Impact of interventions to improve recovery of older adults following planned hospital admission on quality of life following discharge: linked evidence synthesis

Protocol

Version 2.0

19.11.21

Version number	Amendments made	Location in document	Date
1	Original protocol submitted	NA	NA
2	**Search section amended to read:** The search for studies will consist of two parts. For research question 1, the effectiveness study searches for our previous review will be re-run. Bibliographic databases searched include MEDLINE, Embase and HMIC (all via Ovid), CENTRAL (via the Cochrane Library), CINAHL and AMED (both via EBSCO). Search terms include terms for older people or interventions commonly undergone by older people, combined using the AND Boolean operator with search terms for multi-component interventions or terms that describe reducing length of stay, e.g. “length” adjacent to “stay” adjacent to “reducing”. The search terms for multi-component interventions will be expanded to include interventions that were not relevant for our previous review, including supported discharge and home or community rehabilitation. We will also use a study type filter, which will be expanded from our previous review to include quality of life studies. The 218 articles included in our original review and 282 articles we previously excluded due to population, country or language (and thus still failing to meet inclusion for this review) will be removed from the search results, saving significant time at the full-text and data extraction stages of the review. We will also check reference lists and carry out forward citation searching of included studies using Web of Science and Scopus. For research question 2, we will tailor the selection of bibliographic databases and search strategy used for question 1 for the purpose of identifying qualitative studies. Thus we will search MEDLINE and HMIC (both via Ovid), AMED and CINAHL (both via EBSCO) and ProQuest Dissertations and Theses (via ProQuest), and the effectiveness study type filter for question 1 will be replaced with a qualitative study type filter. We will also search Google Scholar, carry out forwards and backwards citation searching using included studies, and inspect the included studies of any relevant systematic reviews that we identify. The bibliographic database results from both searches will be combined and de-duplicated using EndNote X8.	p.12	19.11.21

2	**Inclusion/exclusion criteria updated**: Outcomes - One or more PROM or PREM, collected at any time from the surgery being scheduled or service utilisation must be reported. Examples of PROM or PREM include: Satisfaction, quality of life, participation in meaningful activity and mental health. Examples of service utilisation include: accessing primary care, community nursing, care at home etc. Additional outcomes of interest include: LOS, readmissions, complications, morbidity, mortality and additional post-discharge service utilisation Geographical context Primary studies conducted in any high income country as defined by the World Bank list (78 high-income countries, as defined by World Bank list 2020) Date parameters (both reviews) Studies only included if published after 2000.	p 13 and 14	

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1 Background

1.1 Pressure on hospitals and bed capacity

In the UK, the number of people aged 60 or above is expected to increase from 14.9 million in 2014 to 21.9 million in 2039.[1] In England, there has been a steady increase in the number and age of patients admitted to hospitals between 2005/06 and 2015/16, with the number of combined elective and emergency admissions of 60-65 year olds increasing by 57%.[2] Compared to younger patients, older adults admitted to hospital for elective procedures face disrupted discharge trajectories out of hospital as they are more likely to have transport difficulties[3]; be in poor physical health or living with frailty[4]; be socially isolated[5] or have living arrangements which require additional support following discharge.[6] Older adult hospital inpatients are also at increased risk of peri- or post-operative complications (e.g. delirium, falls, hospital-acquired infection, pressure sores and cognitive decline).[7-14] Such complications can impede patient recovery, increase length of hospital stay (LOS) and influence discharge destination.[10]

Hospitals are under increased pressure to maintain or improve their care provision, and ensure the cost-effective delivery of services. We recently completed a systematic review of the effectiveness and cost-effectiveness of multi-component interventions to enhance recovery and/or reduce LOS in older adults undergoing elective surgery, commissioned by the NIHR HS&DR Evidence Synthesis Centre programme.[15] We showed that, across 73 studies containing data for 26,365 patients, such interventions were associated with either improved clinical outcomes (e.g. LOS, readmissions, complications, mortality, morbidity, clinical markers of recovery), or performed as well as standard care.

Our findings confirmed the significant progress made in reducing hospital LOS for older adults after planned surgery in the last 20 years. Improvements in care inevitably now lead to diminishing returns on LOS, with patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs) becoming increasingly valuable measures of service quality and thus improvement.[16, 17] In working up this proposal two members of our research team, who are involved with older surgical patients on a daily basis, AH (geriatrician) and CL (occupational therapist) were unequivocal about the importance of understanding the impact of an earlier hospital discharge on engagement with primary health & social care services and patient-centred outcomes. Recent research highlights that the transition home following discharge can be challenging and potentially unsafe for older adults, who may rely heavily on informal caregivers.[18] This also highlights the importance of examining and understanding patient outcomes and experience following this transition

Whilst there has been a drive to achieve earlier discharge from hospital, the subsequent impact on patient outcomes, such as experience, quality of life, participation in meaningful

occupations, and engagement with health and social care services, is largely unknown. Thus, there is a need to identify, appraise and synthesise the findings from studies that have considered the influence of multi-component interventions to enhance recovery on longer-term patient recovery, PROMS and PREMS.

1.2 Existing literature

Our previous recent systematic review identified 208 studies evaluating the effectiveness of multi-component interventions aiming to enhance the recovery of older adult inpatients receiving planned surgery.[15] We prioritised RCTs and UK-based studies of any design (n=73) for synthesis, which highlighted positive findings at the hospital level, but a striking lack of PROMS, PREMS or mid- to long-term outcomes. Only 16 of these studies reported PROMS or PREMS, and only two included follow-up at 12 months, the vast majority ceasing to follow patients beyond 30 days post-surgery. This omission stood out to a group of patients with experience of overnight hospital stays for planned procedures, who were involved throughout the project. A narrative review of important markers of recovery following the use of Enhanced Recovery After Surgery (ERAS) protocols further emphasised the need for studies to report such outcomes as part of their intervention evaluations.[19] Scoping searches using MEDLINE in September 2019, looking for recent relevant primary qualitative evidence and systematic reviews regarding experiences of interventions to reduce LOS.[20] No systematic reviews were identified examining the experiences of patients, their carers and staff, across different types of multi-component intervention aiming to enhance the recovery of older adults following any planned procedure, with existing reviews focusing on a narrow range of procedures, interventions and views. Jones et al systematically reviewed evidence examining both quantitative and qualitative literature on PROMs and experiences of enhanced recovery but specific to orthopaedic surgery [21], while Sibbern et al explored qualitative evidence about the views of adults receiving ERAS protocols specifically.[22] The latter review did not focus on older adults and excluded the views of carers, relatives and healthcare professionals.[22]. Searches of the PROSPERO database for systematic reviews in February 2020 identified one systematic review examining staff experiences of implementing ERAS interventions.[23] However, this review focused on only one type of intervention and because of this narrower focus, does not capture primary studies which we know through our scoping would be relevant for inclusion in our proposed review.

In summary, there is a dearth of systematic review evidence to inform decisions about the influence of multi-component interventions to enhance recovery after surgery on mid to long

term patient reported outcomes, and to understand patient experiences of such interventions.

1.3 Why is this research important?

Within all healthcare systems there is an urgent imperative to improve the quality of clinical care whilst reducing the cost as well as reliance on inpatient facilities. Multi-component interventions such as Enhanced Recovery Protocols (ERP) – featuring intervention components at several stages of care from pre-admission to post-discharge – have shown that cost-savings and improved care are not mutually exclusive. Our previous review, which has recently featured as an NIHR Signal found that ERP interventions specifically were associated with reductions in LOS of around 1.5 days in colorectal surgery, 3 days in lower limb arthroplasty and 5 days in upper abdominal surgery. These effects were achieved without an associated increase in the number of complications, adverse events or rates of readmission within 30 days of surgery.[15]

There is now a strong evidence base supporting the effectiveness of multi-component interventions in reducing LOS without detriment to hospital-recorded data and short-term outcomes. However it is increasingly important to look beyond what happens in the hospital. The NHS Long Term Plan [24] sets out a strategy that combines the desire to reduce time spent in hospital with better community care systems. There is also planned investment to reduce waiting times for planned surgery, meaning that the turnover of patients undergoing such procedures will increase. Simultaneously, interventions such as ERP will become more widely implemented in hospitals, effectively minimising LOS. The utilisation of early community-led discharge pathways is also on the rise. This includes discharge to assess (or D2A) and HomeFirst initiatives, which were not included in our previous review. There will therefore be an increasing volume of older adults discharged back into the community or long-term care facilities a day or two after major surgery. After hospital discharge, older adults may require additional support from their family, carers and/or community services, including nurses, GPs, occupational therapists and social workers, compared to younger adults. It is important to understand whether these demands are increased with enhanced recovery approaches or earlier discharge from hospital, particularly given the expected increase in patients meeting this profile in the coming years.

To understand the impact of multi-component interventions intended to improve recovery of older adults, it is vital to seek the views of the patients themselves, their family/carers and professionals delivering the interventions, to identify aspects of care which can influence the quality and success of transition from hospital. This is best achieved through a combination of quantitative (e.g. PREMS, PROMS) and qualitative data.

1.4 Overall aims and objectives

To establish what is known about the influence of multi-component interventions to enhance recovery after surgery on mid to long term patient outcomes and understand patient experiences of such interventions, we propose a programme of mixed-methods evidence synthesis.

The products of this mixed-methods synthesis would allow us to:

- Understand the effect of multi-component interventions which aim to enhance recovery and/or reduce length of stay on mid-to-long term patient-reported outcomes and health and social care utilisation,
- Understand how different aspects of the content and delivery of interventions may influence patient outcomes.

This information should directly influence the design and delivery of multi-component interventions to enhance the recovery of older adults admitted to hospital for planned procedures, and help inform patients and their carers about their needs at, and following, hospital discharge.

Research questions:

1. What is the impact of multi-component interventions to enhance recovery and/or reduce LOS for older adults admitted for planned procedures on patient reported outcome measures and service utilisation?
2. What are the experiences of patients receiving multi-component interventions to enhance recovery and/or reduce LOS, their family and carers and staff involved with delivering care within these interventions?
3. Which aspects of multi-component interventions to enhance recovery and/or reduce LOS are associated with better outcomes for older adults admitted to hospital for planned procedures?

We will conduct a linked-evidence synthesis, integrating the views of clinical stakeholders and older adults and carers with lived experience of inpatient admission for elective surgery. The project will consist of two individual reviews and an overarching synthesis:

1. To address research question 1: A systematic review of the quantitative evidence evaluating the effectiveness of multi-component interventions aiming to reduce the hospital stay and/or enhance the recovery of older adults admitted for planned treatment on PROMs and health and social care service utilisation following discharge from hospital.
2. To address research question 2: A systematic review of qualitative evidence exploring the experiences and views of older adults admitted for planned treatment, their family or carers and health/social care staff, of multi-component interventions intending to reduce the length of hospital stay and/or enhance their recovery.

3. To address research question 3: An overarching synthesis to integrate the findings from the two systematic reviews to develop a model which identifies aspects of care associated with positive or negative outcomes after elective surgery.

We will follow best practice methods guidance and a protocol will be registered on the PROSPERO international database of systematic review protocols.

2 Methods

2.1 Identification of studies

The search for studies will consist of two parts. For research question 1, the effectiveness study searches for our previous review will be re-run. Bibliographic databases searched include MEDLINE, Embase and HMIC (all via Ovid), CENTRAL (via the Cochrane Library), CINAHL and AMED (both via EBSCO). Search terms include terms for older people or interventions commonly undergone by older people, combined using the AND Boolean operator with search terms for multi-component interventions or terms that describe reducing length of stay, e.g. “length” adjacent to “stay” adjacent to “reducing”. The search terms for multi-component interventions will be expanded to include interventions that were not relevant for our previous review, including supported discharge and home or community rehabilitation. We will also use a study type filter, which will be expanded from our previous review to include quality of life studies. The 218 articles included in our original review and 282 articles we previously excluded due to population, country or language (and thus still failing to meet inclusion for this review) will be removed from the search results, saving significant time at the full-text and data extraction stages of the review. We will also check reference lists and carry out forward citation searching of included studies using Web of Science and Scopus.

For research question 2, we will tailor the selection of bibliographic databases and search strategy used for question 1 for the purpose of identifying qualitative studies. Thus we will search MEDLINE and HMIC (both via Ovid), AMED and CINAHL (both via EBSCO) and ProQuest Dissertations and Theses (via ProQuest), and the effectiveness study type filter for question 1 will be replaced with a qualitative study type filter. We will also search Google Scholar, carry out forwards and backwards citation searching using included studies, and inspect the included studies of any relevant systematic reviews that we identify.

The bibliographic database results from both searches will be combined and de-duplicated using EndNote X8.

A provisional search strategy for the MEDLINE (Ovid) bibliographic database can be seen in Appendix A.

2.1.1 Inclusion and exclusion criteria

The inclusion criteria and exclusion criteria (according to the PICO categories) to be applied to the studies identified through the search strategy are detailed below:

Participants/population:

Patients where the mean/median age of sample is ≥ 60 years of age undergoing planned overnight hospital admission for any surgical procedure. Whilst 'old age' cannot be encapsulated simply by the number of years since birth and requires consideration of a number of factors including physical health and social and/or community involvement, for the purposes of this review a clear, replicable method of identifying the population of interest is required. Our chosen definition is based upon the cut-off agreed by the United Nations.[25] For Review 2 the population will also include family, carers and health and social care staff.

Interventions/strategies

Intervention Review 1:
Any multi-component intervention intended to enhance recovery and/or reduce LOS for inpatients receiving planned treatment. By 'multi-component' we mean interventions that combine several different aspects of care which could be otherwise delivered individually. We will include all interventions eligible for inclusion in Review 1, which were required to be hospital-led and delivered over several stages of care, and included ERP, prehabilitation, rehabilitation, staff mix and specialist ward programmes[15]. In addition, we will include interventions which were not necessarily hospital-led, or only affected one stage of the hospital stay, which may include:

- Comprehensive geriatric assessment or multi-faceted assessment to influence the patient's care plan or discharge needs
- Community supported discharge programmes
- Early supported discharge/Discharge to assess

Phenomenon of Interest: Review 2
Experiences of, or attitudes towards, multi-component interventions which aim to enhance recovery and/or reduce length of hospital stay of older adults following admission for a planned procedure. This includes the views of patients, family, carers or health/social care staff.

Comparator(s)/control

Any type of control group or comparator.

Outcomes

Review 1: One or more PROM or PREM, collected at any time from the surgery being scheduled or service utilisation must be reported. Examples of PROM or PREM include:

Satisfaction, quality of life, participation in meaningful activity and mental health. Examples of service utilisation include: accessing primary care, community nursing, care at home etc. Additional outcomes of interest include: LOS, readmissions, complications, morbidity, and mortality and additional post-discharge service utilisation

Date parameters (both reviews)

Studies only included if published after 2000

Study design

Review 1: Randomised controlled trials, controlled clinical trial, controlled and uncontrolled before and after studies
Review 2: Empirical studies based upon interviews and focus groups

Geographical context

Primary studies conducted in any high income country as defined by the World Bank list (78 high-income countries, as defined by World Bank list 2020).

2.1.2 Process for applying inclusion criteria

As an initial calibration exercise of inclusion judgments and the clarity of our inclusion criteria, all reviewers will apply inclusion and exclusion criteria to a sample of search results. Decisions will be discussed in a face to face meeting to ensure consistent application of criteria. Where necessary inclusion and exclusion criteria will be revised to reflect reviewer interpretation and judgement.
The revised Inclusion and exclusion criteria will then be applied to the title and abstract of each identified citation independently by two reviewers. The full text will be obtained for papers where either reviewer indicates that it appears to meet the criteria, and those for which a decision is not possible based on the information contained within the title and abstract alone.
The full text of each paper will be assessed independently for inclusion by two reviewers. Disagreements will be settled by discussion with a third reviewer. Endnote software will be used to support study selection. A PRISMA-style flowchart will be produced to detail the study selection process and reasons for exclusion of each full-text paper will be reported.

2.2 Data extraction

Data extraction will be performed by one reviewer and checked by a second, with disagreements resolved through discussion. Key characteristics will be extracted from studies retained after full text screening. Piloting will again take place, affording the opportunity for further refinement.

Review 1: Data extracted will include the following: study details (author, date, location, design); sample characteristics (age, gender, recruitment and retention, surgical procedure, comorbidities, location/hospital type, study inclusion/exclusion criteria); intervention and control arm characteristics (label, category, aims, components, people (staff, carers) involved in delivery, training provided, availability of a protocol or manual, evaluation of adherence/fidelity); outcomes (name, construct(s) measured, rater, blinding, psychometric properties); outcome data (n, mean/median, SD/range/interquartile range). Data will be extracted using Microsoft Excel software

Review 2: Study and sample characteristics will be extracted as in Review 1, where available. First and second-order construct data, that is participant quotes and author interpretations, will be extracted from the results sections of each primary study selected for synthesis and organised within the Nvivo software package.

2.3 Study quality assessment strategy

Critical appraisal will be performed by one reviewer and checked by a second, with disagreements resolved through discussion.

Review 1 The Effective Public Health Practice Project tool [27] will be used to appraise various different potential sources of study bias, such as: Selection Bias, Study Design, Confounding Variables, Blinding of participants, data collection methods, withdrawals and drop outs and methods of analyses. Critical appraisal will not be used as grounds for excluding studies, however it may justify the use of sensitivity analysis if methodologically flawed studies are otherwise eligible for inclusion in meta-analysis. Otherwise, critical appraisal will inform the interpretation of findings.

Review 2: We will use the Wallace checklist.[28] which assesses the following: research questions, underpinning theory, study design, context, the sample, data collection, analysis, relationships between data and findings, limitations, generalisability and ethics. Critical appraisal may be used to inform the degree to which included studies contribute towards the final synthesis (see below) and the confidence which can be placed in the review findings.

2.4 Data analysis and synthesis

Review 1: Study and intervention characteristics will initially be tabulated and described textually. For synthesis, studies will likely be grouped initially by treatment type (e.g. colorectal surgery, lower limb arthroplasty, upper abdominal surgery etc) and then intervention type (e.g. ERP, prehabilitation, early supported discharge etc). Sub-groups by comparator, population characteristics (e.g. age, frailty etc.) or other important characteristics will be considered as appropriate. The influence of contextual factors detailed in studies will be described narratively.

Meta-analysis will be performed where studies have evaluated sufficiently similar strategies in similar patient groups, and using similar methods and outcome measures. Meta-analysis will include robust variance estimation to accommodate dependent effect sizes, we will use random effects meta-analysis to acknowledge likely heterogeneity, and group outcomes by follow-up time (in-hospital; up to six months post-discharge; beyond six months post-discharge). Sub-group analysis will be considered if appropriate.

Where meta-analysis is not appropriate, we will use narrative synthesis to present findings. We employed this combined approach successfully in our recent systematic review.[15] Our narrative synthesis approach will incorporate the use of tables which use both text abbreviations and graphical symbols to indicate intervention characteristics and outcomes. For example, intervention components will be denoted by short abbreviations (e.g. EON to denote early oral nutrition, MOB to denote early mobilisation). Symbols such as triangles of varying shades will be used to denote the magnitude and direction of effects on outcomes. Study quality will also be indicated in the table, for example by using a coloured background. Complementing these summary tables will be a text description of key findings, important sources of bias and other notable considerations. Reporting will be conducted in line with recently published reporting guidelines.[29]

We will also explore the possibility of network meta-analysis (NMA).[30] Our key basis for undertaking an NMA is if there are enough studies to form meaningful comparisons in an evidence network; this is likely to be linked to the possibility of undertaking pairwise meta-analyses in Review 1. The NMA will also include learning from Review 2 to guide the development of intervention categories, which will be used to form nodes of conceptually similar interventions; that is, ‘clinically meaningful units’. NMAs will be estimated in a frequentist paradigm with random effects, assuming an equal tau-squared for all comparisons in the network. We will form networks by outcome and follow-up time, and check evidence networks for transitivity (i.e. does the network make conceptual sense, and are effect modifiers distributed appropriately over the network?). Subsequently, we will estimate network meta-analyses. We will evaluate these network meta-analyses for

consistency globally using a design-by-treatment interaction test, as well as in specific loops using a side-splitting test. If consistency assumptions are met, we will proceed to estimate probabilistic ranking of network modes using 1,000 bootstrap draws. If consistency assumptions are not met, we will explore imbalance in effect modifiers and, if inconsistency has been resolved, estimate rankings. Findings will be presented in a table comparing each network node against every other, and using forest plots to contrast direct and indirect evidence estimates.

Review 2: Summary data from the primary studies will be initially tabulated and described narratively.

Results from individual primary studies will be synthesised using meta-ethnography[31] assuming sufficient conceptual data is available. The synthesis process consists of four stages: reading and rereading; determining how the studies are related through examining the relationships between the concepts, metaphors, themes and ideas presented by each primary study; translating the studies into one another by examining key concepts within and across studies to identify similarities and differences; synthesising the translations and deciding whether accounts of similar phenomena from across different studies are similar (reciprocal) or different (refutational) from one another.[32] This approach will enable the identification of common themes across different treatment groups and types of intervention, and allow us to consider concepts and ideas that are unique to these groups. The synthesis will also consider how variations in patient characteristics, including patient's age, frailty and number of comorbidities, may influence how interventions are perceived. This approach has been used successfully by members of the team (LS) within other projects.[33] If findings are more descriptive we will conduct a thematic synthesis consistent with the approach used by Thomas and Harden.[34]

To ensure the synthesis is conducted in robust manner, emerging concepts, themes and metaphors and the relationship between them will be discussed with a second reviewer. If thematic synthesis is undertaken, preliminary coding from a sample of papers will be checked by the second reviewer. Emerging themes and subthemes will be discussed and reviewed by the research team and clinical and patient stakeholders, with feedback being incorporated into the ongoing synthesis. Preliminary results will also be checked with the PPI group to explore to what extent the results align with their experiences and challenge the evolving synthesis.

The final themes and subthemes, or third-order constructs, will be described narratively. Examples of how these final themes were derived from first and second order data, along with which studies contribute to each theme will be presented in tables alongside the narrative synthesis.

Overarching synthesis: The aim of the overarching synthesis is to draw together the findings from the individual reviews to aid interpretation of the overall evidence. To do this, we will take the synthesised quantitative and qualitative research findings and combine these initially using a logic model approach as the basis for further synthesis. A logic model is a summary diagram which maps out conjectured links between interventions and anticipated outcomes and seeks to theorise the underpinning pathways from intervention inputs to impacts. The logic model will initially incorporate findings arising from our earlier systematic review. [15]. Our clinical and patient stakeholders (in face to face meetings, telephone calls and via email) will shape iterations of the model that also incorporates learning from Reviews 1 and 2, and form the basis of an overarching synthesis. In addition to conversations with patients and clinicians locally, we will utilise their extended professional networks to seek opportunities to engage with clinicians at a national/international level, to ensure that our co-created logic model is relevant and useful to a wider audience.

In previous complex systematic reviews [35, 36], the use of diagrammatical representation of the study findings has proved invaluable as a communication aid and in facilitating discussion between stakeholders from differing perspectives. To ensure our logic model reflects patient experience, we will consult widely with the clinical and patient community to discuss, explore and interpret our preliminary findings. We will use the networks and contacts created during our previous project and those of our clinical stakeholders and older adult group to identify existing patient and clinician group meetings to attend. Previous experience suggests this to be the most effective and efficient way to reach key individuals and stimulate meaningful discussion and debate. The logic model will be a valuable first step in consolidating the learning across the two review strands, and will help to identify questions and intervention experiences of importance to investigate further.

We will use a variety of overarching synthesis methods to explore and unpack intervention complexity. Initially we will use our previously described interweave synthesis method [37] to explore and identify links between and across review findings. This method involves the use of intersubjective questions to understand the findings of individual reviews through different lenses, and will incorporate the findings from Reviews 1 and 2, including the NMA. We will then use Qualitative Comparative Analysis (QCA) to examine how complex configurations of ‘conditions’ (including intervention components, processes, contextual characteristics, and patient characteristics) promote or hinder the achievement of successful outcomes [38]. QCA is a novel synthesis technique, grounded in Boolean set-theory, designed to identify the key ingredients of complex interventions (i.e. the presence or absence of components or processes) that trigger successful outcomes (e.g. improvements in older people’s wellbeing following receipt of a LOS intervention). QCA requires knowledge of (i) heterogeneity in the direction and magnitude of effect sizes (Review 1) to identify the

extent to which a study belongs to a successful outcome set; (ii) potentially important intervention processes and mechanisms from the qualitative evidence synthesis (Review 2) to identify different 'condition' sets; and (iii) information from clinical co-applicants to help to prioritise which pathways and configurations may be most important to explore.

In conducting the QCA synthesis we will follow the steps outlined by other exemplar studies [38] and follow emerging standards of good practice in conducting QCA pioneered by DK [e.g. 39]. The six key analytical stages of QCA involve: (1) coding and gaining familiarity with the data through tabulating the data; (2) undertaking initial cross-case analyses through constructing and checking 'truth tables' to examine configurations of intervention features in relation to outcomes; (3) undertaking initial robustness checks by resolving contradictory patterns in the data; (4) using Boolean logic to simplify the expression of configurations within the 'truth table'; (5) theorising what would happen in configurations that are logically possible but not represented in the data (known as incorporating 'logical remainders'); and (6) finally returning to the deep case-knowledge and underlying theory to interpret the empirical results. Use of QCA will allow us to develop solutions which help to identify complex configurations of intervention components and contextual characteristics that explain heterogeneity in the effectiveness of interventions to reduce LOS. QCA will allow us to better understand 'how' interventions work to improve PROMs/PREMs, providing added granularity for decision-makers in designing and commissioning interventions.

We anticipate that the overarching synthesis will produce additional insight above and beyond what is possible from the separate reviews, and the accompanying logic model (which will also be updated on the basis of findings from QCA) will form the basis for constructing key messages for decision makers.

3 Stakeholder involvement

Stakeholder involvement will be incorporated throughout the review, from development of the protocol to making sense of preliminary results and preparation of the final report and other outputs.

In addition to the two members of the public from the PPI group who supported our previous review and were involved in the development of this application, we will seek to expand our group to include up to eight members of the public, with experience of hospital admission for a planned procedure either as the patient or as a carer/family member. People with relevant experience will be identified through advertisement in local community venues, consultation with the University of Exeter's PenARC PPI Team and local patient groups.

Our clinical co-applicants and stakeholders have contributed towards developing the protocol and indicated that they are interested in being involved with this review. These individuals are as follows:

- Dr Anthony Hemsley (Associate Medical Director Medical Services Division and Community Services Division; Consultant Geriatrician): Royal Devon & Exeter Hospital, Exeter.
- Chris Lovegrove (Senior Occupational Therapist): Royal Devon & Exeter Hospital, Exeter
- Mr John McGrath (Consultant Urological Surgeon, national advisor to the NHS Enhanced Recovery Partnership on the care of gynaecology and urology patients): Royal Devon & Exeter Hospital, Exeter

Feedback from our PPI group and the clinical stakeholders will be sought during key stages of the project, including:

- Finalising search terms and inclusion criteria for Review 1 and Review 2
- Informing the synthesis strategy of Review 1 and Review 2
- Developing a logic model to support the integration of findings from both reviews
- Identifying key implications for further research and clinical practise
- Identifying a target audience for our work and developing a dissemination strategy
- Developing dissemination materials such as a plain language summary, podcasts and blog posts
- Proof reading final project report where appropriate

Based upon our prior experience of the difficulties in meeting with a group of clinicians in particular, we envisage meeting with cliniicans and older people and their carers in separate face to face meetings. If time-constraints mean that an individual is unable to attend a meeting, they will be invited to meet on an individual basis or make their contributions via email or telephone.

4 Dissemination plans

In addition to the final report submitted to the HS&DR programme, we will work alongside the wider clinical and patient community to produce a variety of dissemination materials intended to be useful to the people this research is expected to benefit. To facilitate this we have included costs for a writing retreat to provide the co-applicant team with the dedicated time and space to develop and prepare publications for submission.

Our projected outputs include:

- Open access publications in academic journals, which may include reports of individual reviews, key findings and editorials and/or methods papers. We have costed for three open access papers.
- Two presentations at local and international conferences. Conferences will be selected based upon relevance to our review topic and attended by a mixture of academics, clinicians and members of the public with experience of/interest in the subject area. We have costed for attendance at a British Geriatrics Society meeting (UK), and a Cochrane Colloquium (international).
- A cartoon strip to provide a short visual summary of our research. This will be shared via our stakeholders' clinical and patient networks, social media and blog posts. See our comic strip which accompanied our previous review here: https://bit.ly/2wI41Do
- A 4 page briefing paper summarising the findings of our research. This will be hosted electronically on the University of Exeter's ESMI website, shared within the professional networks of our clinical stakeholders, sent via email to patient groups (e.g. the Patients Association, British Cardiac Patients Association, Bowel Cancer UK etc.) and shared as a paper-hand out at academic conferences.
- Podcast episodes summarising our findings will be hosted on the existing channel run by the Exeter Evidence Synthesis Team. The podcast will be shared via the EST blog and on other social media sites such as Twitter and Facebook. Podcasts will be led by members of the research team, with scope to include contributions from our clinical co-applicants and older people and carer PPI group.

Each output will be written in plain English and intended to be accessible to a range of audiences including clinicians, commissioners, patients and members of the public. We appreciate that incorporating research findings into clinical practice and/or commissioning pathways can take time and be hindered by lack of relevance of the research to targeted audience and poor dissemination strategies. To overcome this, we will liaise with our clinical co-applicants and the older people and carer PPI group from the beginning of the review to ensure that our work remains relevant to their needs. We will also work with them to identify potential audiences for our findings from the start of the project to establish appropriate

contacts and dissemination pathways. We anticipate sharing the various research outputs electronically for clinical groups e.g. the Devon STP Clinical Cabinet (includes the Medical Directors of all health providers in Devon), GP surgeries, relevant charities and patient support groups and will work closely with the University of Exeter Press Office to target the results of our research to relevant academic, clinical and patient audiences. We will also aim to share our results via face-to-face presentations to local groups.

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Appendix 1. Search strategies

Draft MEDLINE search strategy

1. ((older or frail or elderly) adj2 (person* or people or patient* or population* or adult*)).tw.

2. geriatric*.tw.

3. *aged/

4. *"Aged, 80 and over"/

5. *frail elderly/

6. *Geriatrics/

7. or/1-6

8. ((eye* or sclera or iris or retina or cataract or ophthalmol*) adj3 (surgery or surgical* or procedur*)).tw.

9. exp *ophthalmologic surgical procedures/

10. ((heart or cardiac or coronary) adj3 (surgery or surgical* or procedur* or transplant* or angiography or angioplasty or bypass)).tw.

11. (aortic adj3 (replacement or surgery or surgical* or procedur*)).tw.

12. (carotid adj3 endarterectomy).tw.

13. ((arterial or artery or arteries) adj3 (bypass or surgery or surgical* or angioplasty or embolectomy)).tw.

14. *coronary artery bypass/

15. ((urinary or urologic* or genitourinary or bladder or prostate) adj3 (surgery or surgical* or procedur*)).tw.

16. (urethrotomy or prostatectomy).tw.

17. exp *Urologic Surgical Procedures/

18. (meningioma* adj3 (surgery or surgical* or procedur*)).tw.

19. craniotomy.tw.

20. *craniotomy/

21. ((lung or thoracic or thorax or cardiothoracic or pulmonary or chest or diaphragm) adj3 (surgery or surgical* or resection* or procedur*)).tw.

22. (thoracotomy or pneumonectomy).tw.

23. *Thoracic Surgery/

24. ("bile duct" adj3 (resection* or surgery or surgical* or procedur*)).tw.

25. ((pancreas or pancreatic) adj3 (surgery or surgical* or resection* or procedur*)).tw.

26. (pancreatectomy or pancreaticoduodenectomy).tw.

27. *Pancreatectomy/

28. "endovascular aortic aneurysm repair*".tw.

29. "endovascular abdominal aneurysm repair*".tw.

30. ((hip or knee or "lower limb*") adj3 (replacement* or restructur* or arthroplasty or hemiarthroplasty or surgery or surgical* or procedur*)).tw.

31. *arthroplasty, replacement, hip/

32. *arthroplasty, replacement, knee/

33. ((colorectal or colon or colonic or rectal or rectum or bowel or intenstin*) adj3 (surgery or surgical* or resection* or procedur*)).tw.

34. Colorectal Surgery/

35. or/8-34

36. 7 or 35

37. ("enhanced recovery after" adj3 surgery).tw.

38. ERAS.tw.

39. ((enhanced or early or earlier) adj3 (recovery or mobili?ation or ambulation or rehab*)).tw.

40. ERP.tw.

41. ("proactive care" adj2 "older people").tw.

42. POPS.tw.

43. ("fast track" adj3 (surgery or surgical* or program* or management or "patient care")).tw.

44. (multimodal adj3 (rehab* or perioperative or postoperative or "post operative" or optimi?ation or care or convalesc*)).tw.

45. (optimal adj2 ("preoperative assessment" or "preoperative management")).tw.

46. ((accelerated or optimi?ed or rapid or "fast track") adj3 (care or rehab* or recovery or mobili?ation or ambulation or convalesc*)).tw.

47. ((improved or improving) adj2 recovery).tw.

48. "comprehensive geriatric assessment*".tw.

49. "short acting an?esthetic*".tw.

50. ((integrated or managed) adj1 "care pathway*").tw.

51. ((multidisciplinary or "multi disciplinary") adj1 assessment*).tw.

52. ((physiotherap* or exercise*) adj3 (augment* or increas* or "higher frequency")).tw.

53. ("pressure ulcer*" adj3 "risk assessment").tw.

54. ((nutrition* or feed* or eat*) adj3 support*).tw.

55. *Nutritional Support/

56. ((support* or community) adj3 discharg*).tw.

57. (discharg* adj3 plan*).tw.

58. (rehab* adj3 (home or community)).tw.

59. or/37-58

60. ((length or duration) adj4 stay adj8 (reduce* or reduction* or reducing or shorter or shortening or "positive effect*" or prolong* or increas* or decreas* or improve* or improving or "patient outcome*" or "clinical outcome*" or "clinical indicator*" or "outcome measure*")).tw.

61. (hospital* adj3 stay adj8 (reduce* or reduction* or reducing or shorter or shortening or "positive effect" or prolong* or increas* or decreas* or improve or improving or "patient outcome*" or "clinical outcome*" or "clinical indicator*" or "outcome measure*")).tw.

62. (time adj3 discharg*).tw.

63. *"Length of Stay"/

64. or/60-63

65. 59 or 64

66. randomi?ed.tw.

67. rct*.tw.

68. (trial* or controlled or "control group*").tw.

69. ((single or doubl* or tripl* or treb*) and (blind* or mask*)).tw.

70. ("4 arm" or "four arm").tw.

71. ((before adj4 after) or "BA stud*" or "CBA stud*").tw.

72. ("pre post" or "pre test*" or pretest* or posttest* or "post test*" or (pre adj3 post)).tw.

73. (interrupt* adj2 "time series").tw.

74. ("time points" adj3 (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month* or hour* or day* or "more than")).tw.

75. (("quasi experiment*" or quasiexperiment* or "quasi random*" or quasirandom* or "quasi control*" or quasicontrol*) adj3 (method* or stud* or design*)).tw.

76. randomized controlled trial.pt.

77. controlled clinical trial.pt.

78. (quality adj3 life).tw.

79. quality of life/

80. Quality-adjusted life years/

81. (qol* or qoly or qolys or hrqol* or qaly or qalys or qale or qales).tw.

82. (quality-adjusted life year* or quality adjusted life year* or quality-adjusted life expectanc* or quality adjusted life expectanc*).tw.

83. (HRQOL or HRQL or QOL or QALY*).tw.

84. (EQ-5D or EQ-5D-3L or EQ-5D-5L or EQ-VAS or SF-6D or SF-12 or SF-36).tw.

85. or/66-84

86. 36 and 65 and 85