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Enhanced Recovery After Surgery implementation in practice: an ethnographic study of services for hip and knee replacement

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Objectives

Enhanced Recovery After Surgery (ERAS) programmes aim to improve care quality by optimising components of the care pathway and programmes for hip and knee replacement exist across the UK. However, there is variation in delivery and outcomes. This study aims to understand processes that influence implementation using the Consolidated Framework for Implementation Research (CFIR) to inform the design and delivery of services.

Design

An ethnographic study using observations and interviews with staff involved in service delivery. Data were analysed using a thematic analysis, followed by an abductive approach whereby themes were mapped onto the 31 constructs and five domains of the CFIR.

Setting

Four hospital sites in the UK delivering ERAS services for hip and knee replacement.

Participants

38 staff participated including orthopaedic surgeons, nurses and physiotherapists.

Results

Results showed 17 CFIR constructs influenced implementation in all five domains. Within 'intervention characteristics', participants thought ERAS afforded advantages over alternative solutions and guidance was adaptable. In the 'outer setting', it was felt ERAS should be tailored to patients and education used to empower them in their recovery. However, there were concerns about post-discharge support and tensions with primary care. Within the 'inner setting', effective multi-disciplinary collaboration was achieved by transferring knowledge about patients along the care pathway and multidisciplinary working practices. ERAS was viewed as a 'message' that had to be communicated consistently. There were concerns about resources and high volumes of patients. Staff access to information varied. At the domain 'characteristics of individuals', knowledge and beliefs impacted on implementation. Within 'process', involving opinion leaders in development and 'champions' who acted as a central point of contact, helped to engage staff. Formal and informal feedback helped to develop services.

Conclusions

Findings demonstrate that successful implementation depends on the extent to which services meet patient needs, effective communication and planning processes.

Key words

Enhanced recovery after surgery; joint replacement; implementation science

Strengths and limitations of this study (up to 5 points no longer than one sentence each)

- This study contributes to an understanding of how ERAS services for hip and knee replacement can be effectively implemented.
- Using ethnography that combined interviews and observations provided a rounded, in-depth understanding of practice.
- Including 38 professionals from four study sites provides confidence that findings are transferrable to other settings.
- Including different numbers of participants from study sites meant some hospitals could have been over represented in the analysis but this was mitigated by analysing data from each hospital as a discreet data set.
- Conducting a thematic analysis and transposing themes onto the theory that was considered the best 'fit' for the data ensured data were not forced into predefined constructs.

Background

Over 4.7 million patients are admitted for surgery in the UK each year[1]. To reduce length of stay, lessen readmission rates and improve care quality, Enhanced Recovery After Surgery (ERAS) programmes have been introduced across the healthcare system. ERAS programmes aim to optimise pre-operative, peri-operative and post-operative care in a range of surgical specialties. Programmes may use minimally invasive surgical techniques, effective pain management, early post-operative mobilisation, comprehensive patient education and discharge plans that have been tailored to meet individual patient needs. ERAS involves a close collaboration between healthcare professionals and patients who are invited to work towards their own recovery and rehabilitation[2].

An ERAS programme for hip and knee replacement was introduced with support from the Department of Health in 2009[3]. Around 160,000 total hip and knee replacement surgeries are carried out each year in England and Wales[4], usually to relieve pain and improve function for people with osteoarthritis. Joint replacement involves removing part of a joint and replacing it with a prosthesis[5]. This is a major operation that has significant benefits, but also known risks and adverse outcomes[6, 7]. Research has demonstrated that ERAS orthopaedic pathways reduce length of stay and mortality rates[8, 9]. However, there is significant variation in how these programmes are delivered[10], along with variation in health outcomes[11]. Reasons for this are unclear.

A recent systematic review of existing qualitative studies exploring staff experiences of delivering ERAS identified a number of factors that impacted on successful implementation. These included communication and collaboration between staff, attitudes to change, the use of clinical protocols to standardise care, expectations around the intervention and the embedding of ERAS into everyday practice[12]. However, no studies have explored factors that impact on the implementation of ERAS programmes for hip and knee replacements.

Theoretical frameworks are increasingly being used to understand implementation of complex interventions such as ERAS[13]. The Consolidated Framework for Implementation Research (CFIR) outlines 31 constructs that impact on processes of implementation, grouped into five domains.

These are: 1) *intervention characteristics* that relate to the attributes of an intervention; 2) *outer setting* or external influences; 3) *inner setting* or factors within an organisation; 4) *characteristics of individuals*, that are the behaviours of individuals tasked with enacting the intervention; and 5) *process*, that is the planning and delivery of an intervention[14]. CFIR has been successfully used to explore the implementation of a range of healthcare interventions[15-17].

This study aims to understand the organisational processes that help or hinder the implementation of ERAS programmes for hip and knee replacement. Doing so will provide information about how best to organise and deliver these services to provide effective patient care.

Methodology

This is an ethnographic study that involved spending extended periods of time collecting qualitative data at study sites to generate in-depth understandings[18]. Ethnography is a methodology that involves immersing oneself in a setting for an extended period of time to help understand social systems from the perspective of its inhabitants. As such, it provided an ideal means of exploring contextual factors that impacted on the implementation of services[19].This forms part of a broader study that includes patient experiences of accessing services.

Hospital sites

Maximum variation sampling was used to identify four hospitals from England with a range of characteristics[20]: a teaching hospital, a district general hospital, a specialist orthopaedic hospital and an independent sector treatment centre. This was intended to capture experiences in a range of contexts.

Observation sessions and job shadowing

Potential participants were identified by a staff member working in orthopaedics with knowledge of staffing at each site. Potential participants were then sent a study information pack that included information about the study, invitation letter and reply slip to return if they were interested in participating. Snowball sampling was also used such that participants recommended other potential participants[21].

Using an observation check-list, observation sessions were conducted at each study site. Field notes described the clinical setting, activities taking place, treatment protocols and factors that may impact on implementation. Informal interviews were also used. Data were written up into full fieldnotes. To inform further data collection, memos or reflective notes were used to record emerging ideas. A total of 19 staff agreed to be shadowed and approximately 160 hours of fieldwork were conducted (five days of approximately 8 hours at each study site).

Semi-structured interviews

Face-to-face semi-structured interviews were undertaken with healthcare professionals involved in service delivery. Interviews were between around 30 – 60 minutes long. Thirty-one healthcare professionals participated in interviews, of whom 12 had also participated in observations. A 'topic guide' or list of themes to explore in the interviews was devised based on data collected during observation sessions (Additional file 1). Interviews focused on participants' views and experiences of

delivering ERAS and factors impacting on implementation. The topic guide was not structured around the constructs of CFIR since we wanted to ensure that the experiences of participants were not 'forced' into predefined concepts. The topic guide was flexible to enable follow-up on issues raised. Interviews were audio-recorded, transcribed and anonymised.

Analysis

Analysis was iterative and ongoing and informed further data collection. Analysis was carried out in two phases which involved an interim and final phase. Written field notes and transcripts of interviews were anonymised and imported into NVivo software for analysis. Interview transcripts and fieldnotes were analysed using an inductive thematic approach[22] to identify themes and subthemes in the data. On account of the variation in service delivery between sites, data from each hospital site was analysed as a discrete dataset. 20% of transcripts were double coded by another member of the research team (RGH). Codes were then discussed and refined to reach a single code list. As part of the interim analyses, the Consolidated Framework for Implementation Research (CFIR) was identified as a means of further structuring analysis because of its focus on the importance of meeting patient needs in service design[23]. Using the CFIR as part of analysis involved transposing themes that had been coded inductively onto the 31 constructs of the framework, grouped into the five domains: 1) 'intervention characteristics'; 2) 'outer setting'; 3) 'inner setting'; 4) 'characteristics of individuals' and 5) 'process'. This was an 'abductive' approach to analysis as described by Tavory and Timmermans[24]. Interpretive accounts of the data were then generated.

Ethical approval

Ethical approval was provided by the South-West Exeter Research Ethics Committee (Ref: 16/SW/0214). Written informed consent was provided by all participants prior to interview. This confirmed that participants understood participation was voluntary and that they were willing to let the researcher (SD) use anonymous quotations from them in the write up of the study. Each hospital site provided R&D approval.

Findings

Sample characteristics

The 38 participants included 10 physiotherapists or occupational therapists, 18 nurses, five orthopaedic surgeons, one anaesthetist, one matron, two therapy technician assistants and one theatre manager. Twelve staff participated in interviews and observations, 19 took part in interviews only and 7 in observations only. Between 4 and 14 participants took part from each study site. Participants' characteristics are displayed in Table 1, which presents summarised information by study site to avoid the potential for identification of individual participants. We use pseudonyms for study sites.

Table 1: Participant characteristics (aggregated to ensure anonymity)

Site pseudonym	Profession	Gender	Time spent in role at site
Shinebury District	2 Physiotherapists	1 Man 1 Woman	5 – 14 years

general hospital			
	7 Staff nurse/ sisters	7 Women	2 weeks – 11 years
	3 Consultant orthopaedic surgeons	3 Men	4 years – 21 years
	Consultant anaesthetist	1 Man	22 years
Elmfield Specialist orthopaedic hospital	2 Physiotherapists	2 Women	3 years – 15 years
	3 Occupational therapists	3 women	18 months – 12 years
	6 Staff nurse/ sister/ nurse specialists	6 Women	1 month – 1 year
	Matron	1 Woman	1 month
	1 Consultant orthopaedic surgeon	1 Man	10 years
Towerton Teaching hospital	1 Physiotherapist	1 Man	10 years
	2 Therapy technician assistants	2 Women	1 – 2 years
	4 Staff nurse/ sister/ nurse specialists	4 Women	3 months – 7 years
	1 Orthopaedic surgeon	1 Man	3 years
Lastmere Independent sector treatment centre	2 Physiotherapists	1 Man 1 Woman	2 – 4 years
	1 Staff nurse	1 Woman	4 years
	1 Theatre manager	1 Man	3 years

A total of 17 CFIR constructs were seen to influence processes of implementation for ERAS programmes in all five domains of the framework. A summary of the themes identified and their relationship to these constructs and domains are outlined in Table 2.

Table 2: Themes identified and their relation to the five domains of the Consolidated Framework for Implementation Research and CFIR constructs

Domain (CFIR)	Construct	Description	Related themes
Intervention characteristics	Relative advantage	Perceived advantages of implementing the intervention.	Understanding of advantages Trade-off between reducing length of stay and increasing readmissions
	Intervention source	Views on whether the intervention had been internally or externally developed.	Support for care pathway internally developed

	Adaptability	Adaptability of the intervention to meet the specific needs of the organisation.	Adaptability of ERAS to hospital sites
Outer setting	Patient needs and resources	The extent to which the intervention meets patient needs, including barriers to access.	Adaptability of ERAS to individual needs Importance of education to empower patients ERAS as a "message" to be communicated to patients Concerns about post-discharge support
	Cosmopolitanism	How effectively the organisation networks with external organisations to deliver the intervention.	Challenges in referral from primary care Tensions between primary and secondary care on discharge Inadequate post-discharge documentation
Inner setting	Networks and communication	How effectively individuals within an organisation network and communicate with each other.	Transferral of knowledge about patients along care pathway Multi-disciplinary team meetings Informal communication Multi-disciplinary paperwork Understanding of ERAS as a "message" to be communicated across multi-disciplinary team
	Implementation climate	Receptiveness of individuals within an organisation to implementing the intervention and how well this is supported, rewarded and expected by the organisation.	ERAS champions to generate support Involvement in development of ERAS
	Compatability	Compatability of the intervention with individuals' norms and values, along with how well it fits within existing workflows.	Variation in perceived compatibility of ERAS with existing roles
	Goals and feedback	The communication of goals and how they are acted upon and fed back to staff.	Formal and informal targets used to inform service delivery
	Available resources	Availability of resources for	Concerns about costs to

		implementing the intervention, including physical resources, training and time.	maintain ERAS Shortage of available staff and high staff turnover High volumes of patients
	Access to knowledge and information	Access to information about the intervention.	Varying levels of information and training Educational sessions Formal multi-disciplinary team meetings Learning on the job
Characteristics of individuals	Knowledge and beliefs about the intervention	Individuals' attitudes and support for the intervention.	Belief in relative advantages of ERAS Resistance where ERAS seen as incompatible with professional judgement
Process	Planning	Advanced planning of tasks to support the delivery of the intervention.	Use of protocols to streamline components of care Adaptability of protocols to meet individual needs
	Engaging	Attracting and engaging relevant individuals involved in implementing the intervention through education and other similar strategies.	'Top down' encouragement and monitoring Multi-disciplinary team meetings to cascade information
	Opinion leaders	Influential individuals that are able to help generate support for the intervention.	Value of involving strong opinion leaders in development
	Champions	Individuals responsible for supporting and facilitating the delivery of the intervention.	Champions as a central point of contact and expertise Role in engendering enthusiasm
	Reflecting and evaluating	Feedback about the progress of implementation, including feedback to individuals involved in its delivery.	Reviewing outcomes data Informal communication to discuss development Informal and formal feedback through questionnaires from patients

Below we explore factors that impact on the implementation of ERAS services using the five domains of CFIR in more detail.

'Intervention characteristics'

Participants expressed enthusiasm for the relative advantages of ERAS since shortened length of stay had resource and cost saving implications. There was a sense that there was a 'trade off' between reducing length of stay whilst not increasing readmission and complication rates. At Shinebury, care pathways were developed internally by consultant surgeons who piloted the intervention and communicated findings to staff. This helped generate internal support. By contrast, a nurse sister at Elmfield described how ERAS practices had been "introduced on us" and suggested that having someone to lead its development would have inspired enthusiasm.

ERAS was seen to be adaptable so that it worked within individual hospital contexts. None of those interviewed had seen any formal policies issued by the Department of Health, although many were aware it was a government initiative. There was variation in opinion on which patients should be included in the pathway. At Shinebury, all patients were included whereas at Elmfield, patients were only selected if it was felt they were healthy enough for rapid discharge. How ERAS was interpreted therefore differed across sites.

'Outer setting'

Since ERAS was viewed as a "partnership" between staff and patients, meeting patient needs was viewed as essential to ensuring it worked effectively. A number of patients could not be discharged because they were medically unfit but there were also patients seen to be resistant to rapid discharge. To address these issues, a nurse at Elmfield thought it was crucial to adapt approaches to suit individual needs, adopting a recovery time that was manageable. Another emphasised the importance of education as a way of "breaking down" attitudes that acted as a barrier to discharge.

Purposes of patient education were considered manifold. The most important was to attribute agency to patients to give them ownership of their recovery. Reported benefits were that patients were easier to manage post operatively as they knew what to expect which impacted positively on recovery trajectories. Information was distributed in a range of formats. Written information helped to reinforce information provided at consultation and gave patients a source to refer back to. Sites operated hip and knee schools, regular classes designed to educate patients about their treatment and participants thought that the "group dynamic" created a safe space for asking questions and sharing experiences. Face-to-face contact was seen as an opportunity to clarify information.

Participants conceptualised ERAS as a 'message', which had to be consistently communicated so that patients understood and adhered to aspects of care. It was thought that if this was "diluted", then understanding and adherence could be reduced. Participants thought that new staff who were not familiar with ERAS and those who were "not buying into the process" might provide inaccurate information.

Participants from all sites were concerned about post discharge support. According to a nurse at Elmfield, this was important as patients "panicked" without it. There was variation in post-discharge services provided by the sites. One participant felt that providing a telephone number as a point of contact was "the absolute minimum". Staff thought this made patients feel more "secure".

'Cosmopolitanism' or cooperation with external agencies was important since successful implementation depended on how effectively services worked with practitioners in primary care at

the point of referral and discharge. Staff suggested GPs did not always understand the practicalities of ERAS which manifested itself in inappropriate referrals or giving patients unrealistic expectations about potential outcomes.

Participants highlighted some gaps in communication between primary and secondary care after patients' discharge. One felt that GPs sometimes questioned patients' readiness to return home, another that they got "cross" when they thought patients had been discharged without sufficient pain relief. Participants at Shinebury and Elmfield were also worried that patients had no point of contact if they were experiencing difficulties before their follow-up review, meaning they had to return to primary care, placing an unnecessary burden on services. Furthermore, there were concerns that GPs were not provided with adequate post-discharge documentation. According to a nurse at Elmfield, there was a need to further engage with GPs and community services.

'Inner setting'

It was felt that one of the key elements of success was effective networking and communication between staff. Multi-disciplinary team members tended to operate in 'silos' with responsibility for delivering different components of care. To communicate patient information, knowledge had to be transferred along the care pathway as part of a "logical progression". However, a nurse at Towerton was concerned that those undertaking pre-assessment were not consistently transferring information, meaning that potentially important details were missed.

Regular multi-disciplinary team meetings to discuss ERAS were advocated although these were challenging to organise. Informal communication was seen as being important and the location of staff in close proximity was seen to facilitate this. Nurses, physiotherapists and occupational therapists at Shinebury and Lastmere ran 'joint clinics' together and doing so encouraged collaboration. Multi-disciplinary documentation was also valued although the quality and consistency of this varied. For instance, at Elmfield paperwork did not identify whether patients had been assigned to the ERAS pathway. This reflects norms of practice in a busy communicative context. A physiotherapist at Lastmere viewed documentation as a "back-up" since staff were in "constant communication" with one another.

A number of participants characterised ERAS as a "message" that needed to be communicated across the multi-disciplinary team to ensure that its components were being consistently delivered. However, this was not always achieved. For instance, at Elmfield surgeons did not always agree with one another about which patients were eligible for ERAS. ERAS champions helped to ensure that the "message" was successfully communicated and that staff were delivering components of care consistently.

Regarding the implementation climate, participants described the importance of a collective ethos and "belief" in ERAS. ERAS champions helped to garner support from the multi-disciplinary team. However, at Elmfield there seemed to be no clear leadership. Furthermore, not all team members were invited to meetings to discuss ERAS development and this made them feel less engaged.

There was variation in how compatible ERAS was seen to be with existing roles. A number of participants thought that ERAS involved expanding on existing working practices, making it easy for them to do the necessary work. However, some anaesthetists were reportedly resistant as they preferred using their own professional judgement to following protocols. Similarly, a participant at Towerton had found it difficult to change nursing practice as colleagues were uncomfortable about encouraging patients to be so independent and were reluctant to send them home.

Targets and goals for length of stay were established formally by the Hospital or Trusts and informally by ERAS services. Performance against formal and informal targets were fed back to staff and used as a basis to collaboratively improve service delivery. Failure to meet formal length of stay targets led to fines meaning staff felt under substantial pressure to meet these goals.

The financial cost of maintaining ERAS was a concern, although the extent and nature of this varied. Elmfield staff were particularly worried about lack of current funding that meant they were not able to acquire sufficient staff or facilities such as beds. Staff at Lastmere thought funding cuts may prevent them from providing patient information booklets that they saw as being central to effective rehabilitation.

A shortage of available staff and high staff turnover were seen as creating difficulties as it meant colleagues had to do additional work and struggled to find time to deliver care. At Shinebury, time constraints were seen to make it more difficult to arrange formal care packages after discharge and impacted on the quality of post-operative follow-up. A deputy nurse sister at Elmfield thought that follow-up reviews should be undertaken by nurses or physiotherapists, as they were at Shinebury, to relieve the "pressure" on consultants. High volumes of patients at Shinebury and Towerton were also seen to place pressures on services. Since major trauma was prioritised over elective surgery, operations were often cancelled at short notice. To relieve the burden on services, responsibilities for ERAS had been shifted across existing and new staff roles.

Staff at the four sites had received varying levels of access to knowledge and information about ERAS. Towerton appeared to have the most comprehensive training and education and staff spent time with the nurse champion who ran educational sessions and incorporated information on ERAS into ongoing orthopaedic training. Staff at Shinebury were also expected to attend joint school to help them to educate patients more effectively. By contrast, a participant at Elmfield explained how the intervention had been introduced without any formal education and that this had not been effective. Multi-disciplinary team meetings were used as a way of communicating information about changes in working practice, along with "learning on the job".

'Characteristics of individuals'

Participants emphasised the importance of individual commitment from staff. A strong belief in the relative advantages of ERAS meant that most staff were committed to delivering the service. Resistance to change existed where ERAS practices were seen as being incompatible with professional judgement, as discussed above.

'Process'

To plan processes of care, protocols were used to "streamline" services and ensure patients received key elements of care, although these were not always formally described. However, participants stressed these should be sufficiently flexible to meet individual needs, as discussed above.

A consultant surgeon at Shinebury emphasised the importance of sustaining multi-disciplinary commitment and advocated "top down" encouragement and close monitoring to do so. To facilitate this, staff at Shinebury held multi-disciplinary meetings to ensure key members of the team were cascading information to colleagues "to keep that momentum going". However, a nurse at Elmfield explained that not all team members were invited to meetings to discuss ERAS development and this made them feel lessengaged.

Involving strong opinion leaders in the development of ERAS helped to generate internal support whereas a lack of this at Elmfield was a barrier to engagement, as discussed. The importance of having a recognised ERAS champion to 'drive through' changes was highlighted. Towerton had a designated nurse specialist that acted as the central point of contact. As a result, other members of the multi-disciplinary team did not need to be familiar with all aspects of the protocol. Similarly, consultants at Shinebury were identified as a source of expertise. Clinical champions also helped to engender enthusiasm.

ERAS had to be (re)activated on a continuous basis through reflection, evaluation and modification. To reconfigure care, staff at Shinebury used multi-disciplinary meetings to review outcomes data and "brainstorm" ways of improving services. Informal communication between team members, for instance in hip and knee schools, provided another opportunity for this. Patient feedback was used to shape patient education materials and joint schools. Feedback was collected informally or through patient satisfaction questionnaires. On account of these processes, ERAS was seen as having been improved or "refined" at three study sites. ERAS at Shinebury was described as having a "core element", which has grown outwards as the service has "tried to add bits on to try and improve the situation". By contrast, staff at Elmfield talked about how ERAS was gradually being "nibbled at the edges".

Box 1: Illustrative quotes

'Intervention characteristics'

"[ERAS was] revolutionary… especially for the older nurses who had been there 20 years" [Senior Sister, Towerton]

'When you've seen a patient with enhanced recovery protocols, you never want to go back to how you did things before… [seeing how quickly patients recover] was just an amazing transformation. [Consultant surgeon, Towerton]

'Outer setting'

"You've got to bring the patient on board too. You've got to persuade them to go with the flow". [Consultant surgeon, Shinebury]

"You're the one who's going to make [the joint] work, so let's get you working it. This is yours. It doesn't belong to the NHS. It doesn't belong to the surgeon. This is yours'. [It's about giving] them the ownership and the responsibility." [Deputy Sister, Elmfield]

'Inner setting'

"We [the physiotherapists] can actually gather information to save going through things… [the occupational therapist] might have gathered something that perhaps I might take an hour to get out of somebody." [Physiotherapist, Shinebury]

"The other thing that will sometimes get in the way is if the [ERAS] message has been diluted at some point" [Consultant surgeon, Shinebury]

"I think there are other people that have the same beliefs as my beliefs… the bond, the desire [to implement ERAS] is uniform from top to bottom". [Consultant Surgeon, Towerton]

"The sadness we have is we did have a fabulous all singing and dancing booklet but it was funded by a particular company [who is no longer providing support]… the funding for that isn't possible [anymore]". [Physiotherapist, Elmfield]

Giving [patients] enough time to ask questions I think is important so it's about having an appropriate length of clinic appointments which obviously [presents] a conflict between seeing a number of patients that the Trust wants you to but giving patients enough time to do that." [Consultant surgeon, Elmfield]

"Having 'enough capacities for the key professionals to interact with the patient at the right time, from pre-op to post-op [is difficult]" [Consultant surgeon, Towerton]

'Characteristics of individuals'

"Every anaesthetist was just doing his own individual recipe and it was very difficult… [it] took quite a lot of engagement to get the anaesthetists to really champion it and get their colleagues to *embrace* that". [Occupational therapist, Elmfield]

'Process'

"The idea [of the meetings] was to keep reviewing the figures and make sure there was an emphasis that everybody cascade to their own colleagues about how we were doing and whether we [were] dropping off on our Rapid Recovery… it's been a challenge to keep that momentum going". [Consultant surgeon, Shinebury

Discussion

Overview of findings

This study used the CFIR to explore how healthcare professionals view ERAS programmes for hip and knee replacement. Findings showed that 17 of the CFIR 31 constructs influenced the implementation of ERAS across all five domains. Within 'intervention characteristics', participants felt ERAS afforded advantages over alternative solutions. Support was higher where ERAS was seen to have been developed internally rather than externally. Guidance was flexible and could be adapted to meet the demands of individual hospital services. In the 'outer setting', participants thought ERAS should be tailored to patient needs and that education could empower them in their recovery. There were concerns about a lack of post-discharge support and tensions between primary and secondary care. In the 'inner setting', one of the key elements of success was effective multi-disciplinary collaboration. This was achieved by transferring knowledge about patients along the care pathway, through multi-disciplinary team meetings and paperwork. ERAS was a 'message' that had to be

communicated to all staff but there were concerns about funding constraints, staffing levels and high volumes of patients. Access to information about the intervention was variable. The characteristics of individuals impacted on implementation and staff were reluctant to change working practices where ERAS was seen as being incompatible with professional judgements. Formal and informal targets were used to inform service delivery. Within 'process', protocols were used to streamline care although these had to be flexible to meet individual needs. Participants thought that 'top down' encouragement, monitoring and regular meetings helped to ensure team engagement. Involving strong opinion leaders in its development and 'champions' that drove through implementation and acted as a point of contact, helped facilitate implementation. Reviewing outcomes data, informal communication to discuss progress and patient feedback, helped to develop ERAS over time.

How findings relate to current literature

This study helps to account for the variation in health outcomes for hip and knee replacement[11] by identifying barriers and enablers to their successful implementation. Findings reflect those from previous studies that have explored processes that influence implementation of ERAS for other conditions[25-27]. These found that multi-disciplinary collaboration was essential and that this could be threatened by the need to coordinate working practices across different departments[28]. Likewise, components of ERAS were seen as being incompatible with the working practices of some members of the multi-disciplinary team, making staff resistant to change[29]. A need to engage staff was emphasised and ERAS 'champions' were seen as a means of achieving this goal[27, 30]. The importance of providing education to patients and giving them realistic expectations of their recovery was discussed[25, 30]. Temporality, or strategies to embed ERAS over time, were discussed in a small number of studies[26, 27]. Studies have been synthesised in a recent systematic review[12]. Our study contributed to this literature by emphasising the importance of meeting patient needs in service design and for effective collaboration between primary and secondary care services.

Strengths and weaknesses

Using ethnographic research methods involved spending extended periods of time at study sites using multiple research methods that provided a rounded account of practice. Analysis included information about what people did as well as what they said, and their reasons for their actions and decisions[31]. By including 38 healthcare professionals we aimed to reflect diverse experiences, but the different numbers of participants drawn from each of the study sites meant that experiences at some hospitals could have been over represented in the analysis. However, this was mitigated by analysing data from each hospital as a discreet data set and then comparing and contrasting findings. On account of this, we think that findings are adequately transferrable to other settings[32].

The CIFR provided a theoretical basis to our analysis. We used CFIR because of its emphasis on meeting patients' needs in service design. Our study highlighted that meeting patients' needs was central to its successful implementation into everyday practice. By using inductive coding and transposing themes onto the theory that we thought was the best 'fit' for the data, we ensured that data were not forced into predefined constructs. A challenge that we encountered in analysis was how best to make decisions about where themes fitted best, particularly when it was possible that these could be mapped against more than one construct. Where this was the case, themes were

mapped onto the construct that was considered to be the best 'fit' or coded into more than one construct.

Further research

Study participants reflected on the role of primary care in delivering components of ERAS, including processes of referral and post-discharge support. Further research could explore how primary care interacts with ERAS protocols, providing a more comprehensive understanding of the delivery of ERAS. In addition, exploring patients' experiences would provide vital information about how best to meet patient needs. As part of the broader study of which the results described here form a part, we are exploring patients' experiences.

Conclusions

ERAS has been heralded as a way of improving care for patients undergoing surgery. Our research demonstrates that successful implementation of ERAS services for hip and knee replacement depends on several aspects, such as the extent to which services have been adapted to meet individual needs, effective communication between staff and planning processes. Doing so provides information to healthcare providers on how best to organise and deliver these services in the future. The study may also be of use to clinicians and researchers in helping to understand service delivery for ERAS in other surgeries.

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Competing interests

SD, RC, RGH, RF, KB do not have any competing interests to report. AJ has received consultancy fees from Freshfields Bruckhaus Deringer and is a member of the Data Safety and Monitoring Board (which involved receipt of fees) from Anthera Pharmaceuticals, INC. outside the submitted work.

Author contributions

SD, AJ, RC, and RGH contributed to study design and data analysis. All authors contributed to the interpretation of data and preparation of the manuscript and provided final approval of this version of the manuscript.

Data sharing statement

At the time this study was performed, participants consented to the data of this study being used for research. Therefore, completely open access of the data would contravene consent and ethics approval. The original study team will have exclusive use of this data for six years from the start of the study on 1st April 2016. Data will be kept on the University of Bristol research office's secure server and in hard copy within a secure filing cabinet at the University of Bristol's Musculoskeletal Research Unit. After 1st April 2022, the fully anonymised interviews will be deposited at the University of Bristol Research Data Repository for a further 14 years. Controlled access to the data request must be sought by completing and submitting a request to the University of Bristol Data Access Committee. This will assess the motives of potential researchers before granting access to the dataset. Rachel Cohen will be custodian of the data.

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Enhanced Recovery After Surgery implementation in practice: an ethnographic study of services for hip and knee replacement

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Enhanced Recovery After Surgery implementation in practice: an ethnographic study of services for hip and knee replacement

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Objectives

Enhanced Recovery After Surgery (ERAS) programmes aim to improve care quality by optimising components of the care pathway and programmes for hip and knee replacement exist across the UK. However, there is variation in delivery and outcomes. This study aims to understand processes that influence implementation using the Consolidated Framework for Implementation Research (CFIR) to inform the design and delivery of services.

Design

An ethnographic study using observations and interviews with staff involved in service delivery. Data were analysed using a thematic analysis, followed by an abductive approach whereby themes were mapped onto the 31 constructs and five domains of the CFIR.

Setting

Four hospital sites in the UK delivering ERAS services for hip and knee replacement.

Participants

38 staff participated including orthopaedic surgeons, nurses and physiotherapists.

Results

Results showed 17 CFIR constructs influenced implementation in all five domains. Within 'intervention characteristics', participants thought ERAS afforded advantages over alternative solutions and guidance was adaptable. In the 'outer setting', it was felt ERAS should be tailored to patients and education used to empower them in their recovery. However, there were concerns

about post-discharge support and tensions with primary care. Within the 'inner setting', effective multi-disciplinary collaboration was achieved by transferring knowledge about patients along the care pathway and multidisciplinary working practices. ERAS was viewed as a 'message' that had to be communicated consistently. There were concerns about resources and high volumes of patients. Staff access to information varied. At the domain 'characteristics of individuals', knowledge and beliefs impacted on implementation. Within 'process', involving opinion leaders in development and 'champions' who acted as a central point of contact, helped to engage staff. Formal and informal feedback helped to develop services.

Conclusions

Findings demonstrate successful implementation involves empowering patients to work towards recovery, providing post-discharge support and promoting successful multi-disciplinary team working.

Strengths and limitations of this study (up to 5 points no longer than one sentence each)

- This study contributes to an understanding of how ERAS services for hip and knee replacement can be effectively implemented.
- Using ethnography that combined interviews and observations provided a rounded, in-depth understanding of practice.
- Including 38 professionals from four study sites provides confidence that findings are transferrable to other settings.
- Including different numbers of participants from study sites meant some hospitals could have been over represented in the analysis but this was mitigated by analysing data from each hospital as a discreet data set.
- Conducting a thematic analysis and transposing themes onto the theory that was considered the best 'fit' for the data ensured data were not forced into predefined constructs.

Background

Over 4.7 million patients are admitted for surgery in the UK each year[1]. To reduce length of stay, lessen readmission rates and improve care quality, Enhanced Recovery After Surgery (ERAS) programmes have been introduced across the healthcare system. ERAS programmes aim to optimise pre-operative, peri-operative and post-operative care in a range of surgical specialties. Programmes may use minimally invasive surgical techniques, effective pain management, early post-operative mobilisation, comprehensive patient education and discharge plans that have been tailored to meet individual patient needs. ERAS involves a close collaboration between healthcare professionals and patients who are invited to work towards their own recovery and rehabilitation[2].

An ERAS programme for hip and knee replacement was introduced with support from the Department of Health in 2009[3]. Around 160,000 total hip and knee replacement surgeries are carried out each year in England and Wales[4], usually to relieve pain and improve function for people with osteoarthritis. Joint replacement involves removing part of a joint and replacing it with a prosthesis[5]. This is a major operation that has significant benefits, but also known risks and adverse outcomes[6, 7]. Research has demonstrated that ERAS orthopaedic pathways reduce length of stay and mortality rates[8, 9]. However, there is significant variation in how these programmes are delivered[10], along with variation in health outcomes[11]. Reasons for this are unclear.

A recent systematic review of existing qualitative studies exploring staff experiences of delivering ERAS identified a number of factors that impacted on successful implementation. These included communication and collaboration between staff, attitudes to change, the use of clinical protocols to standardise care, expectations around the intervention and the embedding of ERAS into everyday practice[12]. However, no studies have explored factors that impact on the implementation of ERAS programmes for hip and knee replacements. Since these involve a considerable post-discharge commitment from patients, experiences of service implementation may differ from other conditions. It is unclear which factors identified in previous research may be transferrable to this context.

Theoretical frameworks are increasingly used to understand implementation of complex interventions such as ERAS and these help to provide a more comprehensive explanation of how and

why interventions can be successfully implemented in practice[13]. The Consolidated Framework for Implementation Research (CFIR) outlines 31 constructs that impact on processes of implementation, grouped into five domains. These are: 1) *intervention characteristics* that relate to the attributes of an intervention; 2) *outer setting* or external influences; 3) *inner setting* or factors within an organisation; 4) *characteristics of individuals*, that are the behaviours of individuals tasked with enacting the intervention; and 5) *process*, that is the planning and delivery of an intervention[14]. Unlike other theories and frameworks that derive from the field of implementation science, the CFIR focuses on the importance of meeting patient needs in service design. CFIR has been successfully used to explore the implementation of a range of healthcare interventions[15-17].

This study aims to understand the organisational processes that help or hinder the implementation of ERAS programmes for hip and knee replacement. Doing so will provide information about how best to organise and deliver these services to provide effective patient care.

Methodology

This is an ethnographic study that involved spending extended periods of time collecting qualitative data at study sites to generate in-depth understandings[18]. Ethnography is a methodology that involves immersing oneself in a setting for an extended period of time to help understand social systems from the perspective of its inhabitants. As such, it provided an ideal means of exploring contextual factors that impacted on the implementation of services[19].This forms part of a broader study that includes patient experiences of accessing services. Data collection was undertaken between November 2016 and March 2017 and carried out by one of the research team members involved in planning and carrying out the study (RC). The researcher was employed by the University of Bristol and unknown to study participants.

Hospital sites

Maximum variation sampling was used to identify four hospitals from England with a range of characteristics[20]: a teaching hospital, a district general hospital, a specialist orthopaedic hospital and an independent sector treatment centre. This was intended to capture experiences in a range of contexts.

Observation sessions and job shadowing

Potential participants were identified by a staff member working in orthopaedics with knowledge of staffing at each site. Potential participants were then sent a study information pack that included information about the study, invitation letter and reply slip to return if they were interested in participating. Snowball sampling was also used such that participants recommended other potential participants[21].

Observation sessions were conducted at each study site. To inform data collection, an observation checklist was devised with input from the multi-disciplinary research team and used to explore the clinical setting, activities taking place, treatment protocols and factors that impacted on the implementation of services (Additional file 1). The observation checklist was intended to be used flexibly to guide data collection and enable follow-up on issues considered relevant to the study. Informal interviews were also used. Data were written up into full field notes. To inform further data collection, memos or reflective notes were used to record emerging ideas. A total of 19 staff agreed to be shadowed and approximately 160 hours of fieldwork were conducted Monday – Friday during working hours (five days of approximately 8 hours at each study site).

Semi-structured interviews

Face-to-face semi-structured interviews were undertaken with healthcare professionals involved in service delivery. Interviews were between around 30 – 60 minutes long. Thirty-one healthcare professionals participated in interviews, of whom 12 had also participated in observations. A 'topic guide' or list of themes to explore in the interviews was devised based on data collected during observation sessions (Additional file 2). Interviews focused on participants' views and experiences of delivering ERAS and factors impacting on implementation. The topic guide was not structured around the constructs of CFIR since we wanted to ensure that the experiences of participants were not 'forced' into predefined concepts. The topic guide was flexible to enable follow-up on issues raised. Interviews were audio-recorded, transcribed and anonymised.

Analysis

Analysis was iterative and ongoing and informed further data collection. Analysis was carried out in two phases which involved an interim and final phase. Written field notes and transcripts of interviews were anonymised and imported into NVivo software for analysis. Interview transcripts

and field notes were analysed using an inductive thematic approach[22] to identify themes and subthemes in the data. On account of the variation in service delivery between sites, data from each hospital site was analysed as a discrete dataset. 20% of transcripts were double coded by another member of the research team (RGH). Codes were then discussed and refined to reach a single code list. As part of the interim analyses, the Consolidated Framework for Implementation Research (CFIR) was identified as a means of further structuring analysis because of its focus on the importance of meeting patient needs in service design[23]. Using the CFIR as part of analysis involved transposing themes that had been coded inductively onto the 31 constructs of the framework, grouped into the five domains: 1) 'intervention characteristics'; 2) 'outer setting'; 3) 'inner setting'; 4) 'characteristics of individuals' and 5) 'process'. This was an 'abductive' approach to analysis which involves adopting an existing hypothesis or theory that forms the basis of further investigation. The approach emphasises the importance of collecting detailed fieldnotes, constant comparison of data, memo-writing to help develop theoretical categories and the searching of negative cases to test the theory. This enabled us to apply existing theory whilst ensuring data were not forced into predefined constructs, as described by Tavory and Timmermans[24]. Interpretive accounts of the data were then generated.

Ethical approval

Ethical approval was provided by the South-West Exeter Research Ethics Committee (Ref: 16/SW/0214). Written informed consent was provided by all participants prior to interview. This confirmed that participants understood participation was voluntary and that they were willing to let the researcher (SD) use anonymous quotations from them in the write up of the study. Each hospital site provided R&D approval.

Patient and Public Involvement

To refine the study design and data collection materials, we collaborated with members of the PEP-R ('The Patient Experience Partnership in Research') group. PEP-R is the dedicated patient involvement group based in the Musculoskeletal Research Unit, University of Bristol. PEP-R comprises patients with musculoskeletal conditions, many of whom have had a joint replacement[25]. A written overview of study findings will be provided to participants once the study, of which this qualitative work forms a part, has been completed.

Findings

Characteristics of ERAS services for hip and knee replacement are displayed in Figure 1. These present summarised information only to preserve the anonymity of sites.

Sample characteristics

The 38 participants included 10 physiotherapists or occupational therapists, 18 nurses, five orthopaedic surgeons, one anaesthetist, one matron, two therapy technician assistants and one theatre manager. Twelve staff participated in interviews and observations, 19 took part in interviews only and 7 in observations only. Between 4 and 14 participants took part from each study site. Participants' characteristics are displayed in Table 1, which presents summarised information by study site to avoid the potential for identification of individual participants. We use pseudonyms for study sites.

Table 1: Participant characteristics (aggregated to ensure anonymity)

Type of centre with pseudonym	**Profession**		**Time spent in role at site**
District general hospital **Shinebury**	2 Physiotherapists		5 – 14 years
	7 Staff nurse/ sisters		2 weeks – 11 years
	3 Consultant orthopaedic surgeons		4 years – 21 years
	Consultant anaesthetist		22 years
Specialist orthopaedic hospital **Elmfield**	2 Physiotherapists		3 years – 15 years
	3 Occupational therapists		18 months – 12 years

	6 Staff nurse/ sister/ nurse specialists		1 month – 1 year
	Matron		1 month
	1 Consultant orthopaedic surgeon		10 years
Teaching hospital **Towerton**	1 Physiotherapist		10 years
	2 Therapy technician assistants		1 – 2 years
	4 Staff nurse/ sister/ nurse specialists		3 months – 7 years
	1 Orthopaedic surgeon		3 years
Independent sector treatment centre **Lastmere**	2 Physiotherapists		2 – 4 years
	1 Staff nurse		4 years
	1 Theatre manager		3 years

A total of 17 CFIR constructs were seen to influence processes of implementation for ERAS programmes in all five domains of the framework. A summary of the themes identified and their relationship to these constructs and domains are outlined in Table 2.

Table 2: Themes identified and their relation to the five domains of the Consolidated Framework for Implementation Research and CFIR constructs

Domain (CFIR)	Construct	Description	Related themes
Intervention characteristics	Relative advantage	Perceived advantages of implementing the intervention.	Understanding of advantages Trade-off between reducing length of stay and increasing readmissions

	Intervention source	Views on whether the intervention had been internally or externally developed.	Support for care pathway internally developed
	Adaptability	Adaptability of the intervention to meet the specific needs of the organisation.	Adaptability of ERAS to hospital sites
Outer setting	Patient needs and resources	The extent to which the intervention meets patient needs, including barriers to access.	Adaptability of ERAS to individual needs Importance of education to empower patients ERAS as a "message" to be communicated to patients Concerns about post-discharge support
	Cosmopolitanism	How effectively the organisation networks with external organisations to deliver the intervention.	Challenges in referral from primary care Tensions between primary and secondary care on discharge Inadequate post-discharge documentation
Inner setting	Networks and communication	How effectively individuals within an organisation network and communicate with each other.	Transferral of knowledge about patients along care pathway Multi-disciplinary team meetings Informal communication

			Multi-disciplinary paperwork Understanding of ERAS as a "message" to be communicated across multi-disciplinary team
	Implementation climate	Receptiveness of individuals within an organisation to implementing the intervention and how well this is supported, rewarded and expected by the organisation.	ERAS champions to generate support Involvement in development of ERAS
	Compatability	Compatability of the intervention with individuals' norms and values, along with how well it fits within existing workflows.	Variation in perceived compatibility of ERAS with existing roles
	Goals and feedback	The communication of goals and how they are acted upon and fed back to staff.	Formal and informal targets used to inform service delivery
	Available resources	Availability of resources for implementing the intervention, including physical resources, training and time.	Concerns about costs to maintain ERAS Shortage of available staff and high staff turnover High volumes of patients
	Access to knowledge and information	Access to information about the intervention.	Varying levels of information and training Educational sessions Formal multi-disciplinary team meetings

			Learning on the job
Characteristics of individuals	Knowledge and beliefs about the intervention	Individuals' attitudes and support for the intervention.	Belief in relative advantages of ERAS Resistance where ERAS seen as incompatible with professional judgement
Process	Planning	Advanced planning of tasks to support the delivery of the intervention.	Use of protocols to streamline components of care Adaptability of protocols to meet individual needs
	Engaging	Attracting and engaging relevant individuals involved in implementing the intervention through education and other similar strategies.	'Top down' encouragement and monitoring Multi-disciplinary team meetings to cascade information
	Opinion leaders	Influential individuals that are able to help generate support for the intervention.	Value of involving strong opinion leaders in development
	Champions	Individuals responsible for supporting and facilitating the delivery of the intervention.	Champions as a central point of contact and expertise Role in engendering enthusiasm
	Reflecting and evaluating	Feedback about the progress of implementation, including feedback to individuals involved in its delivery.	Reviewing outcomes data Informal communication to discuss development Informal and formal feedback through questionnaires from patients

Below we explore factors that impact on the implementation of ERAS services using the five domains of CFIR in more detail. See Box 1 for illustrative quotes for each domain.

'Intervention characteristics'

Participants expressed enthusiasm for the relative advantages of ERAS since shortened length of stay had resource and cost saving implications. There was a sense that ERAS involved a compromise between reducing length of stay whilst ensuring this did not lead to an increase in readmission and complication rates. One participant described this as a "trade off". At the district general hospital (Shinebury), care pathways were developed internally by consultant surgeons who piloted the intervention and communicated findings to staff. This helped generate internal support. By contrast, a nurse sister at the specialist orthopaedic hospital (Elmfield) described how ERAS practices had been "introduced on us" and suggested that having someone to lead its development would have inspired enthusiasm.

ERAS was seen to be adaptable and this was viewed as a strength since it could be modified to work within individual hospital contexts. None of those interviewed had seen any formal policies issued by the Department of Health, although many were aware it was a government initiative. There was variation in opinion on which patients should be included in the pathway. At the district general hospital (Shinebury), all patients were included whereas at the specialist orthopaedic hospital (Elmfield), patients were only selected if it was felt they were healthy enough for rapid discharge. How ERAS was understood and implemented in practice therefore differed across sites.

'Outer setting'

Participants viewed ERAS as a "partnership" between staff and patients. As a result, meeting patient needs was viewed as being essential to ensuring it worked effectively. A number of patients could not be discharged because they were medically unfit but there were also patients seen to be resistant to rapid discharge. To address these issues, a nurse at the specialist orthopaedic hospital (Elmfield) thought it was crucial to adapt approaches to suit individual needs, adopting a recovery time that was manageable. Another emphasised the importance of education as a way of "breaking down" attitudes that acted as a barrier to discharge.

Purposes of patient education were considered manifold. The most important was to attribute agency to patients to give them ownership of their recovery. Reported benefits were that patients were easier to manage post operatively as they knew what to expect which impacted positively on recovery trajectories. Information was distributed in a range of formats. Written information helped to reinforce information provided at consultation and gave patients a source to refer back to. Sites operated hip and knee schools, regular classes designed to educate patients about their treatment and participants thought that the "group dynamic" created a safe space for asking questions and sharing experiences. Face-to-face contact was seen as an opportunity to clarify information.

Participants conceptualised ERAS as a 'message', which had to be consistently communicated so that patients understood and adhered to aspects of care. It was thought that if this was "diluted", then understanding and adherence could be reduced. Participants thought that new staff who were not familiar with ERAS and those who were "not buying into the process" might provide inaccurate information. This is discussed in further detail below.

Participants from all sites were concerned about post discharge support. According to a nurse at the specialist orthopaedic hospital (Elmfield), this was important as patients "panicked" without it. There was variation in post-discharge services provided by the sites. One participant felt that providing a telephone number as a point of contact was "the absolute minimum". Staff thought this made patients feel more "secure".

'Cosmopolitanism' or cooperation with external agencies was important since successful implementation depended on how effectively services worked with practitioners in primary care at the point of referral and discharge. Staff suggested GPs did not always understand the practicalities of ERAS which manifested itself in inappropriate referrals or giving patients unrealistic expectations about potential outcomes.

Participants highlighted some gaps in communication between primary and secondary care after patients' discharge. One felt that GPs sometimes questioned patients' readiness to return home, another that they got "cross" when they thought patients had been discharged without sufficient pain relief. Participants at the district general hospital (Shinebury) and the specialist orthopaedic hospital (Elmfield) were also worried that patients had no point of contact if they were experiencing difficulties before their follow-up review, meaning they had to return to primary care, placing an unnecessary burden on services. Furthermore, there were concerns that GPs were not provided with

adequate post-discharge documentation. According to a nurse at the specialist orthopaedic hospital (Elmfield), there was a need to further engage with GPs and community services.

'Inner setting'

It was felt that one of the key elements of success was effective networking and communication between staff. Multi-disciplinary team members tended to operate in 'silos' with responsibility for delivering different components of care. To communicate patient information, knowledge had to be transferred along the care pathway as part of a "logical progression". However, a nurse at the teaching hospital (Towerton) was concerned that those undertaking pre-assessment were not consistently transferring information, meaning that potentially important details were missed.

Regular multi-disciplinary team meetings to discuss ERAS were advocated although these were challenging to organise. Informal communication was seen as being important and the location of staff in close proximity was seen to facilitate this. Nurses, physiotherapists and occupational therapists at the district general hospital (Shinebury) and the independent sector treatment centre (Lastmere) ran 'joint clinics' together and doing so encouraged collaboration. Multi-disciplinary documentation was also valued although the quality and consistency of this varied. For instance, at the specialist orthopaedic hospital (Elmfield) paperwork did not identify whether patients had been assigned to the ERAS pathway. This reflects norms of practice in a busy communicative context. A physiotherapist at the independent sector treatment centre (Lastmere) viewed documentation as a "back-up" since staff were in "constant communication" with one another.

A number of participants characterised ERAS as a "message" that needed to be communicated across the multi-disciplinary team to ensure that its components were being consistently delivered. However, this was not always achieved. For instance, at the specialist orthopaedic hospital (Elmfield), surgeons did not always agree with one another about which patients were eligible for ERAS. ERAS champions helped to ensure that the "message" was successfully communicated and that staff were delivering components of care consistently.

Regarding the implementation climate, participants described the importance of a collective ethos and "belief" in ERAS. ERAS champions helped to garner support from the multi-disciplinary team. However, at the specialist orthopaedic hospital (Elmfield) there seemed to be no clear leadership.

Furthermore, not all team members were invited to meetings to discuss ERAS development and this made them feel less engaged.

There was variation in how compatible ERAS was seen to be with existing roles. A number of participants thought that ERAS involved expanding on existing working practices, making it easy for them to do the necessary work. However, some anaesthetists were reportedly resistant as they preferred using their own professional judgement to following protocols. Similarly, a participant at the teaching hospital (Towerton) had found it difficult to change nursing practice as colleagues were uncomfortable about encouraging patients to be so independent and were reluctant to send them home. These challenges existed across all study sites.

Targets and goals for length of stay were established formally by the Hospital or Trusts and informally by ERAS services. Performance against formal and informal targets were fed back to staff and used as a basis to collaboratively improve service delivery. Failure to meet formal length of stay targets led to fines meaning staff felt under substantial pressure to meet these goals.

The financial cost of maintaining ERAS was a concern, although the extent and nature of this varied. At the specialist orthopaedic hospital (Elmfield) staff were particularly worried about lack of current funding that meant they were not able to acquire sufficient staff or facilities such as beds. Staff at the independent sector treatment centre (Lastmere) thought funding cuts may prevent them from providing patient information booklets that they saw as being central to effective rehabilitation.

A shortage of available staff and high staff turnover were seen as creating difficulties as it meant colleagues had to do additional work and struggled to find time to deliver care. At the district general hospital (Shinebury), time constraints were seen to make it more difficult to arrange formal care packages after discharge and impacted on the quality of post-operative follow-up. A deputy nurse sister at the specialist orthopaedic hospital (Elmfield) thought that follow-up reviews should be undertaken by nurses or physiotherapists, as they were at the district general hospital (Shinebury), to relieve the “pressure” on consultants. High volumes of patients at the district general hospital (Shinebury) and the teaching hospital (Towerton) were also seen to place pressures on services. Since major trauma was prioritised over elective surgery, operations were often cancelled at short notice. To relieve the burden on services, responsibilities for ERAS had been shifted across existing and new staff roles.

Staff at the four sites had received varying levels of access to knowledge and information about ERAS. The teaching hospital (Towerton) appeared to have the most comprehensive training and education and staff spent time with the nurse champion who ran educational sessions and incorporated information on ERAS into ongoing orthopaedic training. Staff at the district general hospital (Shinebury) were also expected to attend joint school to help them to educate patients more effectively. By contrast, a participant at the specialist orthopaedic hospital (Elmfield) explained how the intervention had been introduced without any formal education and that this had not been effective. Multi-disciplinary team meetings were used as a way of communicating information about changes in working practice, along with "learning on the job".

'Characteristics of individuals'

Within this domain, only one construct was found to influence processes of implementation and this related to knowledge and beliefs about the intervention. Participants emphasised the importance of individual commitment from staff. A strong belief in the relative advantages of ERAS meant that most staff were committed to delivering the service. Resistance to change existed where ERAS practices were seen as being incompatible with professional judgement, as discussed above.

'Process'

To plan processes of care, protocols were used to "streamline" services and ensure patients received key elements of care, although these were not always formally described. However, participants stressed these should be sufficiently flexible to meet individual needs, as discussed above.

A consultant surgeon at the district general hospital (Shinebury) emphasised the importance of sustaining multi-disciplinary commitment and advocated "top down" encouragement and close monitoring to do so. To facilitate this, staff at the district general hospital (Shinebury) held multi-disciplinary meetings to ensure key members of the team were cascading information to colleagues "to keep that momentum going". However, a nurse at the specialist orthopaedic hospital (Elmfield) explained that not all team members were invited to meetings to discuss ERAS development and this made them feel less engaged.

Involving strong opinion leaders in the development of ERAS helped to generate internal support whereas a lack of this at the specialist orthopaedic hospital (Elmfield) was a barrier to engagement,

as discussed. The importance of having a recognised ERAS champion to 'drive through' changes was highlighted. The teaching hospital (Towerton) had a designated nurse specialist that acted as the central point of contact. As a result, other members of the multi-disciplinary team did not need to be familiar with all aspects of the protocol. Similarly, consultants at the district general hospital (Shinebury) were identified as a source of expertise. Clinical champions also helped to engender enthusiasm.

ERAS had to be (re)activated on a continuous basis through reflection, evaluation and modification. To reconfigure care, staff at the district general hospital (Shinebury) used multi-disciplinary meetings to review outcomes data and "brainstorm" ways of improving services. Informal communication between team members, for instance in hip and knee schools, provided another opportunity for this. Patient feedback was used to shape patient education materials and joint schools. Feedback was collected informally or through patient satisfaction questionnaires. On account of these processes, ERAS was seen as having been improved or "refined" at three study sites. ERAS at the district general hospital (Shinebury) was described as having a "core element", which has grown outwards as the service has "tried to add bits on to try and improve the situation". By contrast, staff at the specialist orthopaedic hospital (Elmfield) talked about how ERAS was gradually being "nibbled at the edges".

Box 1: Illustrative quotes

'Intervention characteristics'

"[ERAS was] revolutionary… especially for the older nurses who had been there 20 years" [Senior Sister, teaching hospital (Towerton)]

'When you've seen a patient with enhanced recovery protocols, you never want to go back to how you did things before… [seeing how quickly patients recover] was just an amazing transformation. [Consultant surgeon, teaching hospital (Towerton)]

'Outer setting'

"You've got to bring the patient on board too. You've got to persuade them to go with the flow". [Consultant surgeon, district general hospital (Shinebury)]

"You're the one who's going to make [the joint] work, so let's get you working it. This is yours. It doesn't belong to the NHS. It doesn't belong to the surgeon. This is yours'. [It's about giving] them the ownership and the responsibility." [Deputy Sister, specialist orthopaedic hospital (Elmfield)]

'Inner setting'

"We [the physiotherapists] can actually gather information to save going through things… [the occupational therapist] might have gathered something that perhaps I might take an hour to get out of somebody." [Physiotherapist, district general hospital (Shinebury)]

"The other thing that will sometimes get in the way is if the [ERAS] message has been diluted at some point" [Consultant surgeon, district general hospital (Shinebury)]

"I think there are other people that have the same beliefs as my beliefs… the bond, the desire [to implement ERAS] is uniform from top to bottom". [Consultant Surgeon, teaching hospital (Towerton)]

"The sadness we have is we did have a fabulous all singing and dancing booklet but it was funded by a particular company [who is no longer providing support]… the funding for that isn't possible [anymore]". [Physiotherapist, specialist orthopaedic hospital (Elmfield)]

Giving [patients] enough time to ask questions I think is important so it's about having an appropriate length of clinic appointments which obviously [presents] a conflict between seeing a number of patients that the Trust wants you to but giving patients enough time to do that." [Consultant surgeon, specialist orthopaedic hospital (Elmfield)]

"Having 'enough capacities for the key professionals to interact with the patient at the right time, from pre-op to post-op [is difficult]" [Consultant surgeon, teaching hospital (Towerton)]

'Characteristics of individuals'

"Every anaesthetist was just doing his own individual recipe and it was very difficult… [it] took quite a lot of engagement to get the anaesthetists to really champion it and get their colleagues to *embrace* that". [Occupational therapist, specialist orthopaedic hospital (Elmfield)]

'Process'

"The idea [of the meetings] was to keep reviewing the figures and make sure there was an emphasis that everybody cascade to their own colleagues about how we were doing and whether we [were] dropping off on our Rapid Recovery… it's been a challenge to keep that momentum going". [Consultant surgeon, district general hospital (Shinebury)]

Discussion

Overview of findings

This study used the CFIR to explore how healthcare professionals view ERAS programmes for hip and knee replacement. Findings showed that 17 of the CFIR 31 constructs influenced the implementation of ERAS across all five domains. Within 'intervention characteristics', participants felt ERAS afforded advantages over alternative solutions. Support was higher where ERAS was seen to have been developed internally rather than externally. Guidance was flexible and could be adapted to meet the demands of individual hospital services. In the 'outer setting', participants thought ERAS should be tailored to patient needs and that education could empower them in their recovery. There were concerns about a lack of post-discharge support and tensions between primary and secondary care. In the 'inner setting', one of the key elements of success was effective multi-disciplinary collaboration. This was achieved by transferring knowledge about patients along the care pathway, through multi-disciplinary team meetings and paperwork. ERAS was a 'message' that had to be communicated to all staff but there were concerns about funding constraints, staffing levels and high volumes of patients. Access to information about the intervention was variable. The characteristics of individuals impacted on implementation and staff were reluctant to change working practices where ERAS was seen as being incompatible with professional judgements. Formal and informal targets were used to inform service delivery. Within 'process', protocols were used to streamline care although these had to be flexible to meet individual needs. Participants thought that 'top down' encouragement, monitoring and regular meetings helped to ensure team engagement. Involving strong opinion leaders in its development and 'champions' that drove through implementation and acted as a point of contact, helped facilitate implementation. Reviewing outcomes data, informal communication to discuss progress and patient feedback, helped to develop ERAS over time.

How findings relate to current literature

Findings characterise differences in how ERAS services for hip and knee replacement are delivered by identifying barriers and enablers to their successful implementation. This may help to account for variation in health outcomes for these surgeries[11]. For instance, meeting patient needs may help them to work more successfully towards their own recovery[26]. Findings reflect those from previous studies that have explored processes that influence implementation of ERAS for other conditions[27-29]. These found that multi-disciplinary collaboration was essential and that this could be threatened by the need to coordinate working practices across different departments[30]. Likewise, components of ERAS were seen as being incompatible with the working practices of some members of the multi-disciplinary team, making staff resistant to change[31]. A need to engage staff was emphasised and ERAS 'champions' were seen as a means of achieving this goal[29, 32]. The importance of providing education to patients and giving them realistic expectations of their recovery was discussed[27, 32]. Temporality, or strategies to embed ERAS over time, were discussed in a small number of studies[28, 29]. Studies have been synthesised in a recent systematic review[12].

Our study contributed to existing literature by emphasising the importance of meeting patient needs in service design, including the need to ensure that the "message" of ERAS is successfully and consistently communicated in order to encourage patients to engage in rehabilitative work. It also highlights the need for effective collaboration between primary and secondary care services to provide effective discharge support, reflecting challenges in the wider healthcare system[33].

Our study highlights the importance of ensuring that protocols are sufficiently flexible to meet individual patient needs. Services should also prioritise strategies to empower patients in their recovery through education. Adequate post-discharge support should be built into services and effective working relationships established with primary care through established channels such as post-discharge documentation. Likewise, multi-disciplinary team working around ERAS should be encouraged to ensure that there is commitment to delivering ERAS, and a consensus about its meaning and how it should be enacted in the service. Education forms an essential component of this. Strong opinion leaders or ERAS 'champions' may be introduced as a source of information for staff and to help engender enthusiasm for the intervention. Establishing formal evaluation

processes, along with utilising informal sources of feedback to help reconfigure services, may be used to ensure that services are refined and delivered over time.

Strengths and weaknesses

Using ethnographic research methods involved spending extended periods of time at study sites using multiple research methods that provided a rounded account of practice. Analysis included information about what people did as well as what they said, and their reasons for their actions and decisions[34]. By including 38 healthcare professionals we aimed to reflect diverse experiences, but the different numbers of participants drawn from each of the study sites meant that experiences at some hospitals could have been over represented in the analysis. However, this was mitigated by analysing data from each hospital as a discreet data set and then comparing and contrasting findings. On account of this, we think that findings are adequately transferrable to other settings[35]. In our presentation of findings, we differentiated between individual study sites where relevant. Where findings were similar across all sites, data was pooled. Despite significant variation in service delivery, we found that all constructs were relevant across all study sites.

The CIFR provided a theoretical basis to our analysis. We used CFIR because of its emphasis on meeting patients' needs in service design. Our study highlighted that meeting patients' needs was important to its successful implementation into everyday practice. By using inductive coding and transposing themes onto the theory that we thought was the best 'fit' for the data, we ensured that data were not forced into predefined constructs. A challenge that we encountered in analysis was how best to make decisions about where themes fitted best, particularly when it was possible that these could be mapped against more than one construct. Where this was the case, themes were mapped onto the construct that was considered to be the best 'fit' or coded into more than one construct.

Further research

Study participants reflected on the role of primary care in delivering components of ERAS, including processes of referral and post-discharge support. Further research could explore how primary care interacts with ERAS protocols, providing a more comprehensive understanding of the delivery of ERAS. In addition, exploring patients' experiences would provide vital information about how best to

meet patient needs. As part of the broader study of which the results described here form a part, we are exploring patients' experiences.

Conclusions

ERAS has been heralded as a way of improving care for patients undergoing surgery. Our research demonstrates that successful implementation of ERAS services for hip and knee replacement depends on several aspects, such as the extent to which services have been adapted to meet individual needs, effective communication between staff and planning processes. Doing so provides information to healthcare providers on how best to organise and deliver these services in the future. The study may also be of use to clinicians and researchers in helping to understand service delivery for ERAS in other surgeries.

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Department of Health Disclaimer

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Competing interests

SD, RC, RGH, RF, KB do not have any competing interests to report. AJ has received consultancy fees from Freshfields Bruckhaus Deringer and is a member of the Data Safety and Monitoring Board (which involved receipt of fees) from Anthera Pharmaceuticals, INC. outside the submitted work.

Author contributions

SD, AJ, RC and RGH contributed to study design and data analysis. SD, AJ, RC, RF, KB and RGH all contributed to the interpretation of data and preparation of the manuscript and provided final approval of this version of the manuscript.

Data sharing statement

At the time this study was performed, participants consented to the data of this study being used for research. Therefore, completely open access of the data would contravene consent and ethics approval. The original study team will have exclusive use of this data for six years from the start of the study on 1st April 2016. Data will be kept on the University of Bristol research office's secure server and in hard copy within a secure filing cabinet at the University of Bristol's Musculoskeletal Research Unit. After 1st April 2022, the fully anonymised interviews will be deposited at the University of Bristol Research Data Repository for a further 14 years. Controlled access to the data request must be sought by completing and submitting a request to the University of Bristol Data Access Committee. This will assess the motives of potential researchers before granting access to the dataset. Rachel Cohen will be custodian of the data.

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Figure 1: Characteristics of ERAS services for hip and knee replacement at four study sites

Figure 1: Characteristics of ERAS services for hip and knee replacement at four study sites

Towerton

Year ERAS first introduced: 2011
Key features include:

- ERAS nurse champion as central coordinator
- Patients provided with five separate leaflets including information about anaesthetic, monitoring wounds, blood clots
- Patients attend hip or knee school for further information
- Pre-assessment includes medical history and consideration of social history and current living arrangements
- Physiotherapists see patients a minimum of one day after surgery
- Links with other locality services for post discharge support put in place before admission. 'Step-down' ward used for patients who aren't well enough to go home.
- Post-operative follow up appointments conducted at six weeks, six months and 12 months.
- Hip and knee patients follow same care pathway.
- Only patients that have attended a hip or knee school are classed as "ERAS patients".

Shinebury

Year ERAS first introduced: Piloted in 2000
Key features include:

- No central coordinator
- Patients provided with leaflets and DVDs for information. DVD includes information about surgery, previous patients talking about their experiences.
- Patients attend hip or knee school, including demonstration of rehabilitation exercises
- Pre-assessment involves full medical checks. Patients see occupational therapists and complete questionnaires about their home environments to assess level of support needed post discharge.
- Patients seen by physiotherapists and mobilised day one after surgery
- Limited organisational support available for patients post discharge and formal care packages are difficult to put in place.
- Post-operative follow up appointments conducted at two weeks, six weeks and one year, run by the lead physiotherapist, occupational therapists and specialised orthopaedic nurses. Follow up also takes place in fracture clinics at five and ten years.
- Hip and knee patients follow same care pathway.
- All patients are included in the ERAS care pathway.

Lastmere

Year ERAS first introduced: 2014/ 2015
Key features include:

- No designated coordinator but informally, physiotherapists act as key points of contact.
- Patients provided with one comprehensive hip or knee 'joint guide' booklet with information about hospital, surgical procedures and rehabilitation including safety and exercise.
- Patients attend hip or knee school that includes information on exercises, practice with mobility aids and advice on likely length of stay.
- Pre-operatively, patients complete questionnaires about their home environments so their rehabilitation needs can be assessed.
- Patients are seen by physiotherapists post-operatively, preferably on the same day of surgery or day one at the latest. Patients are seen twice a day.
- Post-operative follow up appointments conducted at six weeks by consultants. Patients also seen by physiotherapy team at least three or four times during the first six weeks, either by attending rehabilitation classes or in one to one appointments. All patients are seen within the first two weeks after surgery.
- Hip and knee patients follow same care pathway.
- All patients are included in the ERAS care pathway.

Woodland

Year ERAS first introduced: Around 2010
Key features include:

- No central coordinator
- Referrals from primary care are through a musculoskeletal 'hub', a triage system run by consultants to ensure patients receive the correct treatment
- Patients having hip surgery attend a 'school'. No school exists for those undergoing knee replacement
- There is a same day assessment clinic, a "one-stop shop" which involves a full pre-operative assessment, including full observations and occupational therapy assessment. Only hip school patients see physiotherapists.
- All discharge planning is done by physiotherapists.
- Post-operative follow up appointments conducted at six weeks by consultants.
- Hip and knee patients do not follow the same care pathway.
- Not all patients are assigned to the ERAS care pathway for hip surgery and this is done at the discretion of consultants. Those considered to be more frail or complex are less likely to be included in ERAS.

Observation checklist

Details of observation session:

Study site:

Time and date:

Observation number:

Length of time spent observing:

Topics to explore:

- Types of healthcare professionals, numbers of healthcare professionals
- Description of patients
- Description of setting including layout
- Activities taking place
- Treatment protocols being followed
- Methods of communication between professionals and patients
- Interactions between professionals
- Identification of barriers and facilitators to service delivery

Atlas - A study of hospital care through joint replacement: Staff Topic Guide

Introduction and consent

Discuss how the interview will be recorded, issues of confidentiality, anonymisation, informed consent, purpose. Aim of the study: to understand patients' experiences of hospital care and treatment before, during and after joint replacement

Socio-demographic data and professional background

- Age/ years in current role/ years treating joint replacement patients?

Before surgery

- Which kind of joint replacement surgery (hip/knee) do you perform most often?
- Could you tell me about how the decision is reached for patients to undergo joint replacement surgery? How involved are patients in reaching this decision? Are their preferences and wishes taken into consideration?
- How do patients choose where they will have their surgery?
- What kind of information is given to patients before being admitted for surgery? Do you think this is helpful for them?
- Do patients receive support and/or advice from (e.g.) a physiotherapist, occupational therapist or nurse about recovery before they are admitted to hospital? Could you tell me a bit about this?
- What kind of advice and information are patients given about preparing themselves for surgery? To what extent is this followed by patients?
-

During hospital stay

- Could you give me a walk-through of the admission and operation processes when patients are admitted for joint replacement surgery at your hospital/treatment centre? How has this changed under the ER approach?
- Are patients given an opportunity to ask questions and discuss any worries or concerns?
- How is input from the various MDT members coordinated whilst patients are in hospital?

After surgery

- What kind of support and information is provided for patients immediately after their operations (e.g. pain management, encouraging physical activity, etc.)?
- Can you walk me through the process for preparing a patient for discharge from hospital after their surgery? Who discusses this with the patient? Do patients receive a discharge plan?
- What support is available for patients after they leave hospital (e.g. help from other services, physiotherapy, occupational therapy)? Do many patients receive help from family/friends?
- Is there any provision for patients' psychological/emotional support needs?
- Do you think that patients usually feel confident about continuing their rehabilitation at home?

Recovery

- What does the concept of "enhanced recovery" mean to you?
- What kind of training have you had on the Enhanced Recovery Programme? When was the programme introduced at your hospital/treatment centre?
- Do you feel that the ER programme has had an impact on the delivery of services at your hospital/treatment centre? How has it changed your own working practices?
- Are there any key policies or principles that underpin the local delivery of the ER programme at your hospital/treatment centre?
- What are the main challenges of implementing ER practices?
- Do you think that care and treatment is tailored towards patients' individual needs?
- Can you suggest anything that would improve care and treatment through joint replacement?

About participating in this study

- Is there anything about your participation in this research that you would have liked to have happened differently?

Conclusion

- Is there anything else you would like to add, or anything you wish to talk about that we haven't covered already?
- Would you like us to send you a brief report of the study findings?

Reaffirm consent and thank participant

Standards for Reporting Qualitative Research (SRQR)*

http://www.equator-network.org/reporting-guidelines/srqr/

	Page/line no(s).
Title and abstract	
Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	Page 1, l. 1 - 2
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	Page 2, l. 5 – Page 3, l. 8
Introduction	
Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	Page 4, l. 5 – Page 5, l. 11
Purpose or research question - Purpose of the study and specific objectives or questions	Page 5, l. 13 - 15
Methods	
Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	Page 5, l. 19 - 24
Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	Page 5, l. 24 - 27
Context - Setting/site and salient contextual factors; rationale**	Page 5, l. 29 - 34
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	Page 6, l. 4 - 8
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	Page 7, l. 22 - 28
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	Page 5, l. 19 – Page 7, l. 20

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	Page 6, l. 10 – 18 Page 6, l. 26 – 32 Additional file 1 Additional file 2
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	Page 8, l. 10 – 18 Table 1
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	Page 6, l. 17 Page 6, l. 32 Page 7, l. 3 - 4
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	Page 6, l. 34 – Page 7, l. 20
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	Page 7, l. 7 - 8

Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	Page 9, l. 3 – Page 18, l. 24
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	Box 1

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	Page 21, l. 11 – Page 22, l. 11
Limitations - Trustworthiness and limitations of findings	Page 22, l. 13 – Page 23, l. 2

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	Page 24, l. 14 - 18
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	Page 23, l. 29 – Page 24, l. 12

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

Reference:

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014
DOI: 10.1097/ACM.0000000000000388