

What are the postoperative experiences of patients who have undergone hip and knee joint replacement? A literature review

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Abstract:

Background

There are an increasing number of people undergoing hip and knee joint replacement each year; approximately 68,000 hip and 76,000 knee replacements respectively are performed in England and Wales. Joint replacements serve to reduce pain and improve function.

Objective

The purpose of this qualitative literature review is to gain an in depth understanding into participants' postoperative experiences following hip and knee replacement in order to establish if participants can be better supported post joint replacement and whether preoperative education can be enhanced.

Method

Searches were carried out in 13 online scientific databases (January 1995 to October 2016) to identify relevant studies. The quality of studies was assessed, data were extracted and analysed using thematic synthesis.

Results

A total of 197 studies were identified and screened against the inclusion/exclusion criteria. Seven studies met the inclusion criteria. Three broad themes were identified; coping with pain, recovering function and the challenges of discharge. In general pain was poorly understood and difficulties arose with the appropriate management postoperatively. The recovery process took commitment and required individuals to have realistic expectations. Participants also felt the need for individualised care as they approached discharge.

Conclusion

Overall qualitative evidence surrounding postoperative views of participants is limited. It appears current preoperative education does not fulfil the majority of participants' needs.

Utilising the views of participants may help to tailor preoperative education or provide alternative support postoperatively. Future research should focus on clarifying the effect of a well constructed and well-delivered pre-operative education sessions.

Introduction

Each year approximately 68,000 hip and 76,000 knee replacements respectively are carried out in England and Wales, making them one of the most common types of elective orthopaedic surgery (Neuburger et al. 2012; Smith and Sackley 2016). The majority of procedures are the result of debilitating osteoarthritis that causes daily suffering and reduced function for individuals (Brembo et al. 2016). Joint replacement is highly successful in relieving pain and discomfort, permitting a better quality of life to be re-established (Haase et al. 2016).

Across the UK, those undergoing surgery are given the opportunity to attend preoperative education sessions. These sessions typically provide information on the surgical procedure, hospital stay, challenges that may be encountered and often involves a multidisciplinary team including nurses, physiotherapists and occupational therapists (Conradsen et al. 2016; Moulton et al. 2017). The effectiveness of these preoperative education sessions is debated (Walker 2007). There is some evidence to suggest that that preoperative education may not improve pain, function, quality of life, individual outcomes or length of stay post hip and knee replacement (McDonald et al. 2014; Moulton et al. 2017). Conversely, others suggest that preoperative education help to prepare patients with positive outcomes including reduced length of stay and cost savings (Conradsen et al. 2016; Edwards et al. 2017). Despite these disparities, the National Institute for Clinical Excellence (NICE) guidelines (CG177 2014) advise that information should be provided to those undergoing joint replacement surgeries, inclusive of the procedure and rehabilitation.

Reviews of preoperative education and hip replacement to date have predominantly been quantitative in nature with a focus on quality of life measures and patient satisfaction, (Montin et al, 2008; Jones et al. 2014; McDonald et al. 2014). Arguably one of the most critical aspects of preoperative education are the views of participants and none of the above reviews used qualitative methods to capture these participant perspectives. A gap in the literature was thus identified around understanding the perspective of participants which indicates the need for qualitative exploration in this area. The aim of this review was to understand participants' views following joint replacement in order to improve postoperative care and enhance preoperative educations sessions.

Methods:

Search Strategy

A literature search was undertaken in 13 online databases (CINAHL, Academic Search, Complementary Index, ScienceDirect, MEDLINE, Supplemental Index, SPORTDiscus, PsycINFO, Directory of Open Access Journals, J-STAGE, SwePub, Business Source and JSTOR Journals) from January 1995 to October 2016 in order to identify suitable qualitative studies. Reference lists from studies which met the inclusion criteria were hand searched to locate additional studies. Key search terms ‘hip replacement’, ‘knee replacement’, ‘postoperative’ and ‘patient understanding’ and their alternatives were applied using Boolean logic. The full search of databases can be found in figure 1.

[Figure 1 near here]

Figure 1: Search terms

| | |
|---------------|--|
| Search term 1 | Total hip replacement* OR Total knee replacement* OR Total hip arthroplasty OR Total knee arthroplasty |
| Search term 2 | Patient experience OR Patient understanding |
| Search term 3 | Postoperative |

* (asterisk) expresses characters used in truncation

Inclusion criteria

Studies had to include the views and opinions of adults having undergone hip or knee replacement using qualitative methods. Searches were limited to peer-reviewed journals, in English language from January 1995 to October 2016. The first author (EDS) initially screened articles for eligibility by title and abstract. Potentially relevant articles underwent a

full text screening and were cross checked by the second author (CK). Full inclusion/exclusion criteria are listed in Table 1.

Table 1: Study inclusion and exclusion criteria

| Inclusion | Exclusion |
|---|--|
| <ul style="list-style-type: none"> • Qualitative methods • Adult participants having undergone joint replacement of the hip or knee (no age limiters applied) • Hip and knee joint replacement, elective orthopaedic surgery | <ul style="list-style-type: none"> • Hip and knee joint replacement through trauma • Reports published as conferences, thesis, books, reviews, policy documents or pilot studies • Articles containing participant views purely on preoperative experiences |

Data extraction and synthesis

Data extraction was completed using a customised data extraction form (including study design, aims, design, population, intervention and themes) for each of the studies (see table 2).

The qualitative data underwent thematic synthesis (Thomas and Harden 2008). The findings section of each included study was copied into a Microsoft Word file and underwent line-by-line coding by the first author (EDS). These open codes were then grouped based on similarities and differences between the codes into descriptive themes which were cross-checked with the second author (CK). The third stage was more interpretive in that the authors sought to move beyond the primary studies and produce analytical themes (Thomas and Harden 2008). The process of cross-checking themes between the authors led to valuable discussions which were important in the refining and interpretation of the final themes (Barbour 2001).

Table 2: Study characteristics of included studies

| Study | Aims | Design | Participants | Intervention- type of surgery | Themes identified by study authors |
|---------------------|---|--|--|--|---|
| Montin et al. 2002 | The purpose of this study was to describe the experiences of THR patients before hospitalisation, in hospital and following discharge | Qualitative design using focused interviews | 17 participants, 8 male and 9 female. Mean age 66 years. Setting: Two orthopaedic wards in South Finland | Elective primary total hip replacement | The identified themes: <ul style="list-style-type: none"> • Experiences of care • Experiences of health care o • Experiences of being a hip replacement patient |
| Fielden et al. 2003 | To investigate patient expectations of and the satisfaction with in-hospital discharge planning after THJR in early and late discharge patient groups | Exploratory qualitative using semi structured interviews | 33 participants, ≥18 years (mean age not given). Setting: two metropolitan hospitals in New Zealand | Elective total hip replacement | Three categories identified with further themes in each: <ul style="list-style-type: none"> • Ready self (preoperative) • Recovering mobility • Transition to wellness |
| Fujita et al. 2006 | To describe OA patients' experience | Qualitative- semi structured | 20 participants, 7 male and 13 female. | Elective primary total hip | The identified themes: <ul style="list-style-type: none"> • Life restricted by pain and |

| | | | | | |
|----------------------|---|--------------------------------------|--|--|---|
| | before and after THA in order to have a better understanding of patients' perspectives on THA | interviews | Mean age 62 years. Setting: Saga University Hospital Japan | replacement | disability (preoperative) <ul style="list-style-type: none"> • Freedom from restrictions • Adaptation to life with a prosthesis |
| Rastogi et al. 2007 | To identify what patients believe is important during their recovery in the first six weeks following primary TKA, to link these concerns to components of the ICF and to map the concerns to items in three commonly used self-report outcome measures | Qualitative using interviews | 30 participants, 12 male and 18 female. Mean age 68.4 years. Setting: University Hospital London, Canada. | Elective primary total knee arthroplasty | The identified themes included: 32 separate concerns were identified by patients which were then categorised into ICF components. <ul style="list-style-type: none"> • Body structure and function • Activity • Participation • Environmental factors |
| Jacobson et al. 2008 | To describe patients' experiences with TKR | Qualitative descriptive design using | 10 participants. Mean age 66.03 years (inclusive of | Elective primary total knee replacement | The identified themes included: |

| | | | | | |
|--------------------|---|--|---|---|--|
| | | focus group and interviews | preoperative patients) Setting: United States | | <ul style="list-style-type: none"> • Putting up and putting off • Waiting and worrying (preoperative) • Letting go and letting in • Hurting and hoping |
| Hunt et al. 2009 | To identify evaluations and concerns common to both regimes, and those which were specific to short post-operative stay | Qualitative using semi-structured interviews | 35 participants, 17 male and 18 female Mean age 70.5 years Setting: Two hospitals one in Liverpool and one in Belfast | Elective primary total hip replacement | The identified themes: <ul style="list-style-type: none"> • Complaints • Length of stay and post discharge experience |
| Specht et al. 2016 | To explore the lived experience of patients in fast-track primary unilateral THA/TKA from the first visit in the outpatient clinic to discharge | Qualitative explorative study using participant observation and interviews | 8 participants. Mean age 63 years. Setting: Danish Orthopaedic department | Elective primary unilateral total hip and knee arthroplasty | The identified themes: <ul style="list-style-type: none"> • Dealing with pain • Feelings of confidence or uncertainty • Readiness for discharge |

Quality assessment

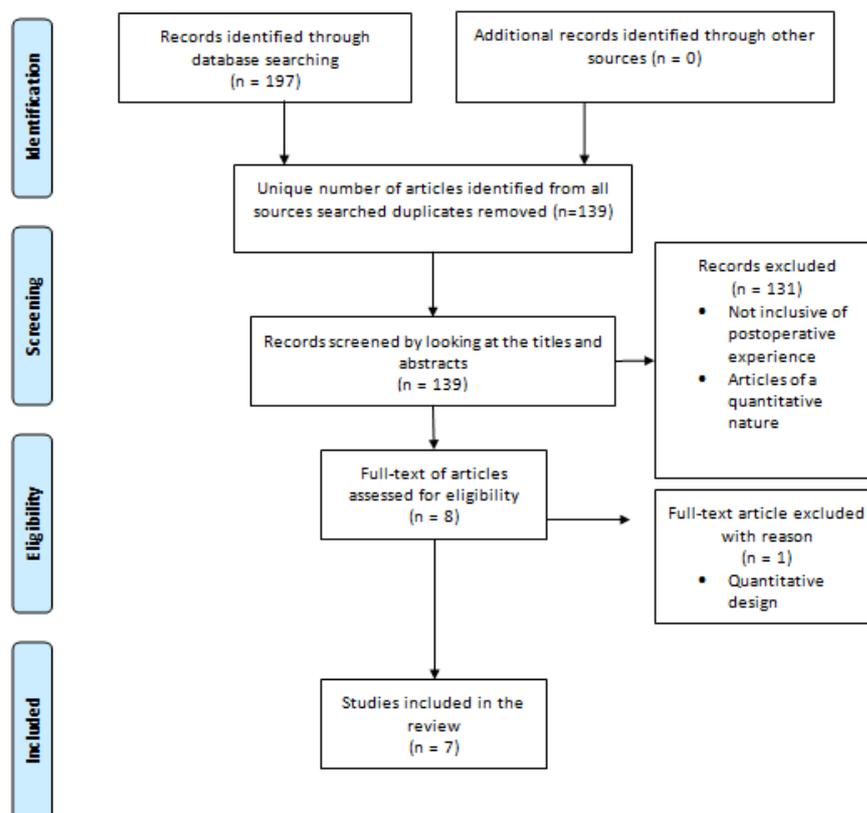
Quality assessment was undertaken using the Critical Appraisal Skills Programme checklist (CASP 2014). The appropriateness of using a checklist approach to appraising qualitative research studies is debated, however, in this study the authors chose to use a critical appraisal tool to guide their reading and assessment of qualitative studies (Taylor 2007). Quality assessment was carried out by the first author (EDS) and the findings were cross-checked with the second author (CK).

Results

Identification of studies

Overall, 197 studies were identified through the search strategy and considered against inclusion/exclusion criteria. Of those, seven studies met the criteria. Figure 2 shows how the studies were selected using a modified flow chart from Preferred Reporting Items for Systematic Reviews and Meta-analyses (Liberati et al. 2009).

Figure 2 flow chart of paper selection:



Quality of studies

There were two main weaknesses identified in the included studies. Five of the seven studies were unclear of their reporting of the relationship between participants and researcher (Montin et al. 2002; Fielden et al. 2003; Rastogi et al. 2007; Hunt et al. 2009; Specht et al. 2016). The researcher-participant relationship is a vital consideration in qualitative research since methodological decisions are made based on the nature of this relationship with a risk of research bias if appropriate steps are not taken (such as keeping a reflex diary, peer-debriefing) (McGinn 2008). This might result in various challenges such as respecting privacy, establishing an open interaction and avoiding misinterpretations (Sanjari et al. 2014). The studies that did not state details on their interactions could have potentially introduced a risk of bias.

The other main weakness was lack of consideration to ethical issues in two of the studies (Hunt et al. 2009; Fujita et al. 2006). One of the roles of an ethics committee is to challenge and discuss the methods of the study so that participants safety is met (Yank and Rennie 2002). Although informed consent had been reported there was no further reporting on ethical approval / ethics committee. Further ethical considerations would have been important, especially for participants who have undergone a surgical journey in order to have the necessary support when describing their experiences. Despite the above weaknesses the decision was made to include all studies due to the fact that each qualitative study may still add a useful contribution in understanding participants' views postoperatively (Noyes et al. 2008).

Study Characteristics

The sample size varied between studies (eight to thirty-five participants). All participants were 18 years or older. The mean age for the six studies which included participant age was 66 years (Montin et al. 2002; Fujita et al. 2006; Rastogi et al. 2007; Jacobson et al. 2008; Hunt et al. 2009; Specht et al. 2016). All studies included both males and female participants.

The location of the studies differed; three took place in Europe (Montin et al. 2002; Hunt et al. 2009; Specht et al. 2016), one in Asia (Fujita et al. 2006), one in Australasia (Fielden et al. 2003) and two in North America (Rastogi et al. 2007; Jacobson et al. 2008).

Only one study was able to be sourced that incorporated both hip and knee replacements (Specht et al. 2016). Four studies solely considered hip replacements (Montin et al. 2002; Fielden et al. 2003; Fujita et al. 2006; Hunt et al. 2009) and the remaining two focused on knee replacements (Rastogi et al. 2007; Jacobson et al. 2008). Data were collected using semi-structured interviews. These took place when participants were either still an inpatient, in the outpatients department or at home. Some of the interviews were conducted as soon as two days post surgery others were scheduled as far as one year postoperative. One study interviewed participants over six consecutive weeks (Rastogi et al. 2007). Interview length varied from five minutes to two hours. Four out of the seven studies made reference to preoperative education, in the form of receiving written information (Fielden et al. 2003; Jacobson et al. 2008; Hunt et al. 2009; Specht et al. 2016) however there was no further detail regarding the content covered.

Major Themes

Following thematic synthesis, this current study identified three major themes as commonly recorded experiences in participants having undergone joint replacement. These were coping with pain, recovering function and the challenges of discharge.

Coping with pain

The main form of pain relief was pharmacological management with other alternative options such as ice, meditation and transcutaneous electrical nerve stimulation (TENS) being less frequently utilised (Jacobson et al. 2008). The pain had changed from chronic joint pain (Fujita et al. 2006) to pain from the postoperative wound and surrounding musculature with a need for muscles to learn to work with their new joint (Montin et al. 2002; Jacobson et al. 2008). Lack of pain relief could inhibit sessions with the Physiotherapist because moving the operated limb exacerbated the pain considerably (Specht et al. 2016). Participants' pain levels generally decreased over time (Fujita et al. 2006; Jacobson et al. 2008), however some participants still experienced marked amounts of pain at the time of discharge (Montin et al. 2002; Rastogi et al. 2007).

Participants felt the need to be cared for whilst experiencing pain and deliberated how it should best be managed (Fielden et al. 2003; Hunt et al. 2009). Some participants were satisfied with the pain relief they received although often felt obliged to take analgesia when

it was offered whether they were in pain or not (Specht et al. 2016). Other participants reported on their fear of pain, particularly in the acute postoperative period (Rastogi et al. 2007): “*I don’t care how much pain relief you’re going to give me- it’s still going to hurt*” (Jacobson et al. 2008, p.59). This thought process was reported influenced by conversing with others that had previously undergone joint replacement (Jacobson et al. 2008). For some there was reluctance to take analgesia through fear of addiction along with the possible side effects such as nausea and constipation (Jacobson et al. 2008; Specht et al. 2016).

Recovering function

Participants had a range of experiences post operatively. On the whole, participants were happy with their functional progress and were motivated to engage in rehabilitation; they looked to the future with optimism (Montin et al. 2002; Fielden et al. 2003; Fujita et al. 2006). Indeed returning to hobbies and activities was something participants looked forward to once they had regained their mobility during the later postoperative stages of rehabilitation (Fielden et al. 2003; Jacobson et al. 2008). However, others believed they would never return to some of their hobbies of their preoperative level and perhaps expectations had been too great (Fujita et al. 2006).

Some participants highlighted the struggles experienced during the postoperative period, specifically pain impacting on mobility (Hunt et al. 2009; Specht et al. 2016). For some, it was the loss of independence and reliance on asking nurses for help, or a burden on family members whilst function was limited (Montin et al. 2002; Rastogi et al. 2007; Jacobson et al. 2008). Other participants felt a sense of neglect from healthcare professionals whilst in hospital which limited their functional recovery (Hunt et al. 2009).

There was some discrepancy between different healthcare professionals regarding the acceptable time frames to resume activities such as driving and returning to employment. This led to concerns for some participants (Fielden et al. 2003; Rastogi et al. 2007). Limited flexion (a frequent precaution for those having undergone hip replacements in order to prevent dislocation of the new joint) proved to be frustrating to accept, whilst those having undergone a total knee replacement had accepted their function may not return to their preoperative level (Fujita et al. 2006; Jacobson et al. 2008).

The challenges of discharge

Specific challenges in relation to discharge were made in six out of seven studies (Montin et al. 2002; Fielden et al. 2003; Fujita et al. 2006; Jacobson et al. 2008; Hunt et al. 2009; Specht et al. 2016). Discharge home was viewed as a daunting prospect, with obstacles and alternative environmental surroundings causing concern (Montin et al. 2002; Jacobson et al. 2008; Hunt et al. 2009). Length of hospital stay varied between studies from one day (Specht et al. 2016) to 21 days (Montin et al. 2002). Although participants looked forward to returning home and resuming a sense of normality, many faced uncertainty having had concerns regarding managing at home, namely the prospect of being alone and contending with pain once discharged (Fielden et al. 2003; Hunt et al. 2009). Understandably, participants were frustrated when discharge was postponed due to lack of synchronisation between health care professionals (Specht et al. 2016).

A period of adjustment took place once home with participants adopting a trial and error approach in order to navigate around their home (Fujita et al. 2006). Some participants felt that everyone's needs were broadly categorised when a more individual approach to discharge may have instilled greater confidence (Fielden et al. 2003). There was awareness of activities which they were not permitted to do, such as driving a car, and relied heavily on written information to guide them in the recovery period (Montin et al. 2002; Fielden et al. 2003). However, others would have liked nurses to have reviewed simple things before discharge (Fielden et al. 2003).

Discussion

Personal experience in the postoperative period following joint replacement is known to be variable (Jonhasson 2005). Many factors contribute to this experience including the level of postoperative pain, participant education and the subjective nature of participants' experiences (Jonhasson 2005). Joint replacement is usually considered when function is declining and other management strategies for coping with discomfort have become less effective. The aim of this qualitative review was to understand the views of participants following their joint replacements with the purpose of improving postoperative care and enhancing preoperative education. In answer to this question, this review has found three key aspects of importance from the participant perspective.

Firstly, from the participant perspective coping with pain was a major challenge postoperatively. This has been reported in the wider literature to be one of the most important problems in the postoperative period (Hanci 2017). The failures around provision of good postoperative analgesia from healthcare professionals is dependent on many factors; such as education of both healthcare professionals and participants, insufficient staffing levels, poor pain assessments carried out by healthcare professionals and fear from participants of side effects related to analgesia (Garimella and Cellini 2013). In this current review participants reported fear of experiencing pain, reluctance to take analgesia due to fear of addiction and other possible side effects. Pain persisting near discharge may be explained by a number of factors, for example culture and ethnicity can affect pain perception as differences occur between individuals' pain expectations and emotional responses- particularly as individuals were apprehensive when preparing to return to different environmental surroundings (Fielden et al. 2003; Cleland et al. 2005). This could explain why some participants appear to have better tolerances to pain and why attitudes towards pain differ. It could also be suggested that this may be the reason as to why some participants were still experiencing pain as they moved out of the acute postoperative period (Montin et al. 2002; Rastogi et al.2007).

These complex individual concerns could all potentially cause disparities between individuals in terms of response to pain (Paller et al. 2009). Achieving participant satisfaction with regard to managing pain in the clinical setting is much more complex and difficult to achieve due to each individuals' experiences and concerns. This illustrates the importance of healthcare professionals awareness of the multiple intrinsic and extrinsic factors that may contribute to participants' perception of pain (Brown 2004). This would support individuals in feeling more understood and thus manage their pain effectively postoperatively

It has been suggested that healthcare professionals should tailor analgesia to the individual and promote participants to self manage their pain (Zhu et al. 2017). However, some healthcare professionals may have received a lack of education in the area of pain management (Fragemann and Wiese 2014) which may explain why some may be better at helping to control participants' pain levels than others. The complex nature of pain and pain management suggests it is difficult to meet all participants' needs in the postoperative period.

Providing greater support in coping with pain based on findings in this current review suggests future preoperative classes should look to include alternative options of analgesia and reassurance surrounding fears of addiction to analgesia as this was important from a participant's perspective. Some explanations on pain have previously tended to focus on the biomedical model of anatomy instead of incorporating pain science and how the nervous system perceives pain (Louw et al. 2013; Moseley et al. 2015). A change in content implemented into educational sessions could help provide patients with an understanding on how pain is processed by the body, allowing informed choices to be made when deciding if they require analgesia, reducing feelings of anxiety (Louw et al. 2013). This could also explain why McDonald et al. failed to find the benefit of preoperative education as the content lacked information on pain science (2014).

The second contribution this review makes with regards to participants' perspectives of their postoperative experience is the challenge around the loss of independence associated with reduced function and mobility. Feelings of helplessness can be associated with increased pain levels and decreased satisfaction when in hospital (Flanigan et al. 2015). Furthermore participant expectations were an important factor in the postoperative period. Expectations varied depending on a participant's preoperative functional status and what activities they aimed to return to (Fujita et al 2006; Jacobson et al. 2008). A proportion of patients post joint replacement are left dissatisfied experiencing some functional disability and may be failing to comprehend their ultimate level of physical function (Wylde et al. 2007). Although most participants are informed preoperatively of what physical ability is likely to be postoperatively, including common precautions (Lee et al. 2017), perhaps the emphasis on this is not enough. In terms of preoperative education, the addition of realistic activities/hobbies individuals are likely to be able to participate in post surgery may help to meet expectations.

Thirdly, some participants found challenges arose associated with discharge and so further preoperative education to overcome these may be beneficial (Fielden et al. 2003; Fujita et al. 2006; Hunt et al. 2009). For example, practical advice for managing alone in their normal surroundings may have helped participants move forward with their rehabilitation more rapidly. Another challenge related to discharge reported by participants was the frustration in regards to the lack of coordination between healthcare professionals (Specht et al. 2016). This could be avoided by all multidisciplinary team members communicating and allowing time to

identify individual needs to support effective discharge planning (Bull and Roberts 2001). In relation to preoperative education participants could be encouraged to inform healthcare professionals of specific needs related to discharge. Not only would this help to individualise their care but also avoid unnecessary frustration for them facilitating the discharge progress.

Follow up care varies post joint replacement (Cott et al. 2016). Using less costly ways of providing follow up care could help participants' progress. For example, a follow up phone call or a support group via social media could help participants seek additional guidance enabling an easier adjustment when home; a feasible method that can increase participants' self-efficacy (Wong et al. 2005). This could contribute to ongoing rehabilitation without largely adding to the workload of healthcare professionals. This is important because participants value care tailored to their individual capabilities, which helps to facilitate physical recovery (Sibbern et al. 2017).

Strengths/ Limitations

A key strength of this review is the fact that it drew on detailed qualitative experiences of participants who had undergone surgery. This allowed greater depth providing further insight into the participant experience. However, a weakness in the search terms is acknowledged. A broader range of search terms could have been used particularly alternative synonyms for 'postoperative' to ensure all relevant studies were identified. Inclusion criteria were limited to English language which may have led to the exclusion of some relevant studies.

A strength of the studies is the use of interviews to gain the data with three of the studies choosing to focus on using open questions in order to gain in depth data (Fielden et al. 2003; Hunt et al. 2008; Specht et al. 2016). Two main limitations of the included studies are noted. All took place in economically developed countries which limits the generalisability of the findings. One of the studies linked the findings to the International Classification of Functioning, Disability and Health (Rastogi et al. 2007) which was less comparable to the other studies findings.

Conclusion

The qualitative studies included in this review offer a greater understanding of participant views following joint replacement. Whilst it is recognised that individual participants' experiences are subjective in nature, there are common themes that occur throughout the

process. Although there are future suggestions for improved pre-operative education perhaps it is not the only solution for addressing challenges that occur and additionally there is debate of the benefits of current preoperative education. Utilising these suggestions by either implementing them into preoperative sessions or by providing alternative support mechanisms postoperatively could help patients feel further assured whilst undergoing joint replacement (Bull and Roberts 2001; Brown 2004; Wong et al. 2005).

Future research should focus on clarifying the effect of a well constructed and well-delivered pre-operative education sessions particularly with regards to pain. The consideration of alternative follow up systems for patients such as the use of postoperative telephone calls or social media to support patients post discharge would also warrant investigation. The cost effectiveness of these different modalities would need to be considered but in turn would allow further improvements for patients.

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Appendix 1

Critical appraisal of papers:

| | Montin et al. 2002 | Fielden et al. 2003 | Fujita et al. 2006 | Rastogi et al. 2007 | Jacobson et al. 2008 | Hunt et al. 2009 | Specht et al. 2016 |
|--|-----------------------|------------------------|--------------------|------------------------|-------------------------|------------------|-----------------------|
| Was there a clear statement of the aims of the research? | Y | Y | Y | Y | Y | Y | Y |
| Is a qualitative methodology appropriate? | Y | Y | Y | Y | Y | Y | Y |
| Was the research design appropriate to address the aims of the research? | Y | Y | Y | U | Y | Y | Y |
| Was the recruitment strategy appropriate to the aims of the research? | Y | Y | Y | Y | U | Y | U |
| Was the data collected in a way that addressed the research issue? | Y | Y | Y | Y | Y | U | Y |
| Has the relationship between | U | U | Y | U | Y | U | U |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| researcher and participants been adequately considered? | | | | | | | |
| Have ethical issues been taken into consideration? | Y | Y | N | Y | Y | U | Y |
| Was the data analysis sufficiently rigorous? | Y | Y | U | Y | Y | U | Y |
| Is there a clear statement of findings? | Y | Y | Y | U | Y | Y | U |
| How valuable is the research? | Y | Y | U | U | U | U | Y |

Key: Y- Yes N- no U- unable to ascertain