of the COVID-19 pandemic After the start of the COVID-19 pandemic	–	–	Difference between means 0.40 (−1.55 to 2.34) −0.21 (−4.88 to 4.46)	0.69 0.93
Rate of death in the year post randomisation before the start of the COVID-19 pandemic[e]	–	–	RR 0.88 (0.76 to 1.00)	0.055

RR, rate ratio.
a Adjusted for hospital, sex, age and medical ward.
b During the index admission and any emergency re-admissions to acute general hospitals.
c For participants admitted from a private residence; PICLP: *n* = 1120, usual care: *n* = 1093.
d During emergency admissions to acute general hospitals.
e Sensitivity analyses to address effects of the COVID-19 pandemic.

Notes
All comparisons are PICLP vs. usual care.
Bootstrap 95% CIs for outcomes analysed using linear regression are shown in *Appendix 8*, *Table 22*.

Source

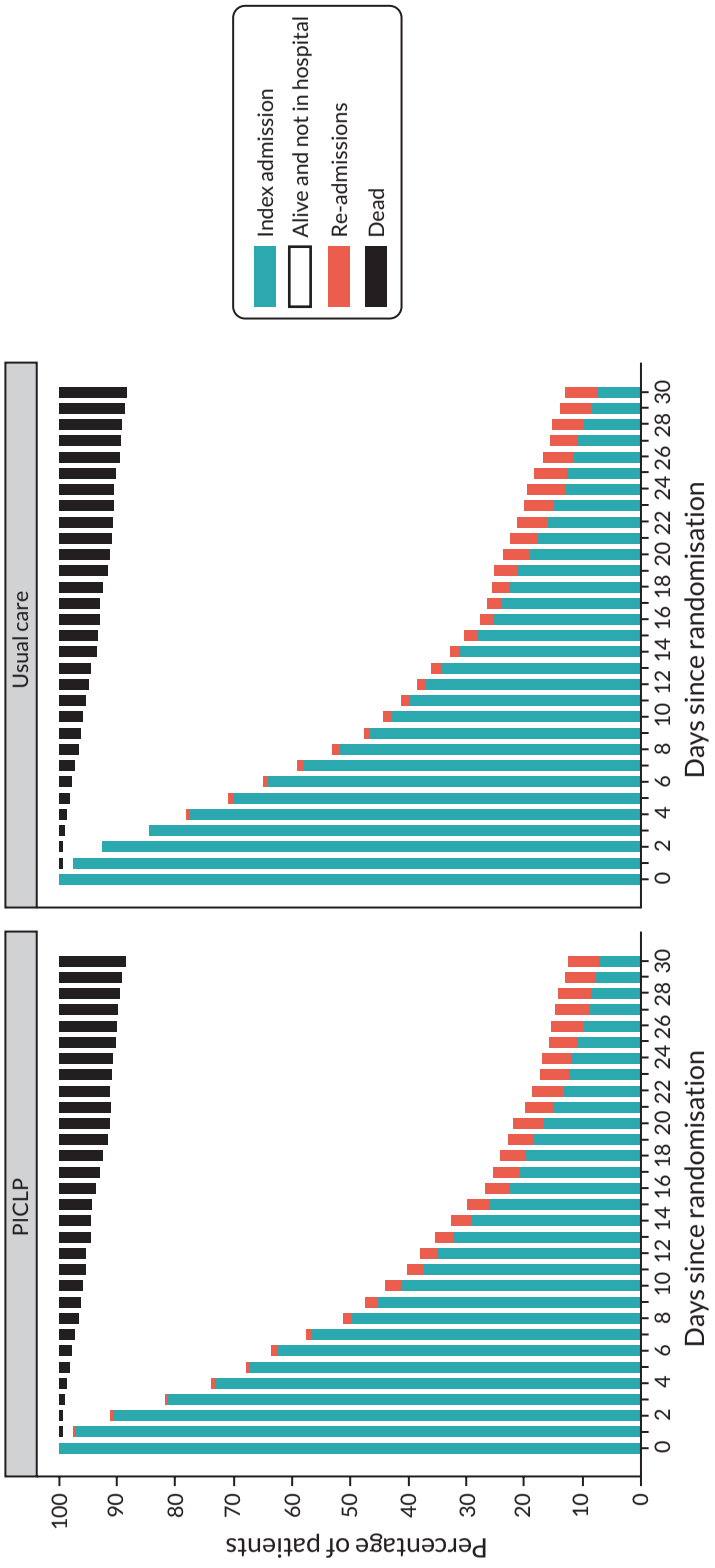


FIGURE 6 Percentage of participants in hospital during their index admission, in hospital during an emergency re-admission, alive and not in hospital, and dead on each of the 30 days post randomisation. Reproduced with permission from Sharpe *et al.*[20] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.

The estimated −0.45 [95% confidence interval (CI) −1.11 to 0.21; p = 0.18] day difference, in favour of PICLP, was smaller than the 1-day difference sought and not statistically significant (*Figure 7*). The differences in the treatment effect in the subgroup analyses of the primary outcome by hospital, sex and age were not statistically significant (see *Appendix 7*, *Table 20*).

In the supplementary analyses, time spent in hospital as a proportion of the time alive in the 30 days post randomisation was less with PICLP as was time spent in hospital in the 30 days post randomisation only including participants who were alive for all 30 days. However, these differences were not statistically significant (see *Appendix 7*, *Table 21*).

Secondary outcomes

The rate of discharge for the total length of the index admission was 9% higher for participants allocated to PICLP than for those allocated to usual care, and this difference was statistically significant (RR 1.09; 95% CI 1.00 to 1.17; p = 0.042). Inspection of the Kaplan–Meier plot indicates that the lines representing PICLP and usual care appear to separate at around 2 weeks post randomisation (*Figure 8*).

There were no statistically significant differences between PICLP and usual care in discharge destination or length of the index admission truncated at 30 days (*Table 14*). Nor were there differences in the number of emergency re-admissions or number of days in hospital in the year post randomisation in our main analyses, supplementary analyses (see *Appendix 8*, *Table 23*) and in those which sought to address effects of the COVID-19 pandemic (see *Appendix 4*).

Forty-one per cent (1116/2744) of participants died in the year post randomisation (see *Table 15* for causes of death). *Figure 9* suggests a lower death rate for those allocated to PICLP over the whole year compared with those allocated

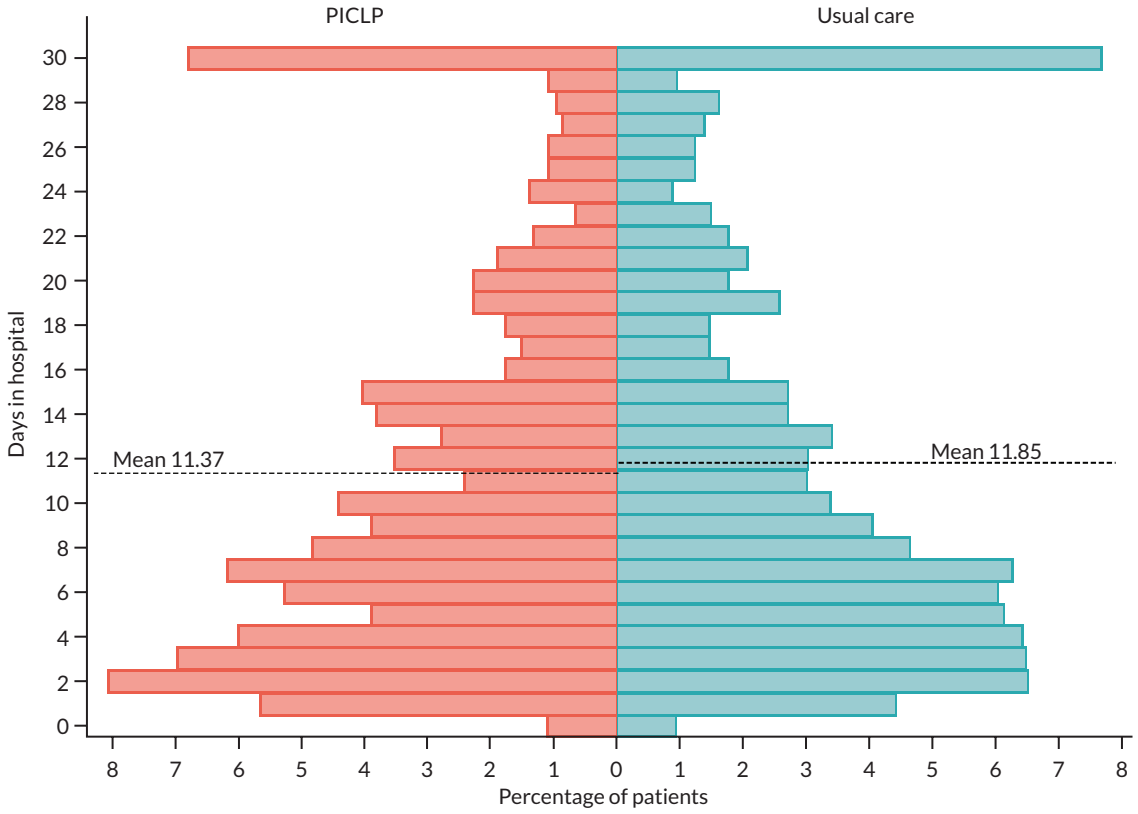
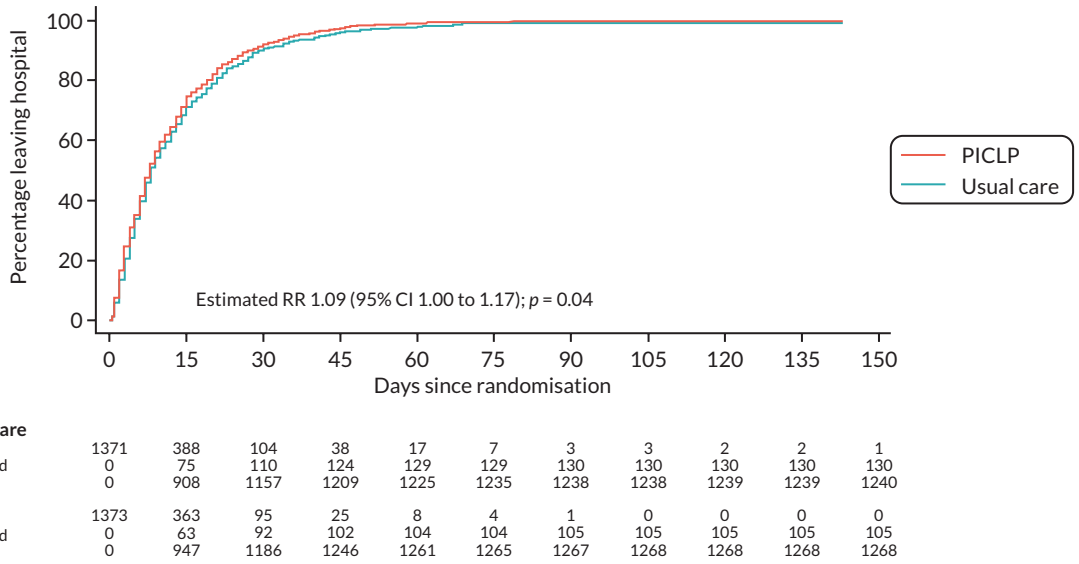


FIGURE 7 Primary outcome. Note: Comparison of the distributions of participants' number of days in hospital in the 30 days post randomisation (primary outcome) with PICLP and usual care. Reproduced with permission from Sharpe *et al.*[20] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.



Usual care											
At-risk	1371	388	104	38	17	7	3	3	2	2	1
Censored	0	75	110	124	129	129	130	130	130	130	130
Event	0	908	1157	1209	1225	1235	1238	1238	1239	1239	1240
PICLP											
At-risk	1373	363	95	25	8	4	1	0	0	0	0
Censored	0	63	92	102	104	104	105	105	105	105	105
Event	0	947	1186	1246	1261	1265	1267	1268	1268	1268	1268

FIGURE 8 Rate of discharge for the total length of the index admission. Reproduced with permission from Sharpe *et al.*[20] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.

TABLE 15 Causes of death in the year post randomisation

	PICLP (*n* = 542)	Usual care (*n* = 574)
Cancer		
Gastrointestinal	22 (4%)	26 (5%)
Lung (including mesothelioma)	18 (3%)	29 (5%)
Prostate	17 (3%)	21 (4%)
Hepatobiliary	13 (2%)	16 (3%)
Unknown primary	10 (2%)	15 (3%)
Other cancer	48 (9%)	34 (6%)
Circulatory		
Ischaemic heart disease (including acute myocardial infarction)	49 (9%)	51 (9%)
Cerebrovascular disease (stroke)	27 (5%)	23 (4%)
Heart valve disease	11 (2%)	19 (3%)
Arrythmia	8 (1%)	7 (1%)
Heart failure	3 (1%)	5 (1%)
Pulmonary embolism	2 (0%)	0 (0%)
Cardiomyopathy	0 (0%)	4 (1%)
Other circulatory	14 (3%)	18 (3%)

continued

TABLE 15 Causes of death in the year post randomisation (*continued*)

	PICLP (*n* = 542)	Usual care (*n* = 574)
Respiratory		
Respiratory infection	40 (7%)	47 (8%)
Chronic obstructive airways disease	35 (6%)	33 (6%)
Interstitial pulmonary disease	7 (1%)	12 (2%)
Other respiratory	14 (3%)	10 (2%)
Neurological and psychiatric		
Dementia	70 (13%)	60 (10%)
Parkinson disease	14 (3%)	14 (2%)
Degenerative neurological disease (including motor neuron disease)	8 (1%)	5 (1%)
Multiple sclerosis	1 (0%)	5 (1%)
Other		
Gastrointestinal and hepatobiliary diseases	30 (6%)	34 (6%)
COVID-19	12 (2%)	14 (2%)
Other (non-respiratory) infection	19 (4%)	18 (3%)
Senility	12 (2%)	10 (2%)
Diabetes	8 (1%)	5 (1%)
Fall or injury	9 (2%)	11 (2%)
Renal disease	2 (0%)	7 (1%)
Other	15 (3%)	19 (3%)
Unknown	**4 (1%)**	**2 (0%)**

Source
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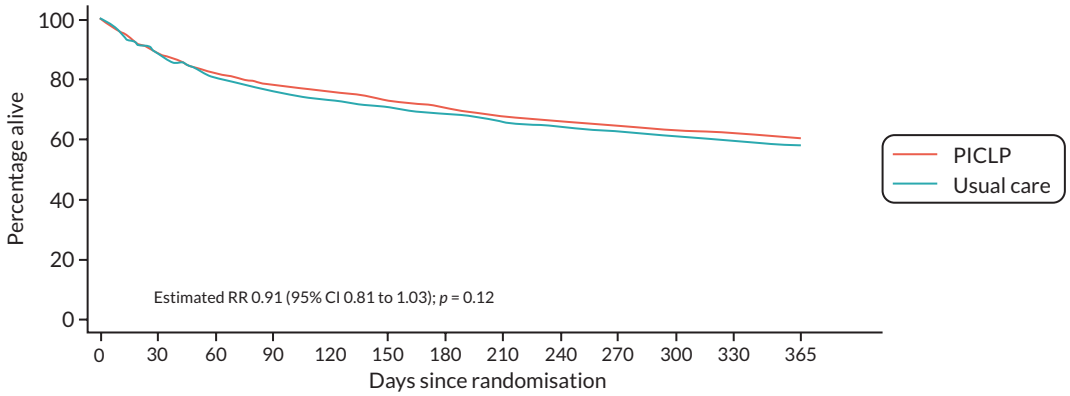
to usual care. Inspection of the Kaplan–Meier plot indicates that the lines representing PICLP and usual care appear to separate after 30 days post randomisation. However, overall, the difference between the groups was not statistically significant (RR 0.91; 95% CI 0.81 to 1.03; $p = 0.12$). This effect of PICLP was slightly larger and was of borderline statistical significance before the onset of the COVID-19 pandemic (RR 0.88; 95% CI 0.76 to 1.00; $p = 0.055$).

At 3 months, the mean depression score was slightly higher with PICLP (0.20; 95% CI 0.01 to 0.38; $p = 0.035$). There were no other statistically significant differences between PICLP and usual care on the outcomes collected from participants (*Table 16*). There was no evidence that the proportion of proxy data collection differed by group and no evidence that the treatment effect differed by patient/proxy data collection for the relevant secondary outcomes (see *Appendix 8*, *Table 24*). Supplementary post-hoc analyses results are presented in *Appendix 10*.

Health economic evaluation

The mean cost of delivering PICLP was £207 (95% CI £200 to £214) per participant (see *Appendix 9*, *Table 25*). We found no meaningful differences in QALYs between PICLP and usual care (*Table 17*).



Usual care													
At-risk	1371	1209	1099	1038	987	957	923	889	866	847	826	805	781
Censored	0	3	4	4	14	16	16	16	16	16	16	16	16
Event	0	159	268	329	370	398	432	466	489	508	529	550	574
PICLP													
At-risk	1373	1219	1125	1072	1030	987	954	922	897	873	857	841	822
Censored	0	0	0	0	7	10	10	10	10	10	10	10	10
Event	0	154	248	301	336	376	409	441	466	490	506	522	541

FIGURE 9 Rate of death in the year post randomisation. Reproduced with permission from Sharpe *et al.*[20] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.

We estimated PICLP to be cost saving compared with usual care over the 1-month time horizon (mean reduction £35 per participant; probability of cost saving 60%) and the 3-month time horizon (mean reduction of £42 per participant; probability of cost saving 55%) (*Table 17* and *Appendix 9*, *Table 25*). However, PICLP did not seem to be cost saving over the 12-month time horizon (mean increase £120 per participant; probability of cost saving 43%).

We also estimated PICLP to be cost-effective over 1 month and 3 months for thresholds of £20,000 per QALY or less. However, over 12 months it was dominated by usual care (more costly and less effective).

Sensitivity and subgroup analyses results are presented in *Appendix 11*.

Adverse events

There were 323 (PICLP 158, usual care 165) SAEs (deaths in the 30 days post randomisation); none of these were judged to be related to the trial treatments or procedures.

TABLE 16 The HOME Study trial outcomes: analyses of data collected from participants

	PICLP	Usual care	Adjusted treatment effect estimate[a] (95% CI)	*p*-value
Experience of the hospital stay (0–10) *Mean (SD)*	8.15 (2.02)	8.08 (2.05)	0.05 (−0.13 to 0.22)	0.64
View on the length of the hospital stay				
Too short	131 (10%)	120 (9%)	1.05 (0.88 to 1.25)[b]	0.57
About right	601 (44%)	592 (43%)		
Too long	302 (22%)	266 (19%)		
Anxiety (GAD-2, 0–6) Mean (SD)				
1 month	2.03 (2.14)	1.94 (2.13)	0.11 (−0.06 to 0.28)	0.20
3 months	1.79 (2.07)	1.69 (2.00)	0.11 (−0.07 to 0.29)	0.24
Depression (PHQ-2, 0–6) Mean (SD)				
1 month	2.03 (2.14)	1.90 (2.09)	0.10 (−0.07 to 0.27)	0.27
3 months	1.84 (2.06)	1.63 (1.98)	0.20 (0.01 to 0.38)	0.035
Cognitive function (MoCA-T, 0–30) Mean (SD)				
1 month	16.99 (7.74)	16.94 (8.01)	0.21 (−0.30 to 0.73)	0.41
3 months	17.97 (7.83)	18.23 (8.03)	−0.20 (−0.79 to 0.38)	0.49
Independent functioning (Barthel, 0–100) Mean (SD)				
1 month	59.89 (30.64)	59.64 (30.64)	−0.94 (−2.93 to 1.05)	0.36
3 months	62.93 (30.66)	63.43 (30.43)	−1.06 (−3.27 to 1.15)	0.35
Health-related quality of life (EQ-5D-5L) Mean (SD)				
1 month	0.35 (0.35)	0.35 (0.35)	0.00 (−0.03 to 0.02)	0.82
3 months	0.34 (0.35)	0.34 (0.36)	0.00 (−0.02 to 0.03)	0.91
Overall quality of life (0–10) Mean (SD)				
1 month	5.92 (2.44)	5.93 (2.46)	−0.05 (−0.25 to 0.16)	0.64
3 months	6.26 (2.36)	6.40 (2.32)	−0.15 (−0.36 to 0.07)	0.18

a Adjusted for hospital, sex, age and medical ward.
b Common odds ratio. Anxiety, depression, cognitive function, independent functioning, health-related quality of life and overall quality of life were also adjusted for corresponding baseline scores.

Notes
All comparisons are PICLP vs. usual care. Effect estimates are differences between means (95% CI) unless otherwise specified.
Bootstrap 95% CIs for outcomes analysed using linear regression are shown in *Appendix 8*, *Table 22*.

TABLE 17 The HOME Study trial outcomes: health economic evaluation

	PICLP	Usual care	Difference (95% CI)[a]	ICER	Probability that PICLP is cost saving	Probability that PICLP is cost-effective
1-month (30 days) time horizon						
Total cost of inpatient care[b]	£5152	£5187	−£35 (−£392 to £322)	£77,717, SW	60%	At the £15,000 per QALY threshold: 59%
QALYs	0.0264	0.0268	−0.0004 (−0.0015 to 0.0006)			At the £20,000 per QALY threshold: 58%
						At the £30,000 per QALY threshold: 57%
3-month (90 days) time horizon						
Total cost of inpatient care[b]	£8100	£8143	−£42 (−£724 to £640)	£22,191, SW	55%	At the £15,000 per QALY threshold: 52%
QALYs	0.0857	0.0876	−0.0019 (−0.0067 to 0.0029)			At the £20,000 per QALY threshold: 51%
						At the £30,000 per QALY threshold: 48%
12-month (365 days) time horizon						
Total cost of inpatient care[b]	£14,041	£13,921	£120 (−£1036 to £1277)	Dominated	43%	At the £15,000 per QALY threshold: 38%
QALYs[c]	0.3260	0.3312	−0.0052 (−0.0280 to 0.0176)			At the £20,000 per QALY threshold: 36%
						At the £30,000 per QALY threshold: 35%

SW, southwest quadrant.
a 95% CIs were informed by the regression outputs.
b Comprises the cost of PICLP delivery (mean £207, 95% CI £200 to £214), the index admission and subsequent emergency admissions to acute general hospitals.
c QALYs derived by extrapolation (assumes constant utility after 3 months for those alive beyond that time point).

Note
All comparisons are PICLP vs. usual care. An intervention with an ICER in the southwest quadrant of cost-effectiveness plane (cost saving and less effective) can only be cost-effective if the ICER is above the cost-effectiveness threshold.

Source
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Chapter 4 Discussion

Summary of the main findings

In this large randomised controlled trial, we studied the experience, effectiveness and cost-effectiveness of PICLP-enhanced care for older medical inpatients.

The HOME Study was successful in recruiting a large representative sample of older patients, who had recently been admitted in an emergency to an acute general hospital. The 2744 trial participants had severe and complex biopsychosocial problems, with a high prevalence of cognitive impairment, depressive and anxiety symptoms, functional dependency and medical multimorbidity.

We found that it was possible to implement PICLP in 24 medical wards across 3 hospitals over the 2-year period of the trial. PICLP delivery took a surprisingly modest amount of clinical time, totalling a mean of < 2.5 hours over an average patient stay of 11 days. The PICLP clinicians' experience was that delivering the new service model was both clinically valuable and professionally rewarding. Furthermore, in qualitative interviews with 97 patients, family members and ward staff, it was reported to be a helpful addition to medical care and discharge planning. It enhanced the ward team's ability to address psychological, psychiatric and social needs and to provide patient-centred care.

Participants allocated to PICLP spent 0.45 fewer days in hospital in the 30 days post randomisation, but this difference in the primary outcome was smaller than sought and was not statistically significant, with the CI extending from a reduction of 1.1 days to an increase of 0.2 days. The rate of discharge for the total length of the index admission was higher with PICLP, a difference that was most apparent in patients who stayed in hospital for > 2 weeks. We also observed some evidence of a lower death rate over the year post randomisation with PICLP, a difference that appeared to be larger for deaths before the onset of the COVID-19 pandemic. On outcomes collected from participants, the only statistically significant difference was a slightly higher mean depression score with PICLP at 3 months, which is of doubtful clinical significance.

In our health economic evaluation, we found that PICLP was likely to be modestly cost saving compared with usual care over the 1- and 3-month (but not the 12-month) time horizons. Similarly, we estimated it to be cost-effective over the 1- and 3-month (but not the 12-month) time horizons at thresholds of £20,000 per QALY or lower.

Proactive Integrated Consultation-Liaison Psychiatry process evaluation

Proactive working

We found that training, which included group workshops and practice on the wards, enabled the PICLP clinicians to work confidently in a proactive way. This observation raises the general issue of how best to prepare experienced clinicians seeking to change from referral-based to proactive working.

Our findings also highlight the important question of when and how proactive services should select and assess patients. In PICLP all older medical inpatients are assessed early in their ward admission in order to proactively identify biopsychosocial impediments to discharge. We found that these assessments took a modest amount of time (31 minutes for the senior psychiatrist and 12 minutes for the assisting clinician). However, this approach was potentially inefficient, as some patients were discharged soon after the assessment. A different method, used by many

proactive services, is to select patients by screening medical records.[41] This may be an efficient method for services which focus on severe mental illness. However, it is likely to be less useful for service models like PICLP, which seek to address a broader range of problems that are typically poorly documented in medical records.

With regard to the timing of the proactive assessment, some of the PICLP clinicians suggested that seeing patients earlier, for example in the emergency unit, might achieve greater influence on their discharge planning. However, it is likely that doing this would result in the assessment of even more patients who leave hospital too quickly to benefit from consultation-liaison psychiatry. Ideally, proactive services would be able to select those patients at high risk of a long hospital stay using information available at the time of admission.[42]

Implementing a biopsychosocial perspective

Although the biopsychosocial perspective has long been advocated, there are still questions about when and how it should be implemented.[43,44] We found it to be clinically appropriate for the care of older medical inpatients, most of whom had multiple biopsychosocial problems that the PICLP clinicians were able to address. The findings of this study suggest that a biopsychosocial perspective may be of value for other medical populations with complex problems and that its implementation can be facilitated by consultation-liaison psychiatry.[45]

We also found that the delivery of biopsychosocial care required the skills of senior consultation-liaison psychiatrists. In addition, the experience of training the PICLP clinicians reminds us of the value of structured guidance in ensuring a consistent and systematic biopsychosocial approach.[46] These observations about PICLP raise issues for the delivery of inpatient consultation-liaison psychiatry in general. While they emphasise the important leadership role played by skilled consultation-liaison psychiatrists, they also suggest that assisting clinicians can contribute to care and that structured guides can make it more systematic.

We found that both patients and ward staff welcomed the proactive biopsychosocial assessments. It might have been anticipated that patients would dislike an unannounced visit from a psychiatrist, especially as it has been reported that some physicians do not refer their patients to consultation-liaison psychiatry because they fear it will be stigmatising.[25] However, the patients' experiences indicate that older medical inpatients are happy to see psychiatric staff if they are approached in the right way. Indeed, patients positively welcomed being asked about their concerns, emotions and personal situation (only one interviewed patient expressed any reservations about this). Similarly, the ward staff saw the information obtained from the proactive biopsychosocial assessments as enhancing the care they were able to provide. These findings support the proposal that consultation-liaison psychiatry has a special role to play in the care of patients with complex biopsychosocial problems.[45,47]

Integrating consultation-liaison psychiatry into the ward team

We found that the process of integrating consultation-liaison psychiatry into the ward team took time. The PICLP clinicians had to build relationships with, and gain the trust of, other ward team members. They also had to become comfortable with their new professional identity which changed from visiting expert to integrated team member. These findings highlight the need to help clinicians adapt their professional identities when they start working in integrated services.[48] There were unexpected effects of integrated working, which included providing continuity of care, explaining the patients' medical problems to them and advocating for their wishes.

Patients and staff generally valued the integration of consultation-liaison psychiatrists into ward teams. Indeed, some patients' inability to differentiate their experience of the PICLP clinicians from other members of the team may reflect how much PICLP was seen as a normal part of care. Both groups of interviewees commented not only on the helpfulness of the PICLP clinicians' psychiatric expertise but also on the benefits of having daily contact with them.

For patients, this daily contact fostered a valuable therapeutic relationship that allowed them to speak openly about their worries and hopes, a finding that serves to remind us of the role of psychotherapy in consultation-liaison psychiatry practice.[49] Interestingly, it also allowed them to clarify their understanding of their medical diagnosis and treatment, and consequently to be more engaged in decisions about their care and discharge planning. This positive patient experience of PICLP is consistent with the 'patient-centred' approach to medical care.[50] It also suggests that

integrated consultation-liaison psychiatry could potentially have beneficial effects on medical outcomes by improving patients' health literacy.[51]

For ward staff, the daily contact with the PICLP clinicians was important for joint working and brought welcome opportunities for education and training. It is noteworthy how much staff valued this, now sometimes neglected, 'liaison' component of consultation-liaison psychiatry.[52] The finding that some staff were uncomfortable about the addition of PICLP clinicians to their team requires reflection. It serves to remind us that integrating consultation-liaison psychiatry into ward teams has implications not only for the roles of consultation-liaison psychiatrists but also for those of other staff members. It also suggests that successful implementation of proactive and integrated consultation-liaison psychiatry could benefit from preparatory work with the whole team.[48]

Delivering discharge-focused care

The PICLP clinicians' experience of delivering a discharge-focused service has implications not only for consultation-liaison psychiatry but also for the care of older patients more generally. The PICLP clinicians identified many obstacles to achieving a prompt discharge.

One obstacle was the difficulty in arranging adequate out-of-hospital care for patients who were dependent on others for help with daily tasks, an obstacle that was especially relevant for those patients who remained in hospital for a long time. This observation might suggest that a PICLP service should also include social workers as some other proactive services do.[53,54] However, the hospitals in this study already had social workers and it is not clear that adding more would solve the problem of inadequate out-of-hospital care.

Another obstacle was the need to persuade ward staff of the desirability of discharge. The PICLP clinicians noted that some ward staff tended to overestimate the risk of discharge and underestimate the risk of staying in hospital. As a consequence, they found themselves acting as advocates for patients when they said that they wanted to go home. These findings suggest that future strategies, to reduce the time older patients spend in hospital, should consider not only improvements in out-of-hospital care but also changes in the attitudes of those providing inpatient care.

Primary outcome

Why did we not find a larger and statistically significant effect of PICLP on our primary outcome? We propose a number of possible reasons.

First, our conceptualisation of how PICLP could reduce time in hospital might have been inadequate. We expected that it would help ward teams to manage biopsychosocial complexity and thereby reduce time in hospital. In qualitative interviews, patients and ward staff reported that it did help with the management of complexity.[19] However, the PICLP clinicians described additional obstacles to prompt discharge that they found difficult to overcome.[18] One was difficulty in achieving a ward team consensus that a patient could go home; in the PICLP clinicians' view, other ward staff often overestimated the risk of discharge and underestimated the risk of staying in hospital. Another was difficulty in arranging adequate and timely out-of-hospital social care for those patients who needed help with daily tasks.

Second, the intensity of PICLP might have been suboptimal. Although we observed good adherence to the service manual, the PICLP clinicians spent only a modest amount of time delivering it. Although this made PICLP relatively inexpensive, it could have impaired its potential effectiveness.

Third, the trial included patients unlikely to benefit from PICLP. Many patients had relatively short hospital stays, whereas our findings suggest that PICLP might be more effective in achieving discharge in those with longer stays.

Fourth, trial procedures could have inadvertently impaired the effectiveness of PICLP. The PICLP clinicians aimed to proactively assess patients as soon as possible after their admission to the medical ward. However, this assessment was delayed for an average of 2 days by the trial enrolment procedures, restricting the influence of PICLP on patients' initial

management plans. Additionally, PICLP clinicians reported that working in the context of an individually randomised trial sometimes made it difficult for them to be fully integrated into the ward team.[18]

Fifth, there could have been contamination of usual care: there was no evidence of increased referrals to consultation-liaison psychiatry in usual care, but the daily presence of the PICLP clinicians on the wards could have changed practice by increasing ward team members' awareness of psychosocial problems and the negative consequences of prolonged hospital stays.

Sixth, the trial was underpowered to detect the 1-day difference in time in hospital sought. We recruited 2744 participants, but this was fewer than the planned sample size as recruitment was curtailed by the COVID-19 pandemic. Although our best estimate of the treatment effect is a 0.45-day difference, the CIs around this are wide and include the 1-day difference we sought – thus, this trial cannot exclude a treatment effect of this size.[55,56]

Secondary outcomes

The lower death rate observed with PICLP over the year post randomisation was unexpected. While this finding should be interpreted with caution, as it was only of borderline statistical significance for deaths before the onset of the COVID-19 pandemic, this difference is clinically plausible. The PICLP clinicians reported that they helped patients and families to understand their medical, as well as psychiatric, diagnoses and treatments. This may have had lasting positive effects on their engagement with medical care.[18]

Health economic evaluation

Our finding that PICLP is likely to be cost saving in the short term indicates that the beneficial effects reported by patients and ward staff may come at no additional cost to the hospital (assuming that the hospital pays for both medical and psychiatric care).[19]

The short-term cost-effectiveness of PICLP, over the 1- and 3-month time horizons, is consistent with its brief nature. The extension of PICLP delivery beyond 30 days post randomisation might have led to longer-term cost-effectiveness estimates favourable to PICLP (i.e. over the 12-month time horizon).

Given that the difference on the primary outcome was not statistically significant, it may be surprising that PICLP is likely to be cost-effective. However, such apparently contradictory conclusions are not uncommon, and these reflect the differing perspectives and methods of statistical significance testing and health economic decision analysis.[57]

Strengths and limitations

Strengths

The strengths of this study include the following:

1. recruitment of a large and representative sample of older acutely ill medical inpatients, including those with cognitive impairment
2. a high participation rate
3. good adherence to the PICLP service manual
4. a primary outcome that included both the index admission and early re-admissions
5. the use of routinely collected data for the primary and other outcomes, limiting any potential bias
6. a high follow-up rate, with few missing patient-reported outcome data apart from those due to deaths
7. analyses that included pre-planned sensitivity analyses that addressed effects of the COVID-19 pandemic
8. a process evaluation that studied the experiences of representative samples of patients and medical ward staff across three hospitals.

Limitations

The limitations of this study include the following:

1. uncertain generalisability of the findings to other patient populations (including those with higher socioeconomic deprivation and greater non-White ethnicity), hospitals (including those in other areas of the UK) and healthcare systems.
2. a primary outcome that was restricted to the time spent in hospital in the 30 days post randomisation
3. potential changes in the behaviour of ward staff as a result of PICLP and therefore altered usual care
4. a main analysis of the primary outcome that did not distinguish patients who were in hospital for < 30 days because they had been discharged from those who were in hospital for < 30 days because they had died
5. an economic evaluation that took an acute hospital perspective and did not include potential costs to other services, such as community and social care, or to patients and their families
6. the use of proxies to provide some of the secondary outcome data.

Contribution to existing knowledge

The HOME Study is the first randomised trial of proactive and integrated consultation-liaison psychiatry and is the first study of its effectiveness in older adults.[24] Although a systematic review found that proactive and integrated consultation-liaison psychiatry services reduce in time in hospital for working-age adults, this evidence was restricted to non-randomised studies.[16]

The HOME Study also provides the first detailed description of patients' experiences of proactive and integrated consultation-liaison psychiatry. There are many publications that describe older patients' negative experiences of inpatient medical care, including the lack of 'therapeutic' relationships, not being treated as a person and not being included in decisions about their care.[58] In this context, it is notable that patients experienced PICLP as addressing all these deficiencies in medical care.

We are aware of only a small number of published descriptions of ward staff members' experiences of proactive and integrated approaches to consultation-liaison psychiatry. Two of the early papers on proactive consultation-liaison psychiatry mention high staff satisfaction, including an appreciation of the ease of communication with psychiatrists.[59,60] Two subsequent evaluations included staff questionnaires and found that physicians and nurses valued consultation-liaison psychiatry being more readily available to them, particularly when caring for patients with behavioural disturbance.[54,61] Finally, a recent questionnaire-based study, which included a qualitative analysis of participants' written comments, assessed staff satisfaction with a new proactive consultation-liaison psychiatry service. Respondents described high satisfaction, particularly with the accessibility of consultation-liaison psychiatry and the support and training opportunities that this offered.[62] Our findings add to the developing consensus that ward staff greatly value the greater presence of consultation-liaison psychiatrists and the improved access to their expertise offered by proactive and integrated services.

Impact and learning

The HOME Study has implications for the design and conduct of future trials in the older medical inpatient population.[55] It shows that large clinical trials with representative samples can be done despite the severity and complexity of these patients' problems. We found that patients were willing to participate, and the use of consultees allowed even those with severe cognitive impairment to do so. Furthermore, we found that high follow-up rates can be achieved by tailoring procedures to the needs of this population. It also highlights the need to carefully consider the choice of primary outcome. We chose time spent in hospital as a variable with clear implications for patients and hospitals. However, the wide variability of this measure necessitates very large sample sizes and other primary outcomes therefore need to be considered.

The findings of the study have been disseminated by presentations at hospital grand rounds and other meetings of the John Radcliffe Hospital, Oxford; Royal Devon and Exeter Hospital, Exeter; and Addenbrooke's Hospital, Cambridge. The findings have also been presented at meetings of the Royal College of Psychiatrists, UK; the European Association of Psychosomatic Medicine; the American Academy of Consultation-Liaison Psychiatry; the American Psychiatric Association; Johns Hopkins Hospital, Baltimore, USA; the University of Washington Medical Center, Seattle, USA. They have also been published in peer-reviewed journals.[18–20]

Implications for decision-makers

The HOME Study findings tell us that implementing PICLP will enhance the care of older medical inpatients as it is experienced positively by both patients and ward staff. They also suggest that the cost of delivering PICLP is likely to be offset by lower costs for hospital stay in the short term. However, they do not tell us that PICLP will reduce time in hospital.

Research recommendations

The HOME Study highlights the need for further research in a number of areas, including:

1. a qualitative study to explore the outcomes that are most important to older medical inpatients and their families
2. a randomised trial to study the effectiveness and cost-effectiveness of a more intensive version of PICLP
3. a randomised trial of the effectiveness of proactive psychiatry that is integrated into the emergency department, as well as the wards, on admission rates and time spent in hospital for older patients
4. a stepped-wedge study of the implementation of PICLP in hospital wards
5. a cluster randomised trial comparing the current version of PICLP with a more intensive version
6. a longitudinal study to determine the demographic and clinical characteristics that predict longer hospital stays in older patients presenting in an emergency
7. a feasibility study to determine the practicality and acceptability of an intervention that builds on PICLP to include out-of-hospital care provision
8. a qualitative study, using interviews with hospital staff and managers, to identify the barriers to and facilitators of implementing biopsychosocial medical care
9. an economic evaluation of PICLP that includes costs and benefits to community health and social care services, patients and families
10. an ethnographic study to explore the effects of PICLP on ward teams' behaviour.

Conclusions

The findings of The HOME Study indicate that PICLP can be delivered at scale, is experienced by older medical inpatients and ward staff as enhancing medical care and may be cost saving in the short term. However, the results provide insufficient evidence to recommend PICLP's implementation for the purpose of reducing time in hospital and we have discussed the possible reasons for this. We conclude that the further development of PICLP to achieve more intensive delivery, a sharper focus on patients at very high risk of longer stays and greater influence on both inpatient and out-of-hospital care is both warranted and needed.

Additional information

CRediT contribution statement

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Patient data statement

This work uses data provided by patients and collected by the NHS as part of their care and support. Using patient data is vital to improve health and care for everyone. There is huge potential to make better use of information from people's patient records, to understand more about disease, develop new treatments, monitor safety and plan NHS services. Patient data should be kept safe and secure, to protect everyone's privacy, and it is important that there are safeguards to make sure that they are stored and used responsibly. Everyone should be able to find out about how patient data are used. #datasaveslives. You can find out more about the background to this citation here: https://understandingpatientdata.org.uk/data-citation.

Data-sharing statement

Owing to the nature of this study, our inability to fully anonymise individual participant data and the conditions attached to original data agreements, there are no data available for wider use.

Ethics statement

Approval for the study was given by the South-Central Research Ethics Committee (17/SC/0497, 2 November 2017).

Information governance statement

The University of Oxford is the sponsor for this study and acts as the data controller in line with the UK Data Protection Act (2018) and the General Data Protection Regulation (EU GDPR) 2016/679. www.ox.ac.uk/. The University of Oxford collected information about participants' health and healthcare use for this research study from NHS Digital. NHS Digital exists to improve health and care by providing national information, data and IT services for patients, clinicians, commissioners and researchers. It also obtains mortality data on NHS patients from the civil registration data held by the Office for National Statistics. The University of Oxford sent information collected for this study to the London School of Hygiene and the University of York, where study analyses were done.

Disclosure of interests

Full disclosure of interests: Completed ICMJE forms for all authors, including all related interests, are available in the toolkit on the NIHR Journals Library report publication page at https://doi.org/10.3310/KGFS3671

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Copyright and credit statement

Publications

Walker J, Burke K, Toynbee M, van Niekerk M, Frost C, Magill N, *et al.* The HOME Study: study protocol for a randomised controlled trial comparing the addition of Proactive Psychological Medicine to usual care, with usual care alone, on the time spent in hospital by older acute hospital inpatients. *Trials* 2019;**20**:483. https://doi.org/10.1186/s13063-019-3502-5

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Appendix 1 Proactive Integrated Consultation-Liaison Psychiatry service manual

The seven principles of Proactive Integrated Consultation-Liaison Psychiatry

1. Taking a proactive approach

PICLP is a population-based model. This means that PICLP clinicians proactively assess the psychiatric needs of all patients.

2. Providing care promptly

The PICLP clinicians assess patients as soon as possible after admission.

3. Making a comprehensive biopsychosocial assessment

The PICLP assessment aims to identify all those problems for which psychiatric intervention might be helpful by using a comprehensive 'biopsychosocial perspective'.

4. Focusing on a clear goal

The main goal of PICLP is to reduce the time that patients spend in hospital. The PICLP clinicians should therefore prioritise the problems that are most likely either to impede the patient's discharge from hospital, or to lead to an early re-admission.

5. Ensuring the systematic delivery of psychiatric care

PICLP is systematically delivered according to the manual. A PICLP workbook should be completed for each patient.

6. Providing intensive interventions

The PICLP clinicians work as part of the patient's clinical team to actively deliver the action plan.

7. Integrating with the clinical team

The PICLP clinicians are members of the patient's clinical team.

Proactive Integrated Consultation-Liaison Psychiatry compared with usual consultation-liaison psychiatry

PICLP is population-based rather than referral-based. PICLP is based on the assumption that most medical inpatients benefit from biopsychosocial care and consequently that a population-based service model is most appropriate. This means that PICLP clinicians assess the psychiatric needs of all patients in the relevant wards and do not just react to referrals.

The PICLP clinicians assess patients as soon as possible after their admission to hospital. Early involvement allows psychiatric aspects of the patient's care to be prioritised as part of their overall management plan. This contrasts with the later involvement of usual consultation-liaison psychiatry services, whose recommendations are often seen as additions to an already well-established plan.

PICLP takes a biopsychosocial perspective and does not focus solely on psychiatric illness. The assessment seeks to identify all the patient's problems in biomedical, psychological and social domains. It then identifies those problems that could delay the patient's discharge.

PICLP focuses on helping the patient to get home and stay home. This differs from usual consultation-liaison psychiatry which typically focuses on addressing various questions posed by referring clinicians. In PICLP, investigations and

treatments that do not need to be done in hospital are, where possible, deferred until after discharge. The rationale is that longer hospital stays have a negative effect on older inpatients.

PICLP is delivered systematically according to the manual and workbook, whereas usual consultation-liaison psychiatry interventions are often 'ad hoc'. This systematic approach ensures that problem-based action plans are delivered with consistent quality.

PICLP actions are delivered intensively and assertively by PICLP clinicians, rather than being merely recommended to the medical team, as is usual. They are also continued throughout the patient's stay and adapted with the patient's progress.

PICLP differs from the usual separate consultation-liaison psychiatry model by being fully integrated into the patient's medical care. PICLP clinicians are actively involved in the patient's ongoing care. PICLP also ensures that appropriate discharge plans are in place, and that a patient's 'after discharge care plan' is communicated to relevant out-of-hospital providers.

Proactive Integrated Consultation-Liaison Psychiatry clinicians and roles

PICLP is delivered by psychiatrists trained in the psychiatric care of patients with medical illnesses. They are aided in caring for all the patients on the wards they serve by one or more assisting clinicians. These assisting clinicians may be trainee doctors, nurses, occupational therapists, social workers or other appropriately qualified clinicians with experience in the psychiatry of the medically ill.

Psychiatrist

The psychiatrist works collaboratively with the other physicians on the clinical team to ensure a unified perspective is adopted on the patient's problems and their management. This psychiatrist leads the initial biopsychosocial assessment and makes the action plan as there is evidence that initial patient assessments are best done by a senior clinician.

Assisting clinician

The assisting clinicians extend the psychiatrist's reach. They gather information from records and informants to inform the psychiatrist's assessments. They also deliver the action plans and ensure the daily follow-up of every patient. They liaise with family members and out of hospital services prior to discharge.

Co-ordination of care

The PICLP clinicians meet at least once each working day to share assessments and plans. Co-ordination with the patient's other clinicians also occurs daily and includes attendance at ward rounds and multidisciplinary meetings.

Proactive Integrated Consultation-Liaison Psychiatry service delivery

Stage 1: complete comprehensive biopsychosocial assessment and problem list

Aim

- To actively seek evidence of ANY current or potential biomedical, psychiatric, psychological or social problems. N.B. the default is to find something.
  Think: 'What problems does this patient have – in each of the biomedical, psychological and social domains?'

Delivered by

- The PICLP psychiatrist supported by the assisting clinician.

Timing

- As soon as possible after admission (≤ 1working day).

Anticipated time required

- Average 40 minutes, range 20–60 minutes.

Actions

- Always listen and talk to the patient.
- Always review relevant clinical notes.
- Always speak to the patient's doctors, nurses and other healthcare professionals.
- Always review medical treatment especially psychotropic drugs.
- Always find out if the patient is known to community psychiatric services by accessing the relevant records system.
- Consider speaking to primary care team/family/carer/other informants.
- Identify from the problem list those that are likely to impede discharge or increase risk of early re-admission.

Outcomes

- Comprehensive and systematic biopsychosocial assessment.
- Problem list covering all of the following areas:
  - ***Bio:*** not medically safe for discharge, medication-related problems, sensory deficits.
  - ***Psycho:*** cognitive impairment; behavioural problem(s), substance misuse, other psychiatric diagnoses, other subdiagnostic threshold psychological problem(s).
  - ***Social:*** functional/mobility impairment(s), social needs/care needs/family concerns, accommodation problem(s), legal considerations.

Stage 2: create action plan

Aim

- To consider the problem list and use it to create an action plan focused on current or potential barriers to prompt discharge.
  Think: 'Why can't this patient go home today and what do I need to do about it?'

Delivered by

- The PICLP clinicians in close collaboration with clinical colleagues.

Timing

- Soon after biopsychosocial assessment.

Anticipated time required

- Average 10 minutes, range 5–15 minutes.

Actions

- Provide leadership in identifying and managing biopsychosocial problems.
- Create an action plan to address each problem likely to impede discharge.

- Prioritise actions for each problem based on: (1) likelihood the problem will impede discharge, (2) role in driving other problems and (3) how easy it is likely to be to solve.
- Discuss problem list and action plan with the clinical team (plus patient, family/carers and other hospital staff as indicated).

Outcomes

- Action plan focused on addressing problems that are likely to impede discharge and/or increase risk of early re-admission.
- Delegation of tasks to specific PICLP clinicians.

Stage 3: deliver action plan and review daily, modifying the plan as needed

Aim

- To deliver the action plan, monitor progress and adapt the action plan as required with relevant members of the clinical team.
  Think: 'Why can't this patient still not go home today and what do I need to do about it?'

Delivered by

- The PICLP clinicians in collaboration with other members of the clinical team.

Timing

- Every weekday.
  - Monitor what is preventing the patient from going home that day.

- As required.
  - Meet with carer/family members.
  - Liaise with hospital social work/placement team.
  - Liaise with external agencies, social services and those responsible for the placement.

Anticipated time required

- Average 10 minutes per working day, range 5–30 minutes.

Actions

- Always review the patient's medical records and prescribed medications.
- Always listen and talk to relevant nurses, doctors, social workers and other healthcare professionals.
- When necessary, revise the problem list and action plan, including responsibility for actions.
- When necessary, listen and talk to the patient.
- When necessary, listen and talk to carer/family.
- When necessary, advise on prescribed medication.
- When necessary, convene team meetings and family meetings.
- When necessary, agree actions and establish responsibility for each.
- When changes to discharge plan are needed, discuss promptly with relevant members of the clinical team.
- When necessary, arrange biopsychosocial reassessment.

Outcome

- Ongoing identification of barriers to discharge with immediate targeted intervention and delegation of responsibility to specific PICLP clinician.

Stage 4: ensure effective discharge and aftercare

Aim

- To ensure the hospital discharge summary includes a specific plan for ongoing management where appropriate. *Think: 'What needs to happen out of hospital and who needs to know about it?'*

Delivered by

- The PICLP clinicians in collaboration with other clinical team members.

Timing

- Prior to discharge summary completion.

Anticipated time required

- Average 5 minutes, range 1–10 minutes.

Actions

- Liaise with primary care and mental health providers as needed.
- Liaise with other external agencies, social services and those responsible for the placement.
- Ensure appropriate information in hospital discharge summary.
- Check accuracy of information in hospital discharge summary if included.

Outcome

- Appropriate and accurate discharge summary with plans for ongoing management.

Training, supervision and quality assurance

Training

- Training and competency assessments must be completed before clinicians deliver PICLP.

Supervision

- PICLP clinicians will have weekly peer supervision to ensure adherence to the service model and to address problems as they arise.
- Peer supervision will include all hospitals and will be by video conference.
- Additional face-to-face meetings will be arranged as needed.

Quality checks

- Quality checks will be undertaken. These will include review of PICLP documentation and direct observation to assess fidelity to the model.

Piloting at each hospital before starting delivery of Proactive Integrated Consultation-Liaison Psychiatry

- Deliver PICLP to a minimum of 20 patients from assessment to discharge.
- Pilot for a minimum of 2 consecutive weeks.
- Each PICLP clinician must be involved in the care of at least five patients.

Competency assessments

- Review of five fully completed workbooks with assessor using PICLP Quality Control Sheet.
- Observation of one session (half-day) of PICLP delivery by assessor using PICLP Quality Control Sheet.
- Psychiatrists assessed on delivering biopsychosocial assessment and daily follow-up.
- Assistants assessed on daily follow-up.

Do's and dont's for Proactive Integrated Consultation-Liaison Psychiatry clinicians

Do

- Remember that you are delivering a new model of care, not your old one.
- Be proactive in both the patient's assessment and treatment.
- Elicit problems in all biomedical, psychological and social domains – not just one of these.
- Identify problems that may impede prompt discharge or lead to early re-admission.
- Provide robust intensive interventions for these problems.
- Remember that problems and targets of intervention may evolve over time.
- Work closely with the medical team, nurses and associated health professionals.
- Keep on going – actively caring for the patient from admission to discharge.

Don't

- Revert to your usual consultation-liaison psychiatric practice.
- Jump on one problem without considering the whole list.
- Only consider psychiatric illness.
- Forget to talk to nurses and relatives.
- Let your input dwindle over the duration of the admission.
- Act without close collaboration with other staff caring for the patient.
- Try to treat problems in hospital that could be treated post discharge.
- Focus on problems which cannot affect the discharge date.

How to respond to frequently asked questions

Who are you?

I am a doctor/clinician working on this ward. I work with the rest of your medical team to make sure we address all your problems, not just the medical ones.

What is Proactive Integrated Consultation-Liaison Psychiatry?

It is a new way of delivering care by having psychiatrists work as part of the medical team. It means that we can better address a wide range of problems and help you leave hospital as soon as you are ready to.

Why is it bad to stay in hospital?

Coming into hospital can be really helpful when people have serious medical problems that need to be assessed and treated. But staying in hospital for longer than necessary can have bad effects – especially for older people. People can lose their confidence, independence and mobility if they stay in hospital too long. They can also get hospital-acquired

infections. So it is important that people are in hospital only long enough to get on top of their medical problems and not so long that they suffer bad effects from being here.

I do not have a psychiatric problem – why are you seeing me/my relative?

We work to help with a wide range of problems, not just psychiatric illness. We do that by working with the rest of the team to make sure we are addressing all the problems that may delay you going home, not just medical ones.

Problems, impediments to discharge and action plans: categories and examples

	Problem category	Category description	Example		
			Problem	Impediment to discharge	Action plan
Bio-	Not medically safe for discharge	Active medical conditions (acute or chronic) requiring urgent treatment in the general hospital	Patient has severe pneumonia	Need for intravenous antibiotics.	Check with the medical team how soon they can start to give the antibiotics orally and plan for discharge that day
	Medication-related problems	Non-concordance, polypharmacy, side effects, physician concerns *N.B. Not restricted to psycho-active medications*	Patient admitted after a fall. Usual antidepressant prescription stopped by medical team	Patient has become severely anxious and is reluctant to mobilise in case they fall again	Discuss risks and benefits of restarting antidepressant medication with medical team. Restart or switch to a different drug to reduce anxiety, allowing mobilisation and prompt discharge
	Sensory deficits	Sensory impairment that affects the patient's orientation, ability to engage with care or interactions with staff	Patient's hearing aids and spectacles have been left at home	Patient's cognitive function and need for care after discharge are both difficult for the ward team to assess	Work with the ward team to resolve impairments (e.g. find hearing aid) and assist with cognitive testing to ensure that best discharge destination can be decided promptly
Psycho-	Cognitive impairment	Acute or chronic cognitive impairment	Patient has delirium and possible dementia	Patient is suspicious of nursing staff and refuses medications	Work with medical team to treat delirium. Gather information from family to assess usual cognitive function. Ensure an appropriate early discharge plan
	Behavioural problems	Any patient behaviour that affects their care	Patient with dementia shouts at staff telling them to leave him alone	Ward staff are unable to assess patient's symptoms and are avoiding the patient	Educate the ward staff about behaviours in dementia Advise on engaging the patient in care so that symptoms can be assessed and treated promptly
	Substance misuse	Misuse of any substance	Patient has smoked cigarettes for 20 years, does not want to stop	Patient is agitated on ward and unable to engage with rehabilitation	Advise on nicotine replacement to allow rehabilitation. Ensure that the planned postdischarge destination allows smoking
	Psychiatric diagnoses	Psychiatric conditions other than delirium and dementia	Patient has depression and is negative about getting discharged to home	Staff avoid spending time with patient, leading to slow discharge planning	Advise on antidepressant medication, educate ward staff about depression and provide behavioural activation to treat depression and engage patient in planning for early discharge

	Problem category	Category description	Example		
			Problem	Impediment to discharge	Action plan
	Subdiagnostic threshold psychological problems	Psychiatric or psychological problems that do not meet diagnostic criteria	Patient is anxious about being in cramped places	Patient is reluctant to have a scan to investigate abdominal pain; scan is repeatedly deferred, delaying discharge	Discuss pros and cons of scan, and other options, with patient and medical team to ensure a decision and prevent further delays to discharge
Social	Problems with basic activities of daily living	Dependence on the assistance of others (prior to admission or currently) for basic needs	Patient's mobility has declined, now unable to walk to bathroom alone	Unclear whether patient will manage activities of daily living without assistance post discharge	Work with the ward team to determine causes of the decline and the need for carers or new living arrangements to plan prompt discharge
	Problems with instrumental activities of daily living	Inability to do activities that maintain independence and quality of life	Patient has had a stroke, can no longer drive to local shops	Patient cannot get food shopping, does not want to move to care home	Work with patient, family, occupational therapist and social worker to find best care solution, avoiding discharge delay
	Accommodation problems	Isolated or inappropriate accommodation, tenancy or residency problems	Patient lives in residential home, but the home is unwilling to take them back due to increased care needs	Patient potentially has no accommodation to return to	Check residential home's understanding of care needs is accurate. Work with patient, family and ward team to arrange return to that home or an alternative
	Legal problems	Patient's capacity to make treatment or discharge decisions is uncertain Problems regarding power of attorney or advance directive	Patient with mild dementia is unwilling to accept additional home care post discharge. The ward team is concerned they will forget to take essential medications	There are differing opinions in the ward team about whether the patient should be allowed to go home without care, leading to a delay in discharge planning	Assess the patient's capacity to make discharge decisions. Educate the ward team about capacity. Discuss wishes with patient and arrange a 'best interests' meeting if required, to avoid further delays to discharge

Appendix 2 Proactive Integrated Consultation-Liaison Psychiatry clinicians' workbook

Proactive Integrated Consultation-Liaison Psychiatry (PICLP) Workbook

Patient initials		Age		Sex (M/F)	
Ward		Bed		Medical team	

The Seven PICLP Principles	
1	TAKING A PROACTIVE APPROACH
2	PROVIDING CARE PROMPTLY
3	MAKING A COMPREHENSIVE BIOPSYCHOSOCIAL ASSESSMENT
4	FOCUSING ON A CLEAR GOAL
5	ENSURING THE SYSTEMATIC DELIVERY OF PSYCHIATRIC CARE
6	PROVIDING INTENSIVE INTERVENTIONS
7	INTEGRATING WITH THE CLINICAL TEAM

Patient identifiers										
First name										
Last name										
Date of birth	D	D	M	M	Y	Y				
Hospital number										

Admission details							
Date of admission	D	D	M	M	Y	Y	

Pre- face-to-face assessment information			
Reason for admission			
Psychiatric diagnoses on admission		Currently under mental health service care Y or N	
Mobility, social support, carers and accommodation on admission			

Pre- face to face assessment background notes

Stage 1: Complete biopsychosocial assessment and problem list

Sources of information reviewed: Y or N or U (unavailable)				Discussion with: Y or N			
Hospital notes		Mental health team notes		Patient		Clinical (ward) team	
Drug chart		Primary care notes		Family/Carer		Other professionals	

	Categories to consider for potential problems	Present Y or N	If problem present, please give details	Is problem impeding discharge or increasing risk of readmission? Y or N
Bio -	Not medically safe for discharge			
	Medication-related problems			
	Sensory deficits			
Psycho -	Cognitive impairment			
	Behavioural problems			
	Substance misuse			
	Psychiatric diagnoses			
	Subdiagnostic threshold psychological problems			
Social	Problems with basic activities of daily living			
	Problems with instrumental activities of daily living			
	Accommodation problems			
	Legal problems			

Date Stage 1 completed	D	D	M	M	Y	Y
Time taken to complete Stage 1 only (minutes to nearest 5)	Psychiatrist					
	Assisting Clinician					

Stage 2: Create action plan for discharge

The plan has been discussed with: Y or N

Patient		Medical team		Therapy (OT/PT) team		Discharge/Social Work team	
Family/Carer		Nursing team		Other (detail):			

** Who is responsible for this action point – Psychiatrist (S), Assisting Clinician (A)

	Categories	**Action plan:** for PICLP clinicians to address problems likely to impede discharge or increase risk of readmission	S or A**
Bio -	Not medically safe for discharge		
	Medication-related problems		
	Sensory deficits		
Psycho -	Cognitive impairment		
	Behavioural problems		
	Substance misuse		
	Psychiatric diagnoses		
	Sub-diagnostic threshold psychological problems		
Social	Problems with basic activities of daily living		
	Problems with instrumental activities of daily living		
	Accommodation problems		
	Legal problems		

Date Stage 2 completed	D	D	M	M	Y	Y	
Time taken to complete Stage 2 only (minutes to nearest 5)	Psychiatrist						
	Assisting Clinician						

Stage 3: Deliver action plan and review daily, modifying plan as needed

* Days since randomisation		Barriers to discharge				PICLP clinician actions		
Day*	Date	Bio	Psycho	Social	WHY can't the patient be discharged TODAY?	** Psychiatrist (S), Assisting Clinician (A) What ACTIONS for PICLP clinicians today?	S or A**	Time (mins) nearest 5 min
	DD/MM/YY	Impeding discharge: Y or N						
0							S	
							A	
1							S	
							A	
2							S	
							A	
3							S	
							A	
4							S	
							A	
5							S	
							A	
6							S	
							A	
7					Biopsychosocial re-assessment completed? Y or N, if N explain			
							S	
							A	

Stage 3: Deliver action plan and review daily, modifying plan as needed

* Days since randomisation		Barriers to discharge				PICLP actions		
Day*	Date	Bio	Psycho	Social	WHY can't the patient be discharged TODAY?	**Psychiatrist (S), Assisting Clinician (A) What ACTIONS for PICLP clinicians TODAY?	S or A**	Time (mins) nearest 5 min
	DD/MM/YY	Impeding discharge: Y or N						
8							S	
							A	
9							S	
							A	
10							S	
							A	
11							S	
							A	
12							S	
							A	
13							S	
							A	
14					Biopsychosocial re-assessment completed? Y or N, if N explain			
							S	
							A	

Stage 3: Deliver action plan and review daily, modifying plan as needed

* Days since randomisation		Barriers to discharge				PICLP clinician actions		
Day*	Date	Bio	Psycho	Social	WHY can't the patient be discharged TODAY?	**Psychiatrist (S), Assisting Clinician (A) What ACTIONS for PICLP clinicians TODAY?	S or A**	Time (mins) nearest 5 min
	DD/MM/YY	Impeding discharge: Y or N						
15							S	
							A	
16							S	
							A	
17							S	
							A	
18							S	
							A	
19							S	
							A	
20							S	
							A	
21					Biopsychosocial re-assessment completed? Y or N, if N explain			
							S	
							A	

Stage 3: Deliver action plan and review daily, modifying plan as needed

* Days since randomisation		Barriers to discharge				PICLP clinician actions		
Day*	Date	Bio	Psycho	Social	WHY can't the patient be discharged TODAY?	**Psychiatrist (S), Assisting Clinician (A)) What ACTIONS for PICLP clinicians TODAY?	S or A**	Time (mins) nearest 5 min
	DD/MM/YY	Impeding discharge: Y or N						
22							S	
							A	
23							S	
							A	
24							S	
							A	
25							S	
							A	
26							S	
							A	
27							S	
							A	
28					Biopsychosocial re-assessment completed? Y or N, if N explain			
							S	
							A	

Appendix 3 Details of data coding

Socioeconomic deprivation

Socioeconomic deprivation was calculated using participants' home addresses (postcodes) and the English Index of Multiple Deprivation (IMD) 2019. The IMD 2019 provides a relative measure of deprivation. It divides England into 32,844 small geographical areas or neighbourhoods and ranks these from the most deprived (ranked 1) to the least deprived (ranked 32,844). The deprivation measure for each geographical area is based on indicators from seven domains – income, employment, health, education, crime, housing and living environment. Participants' postcodes were used to allocate them to the relevant small geographical area.

McLennan D, Noble S, Noble M, Plunkett E, Wright G, Gutacker N. The English Indices of Deprivation 2019 Technical Report: Ministry of Housing, Communities and Local Government. 2011. URL: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/833951/IoD2019_Technical_Report.pdf.

Rural–urban classification of area of residence

Participants' areas of residence were classified as either rural or urban classification, using their home addresses (postcodes) and the English Rural–Urban Classification (RUC) for small area geographies 2011. The RUC classification divides England into 171,372 small areas (output areas) using the results of the 2011 Census. These areas are then classified as urban or rural according to their population size. An area with a population size of > 10,000 people is defined as urban. All other areas are rural.

Bibby P, Brindley P. Urban and Rural Area Definitions for Policy Purposes in England and Wales: Methodology (v1.0). Government Statistical Service, 2013. URL: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/239477/RUC11methodologypaperaug_28_Aug.pdf.

Main reason for admission

Data regarding the participant's main reason for admission to hospital were collected from their medical records on the day of recruitment. The recruiter obtained this information from the details recorded by the medical team at the time of admission. The three hospitals where recruitment took place used different medical records systems. The information was obtained from the 'working diagnosis' section of the admission notes for the Oxford site, the 'impression' section of the admission notes for the Exeter site and the 'reason for attendance' section of the admission notes for the Cambridge site. The notes were transcribed exactly as they had been written by the medical team. The reasons for admission were categorised by three clinicians using consensus. If a participant had multiple documented reasons for admission, we used the first symptom in the list that was specific and definite (i.e. if the first symptom was recorded as '?' or 'possible' and the subsequent was a definite symptom, we used the latter). If a general symptom was followed by a causal one (e.g. weight loss caused by dysphagia) we used the causal symptom.

Medical conditions/multimorbidity

Data regarding the participant's other diagnoses at the time of admission to hospital were collected from their medical records on the day of recruitment. The recruiter obtained this information from the details recorded by the medical team at the time of admission. The three hospitals where recruitment took place used different medical record systems. The information was obtained from the 'significant past medical history' section of the admission notes for the Oxford site, the 'background/past medical history' section of the admission notes for the Exeter site and the 'hospital diagnoses (problems being addressed during this admission)' and 'non-hospital diagnoses (problems not being addressed during

this admission)' section of the admission notes for the Cambridge site. The notes were transcribed exactly as they had been written by the medical team. The medical conditions listed were categorised, by three clinicians using consensus, according to the *International Statistical Classification of Diseases and Related Health Problems*, Tenth Revision categories.

We focused on diagnoses that were current, chronic, non-communicable diseases and took an inclusive approach – assuming diagnoses to be current if there was no associated date and including diagnoses recorded as 'recurrent', 'recent', 'probable', 'presumed', 'possible' and '??'. We did not include symptoms or signs unless related very obviously to a specific diagnosis, did not translate medications or investigation results into diagnoses and did not include 'previous' or 'prior' diagnoses unless they were those which were likely to have had permanent effects (e.g. stroke, traumatic brain injury, spina bifida). We assumed that all fractures were recent if the diagnosis was not accompanied by a date, except for fractured neck of femur (trial recruitment did not take place on any orthopaedic wards, meaning that these diagnoses were unlikely to be very recent). We included cancer diagnoses that were accompanied by a date in the last 5 years or no date was specified.

We did not include infectious diseases or injury and poisoning.

Prescribed medications

Participants' prescribed medications were recorded at the time of recruitment and at discharge. These were transcribed by researchers and entered into the study database. Medications were categorised by a clinician. We took an inclusive approach, including all prescriptions that might be considered as medications (administered by any route, including inhaled and topical), including food supplements, enteral feeds, infusions and total parenteral nutrition. We did not, however, include prescriptions for devices (e.g. inhaler devices, as opposed to inhaled medications), compression stockings, enteral water, saline flushes and dressings. We assumed that anticonvulsant drugs were prescribed for epilepsy (not bipolar disorder), that antihistamine drugs were prescribed for itch (not sedation) and that benzodiazepines were prescribed for anxiety or insomnia, except for one prescription of 'as required rectal diazepam', which we assumed to have been prescribed for seizures. We calculated the number and percentage of participants who had been prescribed at least one drug in each of the following categories: antidepressant, antipsychotic, anxiolytic/hypnotic, dementia medications, lithium. We included all relevant drugs whether prescribed at a minimum effective dose or not.

Cognitive function

Cognitive function was measured using the telephone version of the MoCA (the MoCA-T), which is scored from 0 to 22. We converted the scores to standard MoCA scores (0–30) by multiplying MoCA-T scores by 30/22. For the categorisation of participants' baseline scores, we rounded to the nearest whole number and then categorised these into severe, moderate, mild and no cognitive impairment.

Appendix 4 Details of the sensitivity analyses to address effects of the COVID-19 pandemic

The COVID-19 pandemic had a major effect on hospital admissions and on deaths from March 2020 onwards. We therefore did sensitivity analyses (pre-specified after the SAP was published and before the end of the trial) to address effects of the pandemic on the outcomes that were measured over the year post randomisation. We split the follow-up period into 'before' and 'after' 1 March 2020, for number of emergency re-admissions and number of days in hospital, and we censored at this date for deaths.

Number of emergency re-admissions and time spent in an acute general hospital in the year post randomisation

We split follow-up into periods of 3 months anchored by the participants' randomisation date. Periods were classed as taking place either before or after 1 March 2020. For any periods that crossed 1 March 2020, we classed them according to whether the majority of days in the period were before or after this date. Accordingly, each participant had four measures of each outcome. We fitted a Poisson model with robust standard errors that allowed for clustering within participant. For number of days in hospital, we used a mixed model with a random effect for participant and allowed different variance estimates by period. These models included treatment allocation, period, hospital and a before/after 1 March 2020 indicator together with all two-way, three-way and four-way interactions between these four factors, together with sex, age and ward. We then estimated hospital-specific treatment effects before and after 1 March 2020 by summing estimates across the four periods. Before and after treatment effects and their interaction were calculated as weighted means of the three hospital-specific treatment effects (with weights proportional to the number of people randomised at each hospital).

Deaths in the year post randomisation

We estimated treatment effects on deaths before the start of the pandemic, using a Cox proportional hazards model and censoring follow-up on 1 March 2020. We took an analogous approach to the main analysis of this outcome in terms of which covariates to include in the model.

Appendix 5 Additional data about the index admission

TABLE 18 Additional data about the index admission

	PICLP (*n* = 1373)	Usual care (*n* = 1371)
Recorded incidents		
Number of incidents, *median, range*	0, 0–3	0, 0–3
Participants with ≥ 1 recorded incident	67 (5%)	60 (4%)
Medications prescribed at discharge		
Number prescribed, *median, range*	8, 1–26	9, 1–29
Antidepressant	351 (26%)	305 (22%)
Anxiolytic/hypnotic	202 (15%)	181 (13%)
Dementia medication	98 (7%)	86 (6%)
Antipsychotic	95 (7%)	86 (6%)
Lithium	7 (1%)	4 (< 1%)
Anticholinergic burden score at discharge, *median, range*	1, 0–11	1, 0–10
Length of hospital admission (days), mean (SD)		
From randomisation	11.2 (11.2)	12.1 (12.6)
From admission	14.7 (11.4)	15.5 (12.8)
Reason for end of hospital admission		
Discharged to private residence	876 (64%)	844 (62%)
Discharged to care/nursing home	266 (19%)	246 (18%)
Discharged to other location	126 (9%)	150 (11%)
Died	105 (8%)	130 (9%)

Source
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Appendix 6 Additional Proactive Integrated Consultation-Liaison Psychiatry data

TABLE 19 Number of problem categories per patient at the PICLP stage 1 biopsychosocial assessment

n = 1359	Number of categories in which each patient had a problem (0–12)	Number of categories in which each patient had a problem impeding discharge (0–12)
Mean (SD)	4.5 (1.8)	3.4 (1.7)
Median (range)	5 (0–11)	3 (0–9)
0	4 (< 1%)	17 (1%)
1	66 (5%)	182 (13%)
2	119 (9%)	242 (18%)
3	202 (15%)	304 (22%)
4	288 (21%)	296 (22%)
5	286 (21%)	176 (13%)
6	200 (15%)	83 (6%)
7	120 (9%)	48 (4%)
8	49 (4%)	10 (< 1%)
9	20 (2%)	1 (< 1%)
10	4 (< 1%)	0 (0%)
11	1 (< 1%)	0 (0%)
12	0 (0%)	0 (0%)

Source
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Appendix 7 Additional analyses of the primary outcome

TABLE 20 Subgroup analyses of the primary outcome

Moderator		PICLP (*n* = 1373)	Usual care (*n* = 1371)	Adjusted difference between means	Test of differences in treatment effect
Hospital	Exeter	11.21 (8.55)	11.23 (8.60)	0.04 days 95% CI −0.93 to 1.01	*p* = 0.30
	Oxford	11.34 (8.89)	12.24 (9.27)	−0.82 days 95% CI −1.90 to 0.25	
	Cambridge	11.91 (8.95)	12.74 (9.38)	−1.00 days 95% CI −2.71 to 0.72	
Sex	Male	11.59 (8.62)	12.16 (9.07)	−0.64 days 95% CI −1.57 to 0.29	*p* = 0.57
	Female	11.14 (8.86)	11.53 (8.91)	−0.25 days 95% CI −1.20 to 0.69	
Age	65–74 years old	10.26 (8.49)	10.97 (8.81)	At age 70 years −0.61 days 95% CI −1.81 to 0.60	*p* = 0.76
	75–84 years old	11.86 (8.98)	12.29 (9.34)	At age 80 years −0.48 days 95% CI −1.17 to 0.21	
	≥ 85 years old	11.56 (8.63)	11.95 (8.78)	At age 90 years −0.35 days 95% CI −1.27 to 0.56	

Source
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TABLE 21 Patient-centred analyses of the primary outcome

	PICLP (*n* = 1373)	Usual care (*n* = 1371)	Adjusted difference between means
Time spent in hospital as a proportion of the time alive in the 30 days post randomisation	0.43 (0.33)	0.45 (0.34)	−0.02 days 95% CI −0.04 to 0.01, *p* = 0.16 Bootstrap 95% CI −0.04 to 0.01
	PICLP (*n* = 1205)	**Usual care (*n* = 1193)**	**Adjusted difference between means**
Time spent in hospital in the 30 days post randomisation only including participants who were alive for all 30 days	11.42 (8.93)	11.94 (9.19)	−0.49 days 95% CI −1.21 to 0.23, *p* = 0.18 Bootstrap 95% CI −1.19 to 0.25

Source
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In the main analysis of the primary outcome, a patient may be in hospital for < 30 days because they have been discharged or because they have died. To complement this hospital-centred analysis, we conducted two supplementary analyses which took a more patient-centred approach. These considered time spent in hospital as a proportion of the time alive in the 30 days post randomisation and time spent in hospital in the 30 days post randomisation only including participants who were alive for all 30 days.

Appendix 8 Additional analyses of the secondary outcomes

TABLE 22 Bootstrap 95% CIs for outcomes analysed using linear regression

Outcome	Estimate	Parametric 95% CI	Bootstrap 95% CI
Number of days spent as an inpatient in the 30 days post randomisation (primary outcome)	−0.45 days	−1.11 to 0.21 days	−1.13 to 0.20 days
Length of the index admission (post randomisation) truncated at 30 days	−0.53 days	−1.17 to 0.12 days	−1.17 to 0.14 days
Number of days spent as an inpatient in the year post randomisation	−0.17 days	−1.87 to 1.53 days	−1.74 to 1.69 days
Experience of the hospital stay	0.05	−0.13 to 0.22	−0.14 to 0.21
Anxiety (GAD-2, 0–6)			
1 month	0.11	−0.06 to 0.28	−0.05 to 0.30
3 months	0.11	−0.07 to 0.29	−0.07 to 0.29
Depression (PHQ-2, 0–6)			
1 month	0.10	−0.07 to 0.27	−0.08 to 0.27
3 months	0.20	0.01 to 0.38	0.01 to 0.38
Cognitive function (MoCA-T, 0–30)			
1 month	0.21	−0.30 to 0.73	−0.32 to 0.70
3 months	−0.20	−0.79 to 0.38	−0.80 to 0.38
Independent functioning (Barthel, 0–100)			
1 month	−0.94	−2.93 to 1.05	−2.95 to 1.10
3 months	−1.06	−3.27 to 1.15	−3.27 to 1.33
Health-related quality of life (EQ-5D-5L)			
1 month	0.00	−0.03 to 0.02	−0.02 to 0.02
3 months	0.00	−0.02 to 0.03	−0.02 to 0.03
Overall quality of life (0–10)			
1 month	−0.05	−0.25 to 0.16	−0.23 to 0.16
3 months	−0.15	−0.36 to 0.07	−0.33 to 0.09

TABLE 23 Patient-centred analyses of re-admissions and time in hospital in the year post randomisation

	PICLP (*n* = 1373)	Usual care (*n* = 1371)	Mean count ratio PICLP : UC
Number of re-admissions in the year post randomisation, scaled by time alive	1.04 (1.77)	1.00 (1.61)	1.00 95% CI 0.89 to 1.12, *p* = 0.94
	PICLP (*n* = 1373)	**Usual care (*n* = 1371)**	**Adjusted difference between means**
Days in hospital in the year post randomisation as a proportion of time alive	0.21 (0.30)	0.22 (0.31)	−0.01 95% CI −0.03 to 0.01, *p* = 0.32

Source
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To complement the hospital-centred analyses of re-admissions and days in hospital in the year post randomisation, we conducted two supplementary analyses which took a more patient-centred approach. These considered the number of emergency re-admissions to hospital in the year post randomisation modelled using the number of re-admissions scaled by time alive (measured in years) and time (days) spent in hospital in the year post randomisation, modelled using the number of days that participants spent in hospital as a proportion of time alive.

TABLE 24 Effects of proxy data collection on relevant secondary outcomes

	PICLP	Usual care	*p*-value for whether proxy measurements differ by group	*p*-value for whether treatment effect differs by patient/proxy
Experience of the hospital stay				
Patient	8.4 (1.9)	8.4 (1.9)	0.66	0.69
Proxy	7.6 (2.1)	7.4 (2.2)		
View on the length of the hospital stay				
Patient				
Too short	100 (14%)	82 (12%)	0.51	0.08
About right	472 (65%)	463 (67%)		
Too long	153 (21%)	141 (21%)		
Proxy				
Too short	31 (10%)	38 (13%)		
About right	129 (42%)	129 (44%)		
Too long	149 (48%)	125 (43%)		
Anxiety at 1 month				
Patient	1.7 (2.0)	1.6 (2.0)	0.97	0.36
Proxy	2.8 (2.3)	2.6 (2.2)		

continued

TABLE 24 Effects of proxy data collection on relevant secondary outcomes (*continued*)

	PICLP	Usual care	*p*-value for whether proxy measurements differ by group	*p*-value for whether treatment effect differs by patient/proxy
Anxiety at 3 months				
Patient	1.6 (2.0)	1.4 (1.9)	0.39	0.63
Proxy	2.4 (2.2)	2.3 (2.1)		
Depression at 1 month				
Patient	1.6 (1.9)	1.5 (1.9)	0.92	0.33
Proxy	2.9 (2.3)	2.7 (2.2)		
Depression at 3 months				
Patient	1.5 (1.9)	1.3 (1.8)	0.47	0.11
Proxy	2.7 (2.2)	2.3 (2.2)		
Independent functioning at 1 month				
Patient	72.7 (24.3)	73.3 (23.6)	0.87	> 0.99
Proxy	37.5 (27.5)	35.3 (26.3)		
Independent functioning at 3 months				
Patient	75.4 (24.1)	76.8 (23.2)	0.67	0.35
Proxy	38.7 (27.4)	38.8 (26.6)		
Health-related quality of life at 1 month				
Patient	0.5 (0.3)	0.5 (0.3)	0.90	0.37
Proxy	0.2 (0.3)	0.2 (0.3)		
Health-related quality of life at 3 months				
Patient	0.5 (0.3)	0.6 (0.3)	0.38	0.30
Proxy	0.3 (0.3)	0.3 (0.3)		
Overall quality of life at 1 month				
Patient	6.5 (2.3)	6.4 (2.3)	0.93	0.17
Proxy	4.7 (2.4)	4.9 (2.4)		
Overall quality of life at 3 months				
Patient	6.7 (2.2)	6.9 (2.2)	0.36	0.88
Proxy	5.2 (2.5)	5.4 (2.2)		

Note
Data are *n* (%) or mean (SD).
Source
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Appendix 9 Additional details of the economic evaluation

TABLE 25 Additional details of the economic evaluation

	Index admission costs	Subsequent admissions costs	PICLP costs	PICLP plus index admission costs	Total costs	QALYs	Life-years	ICER[a]	iNHB at λ[a] (QALYs) (cost-effectiveness probability)
Analysis 1 – 1-month (30 days) time horizon									
Usual care	£3985	£1158	0	£3985	£5187	0.0268	0.0781	£77,717, SW	λ_1: 0.0019 (59%) λ_2: 0.0013 (58%) λ_3: 0.0007 (57%)
PICLP	£3769	£1225	£207	£3976	£5152	0.0264	0.0783		
Difference (95% CI)	−£216 (−£455 to £23)	£66 (−£223 to £356)	£207 (£200 to £214)	−£9 (−£251 to £232)	−£35 (−£392 to £322)	−0.0004 (−0.0015 to 0.0006)	0.0002 (−0.0010 to 0.0014)		
Probability PICLP is	Cost saving					HRQoL-improving	Life-extending		
	97%	31%	0%	53%	60%	23%	62%		
Analysis 2 – 3-month (90 days) time horizon									
Usual care	£4364	£3750	0	£4365	£8143	0.0876	0.2130	£22,191, SW	λ_1: 0.0009 (52%) λ_2: 0.0002 (51%) λ_3: −0.0005 (48%)
PICLP	£4062	£3898	£207	£4270	£8100	0.0857	0.2154		
Difference (95% CI)	−£302 (−£618 to £14)	£148 (−£441 to £738)	£207 (£200 to £214)	−£96 (−£414 to £223)	−£42 (−£724 to £640)	−0.0019 (−0.0067 to 0.0029)	0.0023 (−0.0031 to 0.0078)		
Probability PICLP is	Cost saving					HRQoL-improving	Life-extending		
	98%	32%	0%	72%	55%	23%	81%		
Analysis 3 – 12-month (365 days) time horizon[b]									
Usual care	£4386	£9475	0	£4386	£13,921	0.3312	0.7039	Dominated	λ_1: −0.0132 (38%) λ_2: −0.0112 (36%) λ_3: −0.0092 (35%)
PICLP	£4063	£9878	£207	£4270	£14,041	0.3260	0.7225		
Difference (95% CI)	−£323 (−£646 to −£0.23)	£403 (−£666 to £1473)	£207 (£200 to £214)	−£117 (−£442 to £209)	£120 (−£1036 to £1277)	−0.0052 (−0..0280 to 0.0176)	0.0186 (−0.0098 to 0..0470)		
Probability PICLP is	Cost saving					HRQoL-improving	Life-extending		
	98%	23%	0%	76%	43%	35%	90%		

λ, cost-effectiveness threshold; λ_1, £15,000 per QALY; λ_2, £20,000 per QALY; λ_3, £30,000 per QALY; HRQoL, health-related quality of life; INHB, incremental net health benefit (includes both health effects on individuals receiving PICLP and health effects on wider NHS patients of additional resources being available or not for other purposes, dependent on the cost implications of PICLP); SW, Southwest quadrant.

a Compared to PICLP.

b QALYs derived by extrapolation (assumes constant utility after 3 months for those alive beyond that time point).

Note

Please note that disaggregated costs by category were estimated by separate regressions and are therefore indicative and do not add up to the total costs.

Appendix 10 Supplementary post hoc analyses

Because the primary outcome and several secondary outcomes involved different combinations of discharge, re-admission and death over different periods, we did exploratory analyses estimating rates and RRs for discharge, re-admission and death over time, and we estimated the difference in mean total length of stay post randomisation between groups.

The results show the PICLP group compared with the usual care group to have a slightly increased rate of discharge, starting around 10 days; a slightly increased rate of re-admission and a slightly decreased rate of deaths over the first 150 days. None of these differences were statistically significant, but together they help to illustrate the differing effects of the intervention on the three components of the primary outcome. They demonstrate why the estimated treatment difference for the primary outcome was slightly smaller than for the truncated length of index admission, which in turn was smaller than the observed difference between the treatment groups in mean length of index admission. Specifically, neither of these comparisons relating exclusively to the index admission were affected by re-admissions or deaths.

TABLE 26 Difference in mean total length of stay post randomisation

	PICLP (*n* = 1373)	Usual care (*n* = 1371)	Difference between means
Mean (SD)	11.19 (11.15)	12.10 (12.58)	−0.84 days 95% CI −1.72 to 0.05, *p* = 0.06 Bootstrap 95% CI −1.72 to 0.00

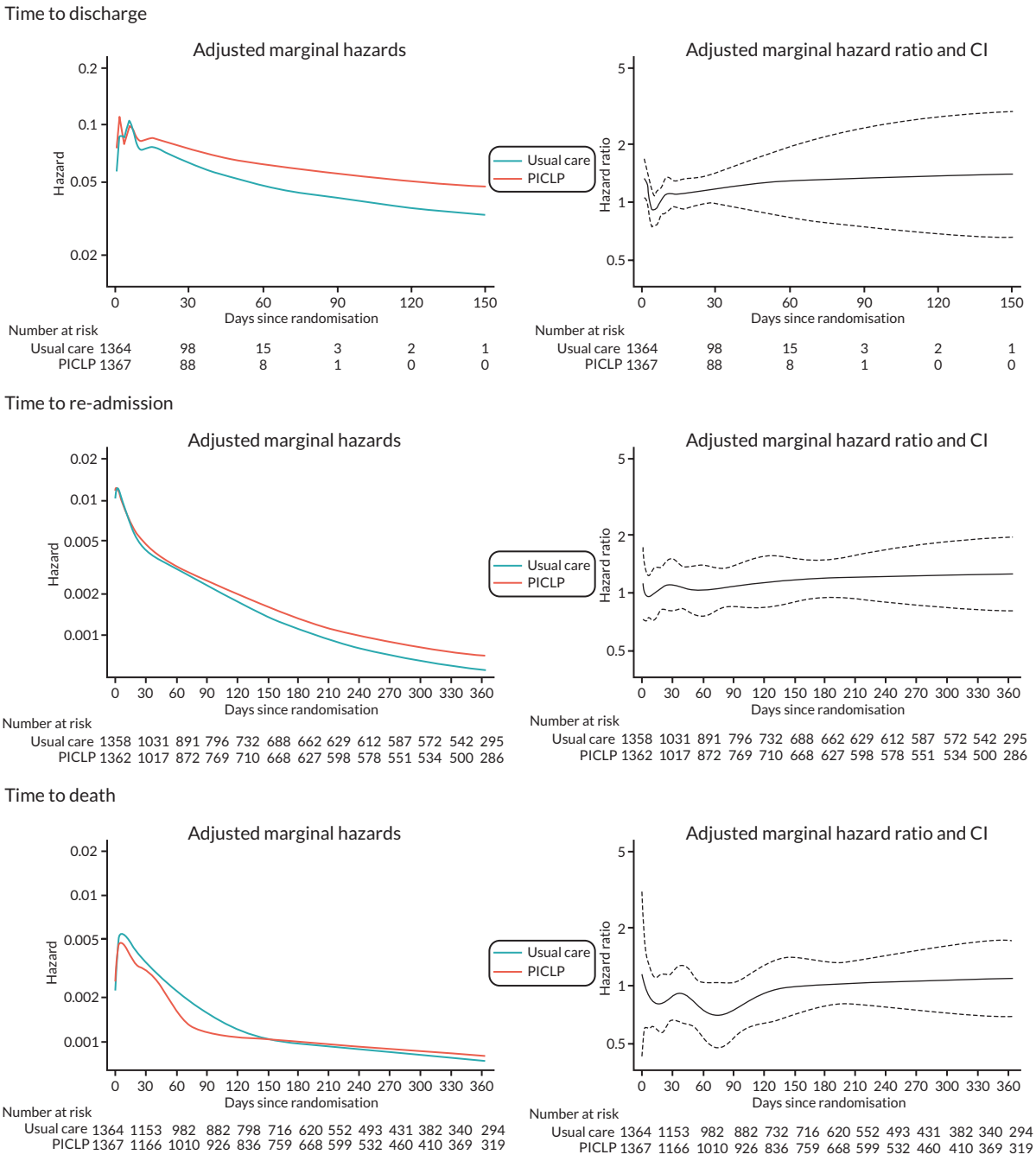

FIGURE 10 Flexible parametric modelling of time to discharge, re-admission and death over time. Note: Hazard ratios are PICLP vs. usual care.

Appendix 11 Sensitivity and subgroup cost-effectiveness analyses

TABLE 27 Summary cost-effectiveness results using seemingly unrelated regression models

PICLP vs. usual care	Difference in costs (95% CI)[a]	Difference in QALYs (95% CI)[a]	ICER (per QALY)
1-month (30 days) time horizon	−£13 (−£368 to £342)	−0.0004 (−0.0015 to 0.0006)	£29,135, SW
3-month (90 days) time horizon	£85 (−£619 to £789)	−0.0019 (−0.0067 to 0.0029)	Dominated
12-month (365 days) time horizon	£144 (−£1160 to −£1447)	−0.0052 (−0.0280 to 0.0176)	Dominated

SW, Southwest quadrant.
a 95% CIs were informed by the regression outputs.

Note
An intervention with an ICER in the southwest quadrant of cost-effectiveness plane (cost saving and less effective) can only be cost-effective if the ICER is above the cost-effectiveness threshold.

TABLE 28 Summary of subgroup cost-effectiveness results

	PICLP vs. usual care	Difference in costs (95% CI)[a]	Difference in QALYs (95% CI)[a]	ICER (per QALY)
1-month (30 days) time horizon				
Hospital	Exeter	−£119 (−£635 to £397)	−0.0005 (−0.0021 to 0.0010)	£219,605, SW
	Oxford	−£19 (−£584 to £546)	−0.0004 (−0.0021 to 0.0014)	£53,305, SW
	Cambridge	£236 (−£770 to £1243)	−0.0004 (−0.0031 to 0.0022)	Dominated
Sex	Male	−£44 (−£548 to £360)	−0.00008 (−0.0015 to 0.0014)	£31,205, SW
	Female	−£26 (−£531 to £480)	−0.0008 (−0.0024 to 0.0009)	£528,864, SW
Age	65–74 years old	−£703 (−£1409 to £3)	−0.0014 (−0.010 to 0.0025)	£509,085, SW
	75–84 years old	£214 (−£407 to £835)	0.0008 (−0.0021 to 0.0014)	£283,988
	≥ 85 years old	£139 (−£406 to £684)	−0.0009 (−0.0026 to 0.0007)	Dominated
3-month (90 days) time horizon				
Hospital	Exeter	−£442 (−£1434 to £550)	−0.0032 (−0.0103 to 0.0038)	£136,035, SW
	Oxford	£33 (−£981 to £1044)	−0.0017 (−0.0097 to 0.0063)	Dominated
	Cambridge	£1925 (−£505 to £4355)	0.0017 (−0.0107 to 0.0140)	£1,166,510
Sex	Male	£7 (−£978 to £992)	0.0018 (−0.0015 to 0. .0014)	£3847
	Female	−£88 (−£1033 to £858)	−0.0058 (−0.0024 to 0.0007)	£15,216, SW
Age	65–74 years old	−£812 (−£2265 to £641)	−0.0023 (−0.013 to 0.0080)	£355,530, SW
	75–84 years old	£285 (−£933 to £1505)	0.0040 (−0.0041 to 0.0120)	£71,669
	≥ 85 years old	£31 (−£960 to £1023)	−0.0066 (−0.0143 to 0.0010)	Dominated
12-month (365 days) time horizon				
Hospital	Exeter	−£316 (−£2068 to £1435)	−0.0199 (−0.0533 to 0.0134)	£15,849, SW
	Oxford	£333 (−£1288 to £1954)	0.0014 (−0.0367 to 0.0395)	£241,599

TABLE 28 Summary of subgroup cost-effectiveness results (*continued*)

	PICLP vs. usual care	Difference in costs (95% CI)[a]	Difference in QALYs (95% CI)[a]	ICER (per QALY)
	Cambridge	£1647 (−£3338 to £6631)	0.0232 (−0.0365 to 0.0826)	£71,000
Sex	Male	−£254 (−£1930 to £1422)	0.0193 (−0.0122 to 0.0508)	Dominating
	Female	£458 (−£1134 to £2052)	−0.0307 (−0.0638 to 0.0023)	Dominated
Age	65–74 years old	−£2065 (−£4729 to £599)	0.0126 (−0.0363 to 0.0614)	Dominating
	75–84 years old	£1146 (−£10,221 to £3314)	0.0215 (−0.0168 to 0.0597)	£53,436
	≥ 85 years old	£181 (−£1423 to £1784)	−0.0371 (−0.0729 to −0.0012)	Dominated

SW, Southwest quadrant.
a 95% CIs were informed by the regression outputs.

Note
An intervention with an ICER in the southwest quadrant of cost-effectiveness plane (cost saving and less effective) can only be cost-effective if the ICER is above the cost-effectiveness threshold.

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HTA
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