Content and delivery of pre-operative interventions for patients undergoing total knee replacement: a rapid review

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Abstract

Background:

Total knee replacement (TKR) is a common operation typically performed for end-stage knee osteoarthritis. Patients awaiting TKR often have poor health-related quality of life. Approximately 20% of patients experience persistent pain post-TKR. Pre-operative TKR interventions could improve pre- and post-operative outcomes, but future research is required to inform their design. This review aimed to identify and synthesize recent literature on the content and delivery of pre-operative TKR interventions to help guide future research and clinical practice.

Methods:

This rapid review included randomized trials of pre-operative TKR interventions (*'outcomes studies'*) and primary studies exploring patients' and/or health professionals' views of pre-operative TKR interventions (*'views studies'*). Medline, Embase, PsycINFO, CINAHL and the Cochrane Central Register of Controlled Trials were searched for English language studies published between January 2009 and December 2020. Eligible studies' reference lists were screened. Studies were appraised using the Mixed Methods Appraisal Tool. The findings were narratively synthesized using a convergent segregated approach.

Results:

From 3263 records identified, 52 studies were included (29 outcomes studies, 21 views studies, two outcomes/views studies). The studies' methodological quality varied but was generally highest in qualitative studies. The outcomes studies investigated education (n=5), exercise (n=20), psychological (n=2), lifestyle (n=1) and/or other interventions (n=5). The views studies addressed education (n=20),

exercise (n=3), psychological (n=1), lifestyle (n=4) and/or other interventions (n=1). Only three outcomes studies (two randomized controlled trials (RCTs) and a pilot study) compared the effectiveness of intervention components/delivery approaches. The two RCTs' results suggest that pre-operative TKR exercise interventions are equally effective regardless of whether they include strength or strength plus balance training and whether they are hospital- or home-based. Personal tailoring and using more than one delivery format were associated with improved outcomes and/or perceived as beneficial for multiple intervention types.

Conclusions:

Definitive evidence on the optimal design of pre-operative TKR interventions is lacking. Personal tailoring and employing multiple delivery formats appear to be valuable design elements. Preliminary evidence suggests that including balance training and hospital versus home delivery may not be critical design elements for pre-operative TKR exercise interventions.

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Key words

Total knee replacement; Total knee arthroplasty; Pre-operative care; Education; Prehabilitation; Exercise; Rapid review

Background

Total knee replacement (TKR) is a common elective operation typically performed in older people with end-stage knee osteoarthritis (OA) (1). Internationally the demand for TKR has risen dramatically over the past two decades due to factors such as ageing populations and rising obesity levels (2-4). The COVID-19 pandemic has limited the capacity of services to meet this high demand. For example, approximately 97,000 TKR procedures were performed annually in the UK between 2016 and 2019, compared to approximately 45,000 in 2020 (5). This has created a large backlog of patients awaiting TKR (6). Correspondingly, estimates suggest TKR waiting times will continue to be at least six months longer than before the pandemic unless service provision is increased above pre-pandemic levels (6).

Long waiting times can profoundly affect patients. A cross-sectional study undertaken in 2020 found almost a quarter of patients awaiting TKR were in a health state *'worse than death'* (7: p.673). Furthermore, the study identified a direct correlation between increasing waiting times and deteriorating health-related quality of life (7). Pre-pandemic studies have also demonstrated that patients awaiting TKR experience high and deteriorating levels of pain and functional limitations (8, 9). These issues are particularly concerning because worse pre-operative pain and function are associated with poor outcomes following TKR (10, 11). Poor TKR outcomes are a frequent problem, with estimates suggesting approximately 20% of patients experience persistent pain post-TKR (12).

By addressing modifiable predictors of poor TKR outcomes, pre-operative TKR interventions could help improve patient outcomes both pre- and post-operatively (13). Pre-operative interventions often focus on prehabilitation – the process of improving patients' pre-operative health and well-being to help them withstand the stresses of surgery and optimize their post-operative recovery (14, 15). Prehabilitation programs can include multiple intervention types, such as exercise, psychological interventions and health promotion (14, 15). Education is another key type of pre-operative TKR intervention, which facilitates patients' preparations for surgery and helps ensure that they have realistic outcome expectations (16, 17).

Although pre-operative TKR interventions offer many potential benefits, there are significant limitations in the evidence base supporting them. For example, a recent overview of reviews demonstrated that pre-operative exercise interventions for patients undergoing total joint replacement reduce length of hospital stay (18). However, it was unable to establish whether the interventions improved any pre-operative outcomes, as none of the included reviews evaluated outcomes immediately post-intervention. Furthermore, most previous reviews of pre-operative TKR interventions have focused on evaluating intervention effectiveness. The few that have focused on intervention content and delivery have been limited to specific intervention types and/or study designs. For example, Louw et al. (19) reviewed the content and delivery of pre-operative education but only included four TKR studies, all of which were RCTs.

Reviewing evidence on intervention effectiveness and stakeholders' perspectives is valuable for informing intervention development (20). Correspondingly, a

comprehensive review addressing the above gap in existing literature could help inform the development of pre-operative TKR interventions for future research and clinical practice.

This review aimed to identify and synthesize recent literature on the content and delivery of pre-operative TKR interventions. Its objectives were:

1. To identify what pre-operative TKR intervention components and delivery approaches are associated with improved outcomes amongst patients undergoing TKR.
2. To explore the experiences and perspectives of patients wait-listed for TKR, and their health professionals, on pre-operative TKR intervention components and delivery approaches.

This review formed part of the first phase of a mixed methods project aimed at developing a pre-operative education and prehabilitation digital intervention for patients listed for TKR. A key purpose of the review within the project was to inform an online modified Delphi study aimed at developing recommendations on pre-operative TKR education and prehabilitation (21).

Methods

The review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline (22) (see Additional File 1 for completed PRISMA checklist). The review was registered with the International

Prospective Register of Systematic Reviews (PROSPERO) on 3rd September 2019 (CRD42019143248). The review protocol is available from the corresponding author. A Project Advisory Group, comprising an independent chair, four reviewers (AMA, ACR, CC, GAM), two patient representatives and a key collaborator, oversaw the review.

Rapid review methodology was adopted for the following reasons.

- The purpose of this review was to provide an overview of pre-operative TKR intervention components and delivery approaches, rather than definitive evidence about their effectiveness.
- Rapid reviews are considered acceptable for informing intervention development (20).
- Rapid reviews generally produce similar conclusions to systematic reviews (23).
- The review had to be completed in a defined period of time because its findings were required to inform the online modified Delphi study mentioned above (21).

Preliminary literature searches suggested that studies with varying designs would be relevant to the review's aim. Furthermore, the review had two complementary objectives that address different aspects of the same phenomenon. A mixed methods convergent segregated design was therefore employed (24). The review was informed by:

- SelecTing Approaches for Rapid Reviews (STARR) decision tool (25)

- World Health Organization rapid review guidance (26)
- Joanna Briggs Institute (JBI) mixed methods review guidance (24)

Eligibility criteria

Mixed methods reviews are often described as including quantitative and qualitative components (24). For the purpose of this review, the terms *'outcomes studies'* and *'views studies'* were chosen because studies of various designs can provide valuable information about peoples' experiences/perspectives (27, 28). Studies meeting the eligibility criteria specified in Table 1 were included.

Table 1: Eligibility criteria

Only studies published from January 2009 onward were eligible because limiting a review's scope by date is an accepted streamlining approach for rapid reviews (25, 26). In addition, the specific start date chosen (2009) helped to ensure that the findings are relevant to current healthcare contexts. This was considered important because TKR enhanced recovery programs have become increasingly widespread since 2009. For example, the UK Department of Health implemented an Enhanced Recovery Partnership Program between 2009 and 2011 (29) and Denmark introduced a national enhanced recovery protocol for hip and knee replacements in 2009 (30). Enhanced recovery programs affect multiple aspects of TKR pathways and have contributed to dramatic reductions in TKR length of hospital stay (30). Short hospital stays mean it is particularly important that patients receive adequate pre-operative support to prepare for their discharge in advance (31).

The protocol specified that views studies would be eligible if they explored participants' experiences and/or perspectives of at least one pre-operative TKR intervention. During the study selection process, it was decided to only include studies exploring participants' experiences and/or perspectives of at least one pre-operative intervention component or delivery approach to ensure that all the included studies were directly relevant to the study aim.

Search strategy

The following electronic databases were searched on 11th September 2019: Medline (Ovid), Embase (Ovid), PsycINFO (Ovid), CINAHL (EBSCOhost) and the Cochrane Central Register of Controlled Trials (Cochrane Library). All the searches were subsequently updated to 31st December 2020. The searches were conducted by one reviewer (AMA) using subject headings and text words related to TKR, the pre-operative phase and relevant interventions (see Additional File 2 for full search strategies). All searches were limited to human studies published between January 2009 and December 2020. Searches were also limited to studies published in the English language where possible. Reference lists of all eligible studies were screened. In line with accepted rapid review streamlining approaches, grey literature was not searched (26).

Study selection

Following removal of duplicates, all records were screened for eligibility based on their title and abstract. Full-text reports of potentially relevant articles were then reviewed to identify studies for final inclusion. One reviewer (AMA) performed both steps. A second reviewer (BTD) verified the study selection for a randomly selected sample of 10% of all full-text reports reviewed. The random selection was made by numbering the reports and using the RANDBETWEEN function of Microsoft Excel 2016. Disagreements were resolved through reconciliation discussions.

Data extraction and appraisal

One reviewer (AMA) extracted data using two standardized data extraction forms, one for outcomes studies and one for views studies. The data extraction forms covered general study information, study characteristics, participant characteristics, intervention overview and details (outcomes studies only) and study findings (see Additional File 3 for data items included in the data extraction forms). The intervention details data items were based on the Template for Intervention Description and Replication (TIDieR) checklist and guide (32). The outcome studies' interventions were classified as one or more of the following intervention types: education, exercise, psychological, lifestyle and other. Interventions that included a brief educational component within a different intervention type were not classed as education. The term *'other'* was chosen to provide an inclusive category for any interventions that did not fit the definitions of the specified intervention types. The protocol listed the following examples of other pre-operative TKR interventions: orthotics, nutritional supplements and acupuncture.

To facilitate the data syntheses, outcomes studies were dichotomized into two categories.

1. Studies in which a statistically significant difference in favor of the intervention group was identified for at least one outcome at one or more follow-up time points (alpha=0.05).
2. Studies in which no statistically significant differences in favor of the intervention group were identified for any outcomes at any follow-up time points (alpha=0.05).

The views studies' findings were classified using the same intervention types and data items as the outcomes studies (see Additional File 3). Authors were not contacted to obtain missing data, which is a frequently used streamlining approach in rapid reviews (23).

Coding data about the intervention components and delivery approaches involved some subjective judgements due to the differing terminology and level of detail in the included reports. Furthermore, it was not always clear whether participants' perspectives/experiences reported for views studies related to interventions delivered in the pre-operative phase. In cases of uncertainty, an inclusive approach was adopted to maximize the number of intervention components and delivery approaches identified. The lead reviewer (AMA) completed extensive crosschecking to ensure that the coding was consistent across studies and discussed key uncertainties with other reviewers. In addition, two reviewers (DA, CC) verified the data extraction for a randomly selected sample of 10% of the included studies. The random selection was made by numbering the studies and again using the

RANDBETWEEN function of Microsoft Excel 2016. Disagreements were resolved through reconciliation discussions.

No studies were excluded from the review or syntheses based on their methodological quality to maximize the number of intervention components and delivery approaches identified. Appraisal of the included studies was still undertaken to assist with interpretation of their findings. One reviewer (AMA) conducted the appraisals using the Mixed Methods Appraisal Tool (MMAT) version 2018 (33). The MMAT includes five categories of study designs, each with five methodological quality criteria. All studies were rated using the criteria for the relevant study design(s). Each criterion was rated as *'Yes'* if it was met, *'No'* if it was not met or '*Can't tell'* if insufficient information was available to rate the criterion. This meant that each study received between zero and five *'Yes'* ratings for each applicable MMAT category. Receiving *'Yes'* ratings only implies a study has high methodological quality. In line with the MMAT guidance, no overall scores were calculated. Second reviewers (DA, CC) verified the data extraction for the same randomly selected 10% of studies verified at the data extraction stage.

Data syntheses

Narrative syntheses were used to summarize the data extracted for each intervention type. In line with a convergent segregated design, the outcomes studies and views studies were synthesized separately, then the two separate syntheses were integrated (24). To facilitate the integration, the intervention components and

delivery approaches from all studies investigating the same intervention type were juxtaposed in tables.

Results

A total of 3238 non-duplicate records were identified from the database searches. A further 25 records were identified from hand searching. Fifty-eight reports, covering 52 studies, met the eligibility criteria (Figure 1).

Figure 1: PRISMA flow diagram

Key excluded studies of note were:

- A qualitative study that explored orthopaedic surgeons' and physiotherapists' perceptions of a '*pre-operative'* exercise intervention (34: p.1). Whilst the intervention was described as *'pre-operative'*, it was delivered to potential candidates for TKR rather than patients listed for TKR; hence, it did not meet this review's definition of a pre-operative intervention.
- An RCT that investigated an e-learning tool (35). Intervention group participants received email invitations to access the tool pre- and post-operatively, so the intervention did not meet the criterion of being delivered solely pre-operatively. This RCT did not include any follow-up outcome assessments in the pre-operative phase; therefore, no data about the pre-operative impact of the tool were available.

Outcomes study overview and appraisal

Thirty-one studies met the criteria for an outcomes study. Most of these investigated interventions classified as a single intervention type (n=29). The most commonly investigated intervention type was exercise (n=20). A pilot study involving 20 participants received *'Yes'* ratings for all the MMAT RCT criteria except outcome assessor blinding (36). The MMAT RCT ratings of the other outcomes studies varied, but all received three or fewer *'Yes'* ratings. Table 2 summarizes the included outcomes studies and their MMAT ratings (see Additional File 4 for further details of the outcomes studies' characteristics).

Table 2: Outcomes studies' summaries and Mixed Methods Appraisal Tool ratings

Views study overview and appraisal

Twenty-three studies met the criteria for a views study. Most of these addressed a single intervention type (n=19). The most frequently addressed intervention type was education (n=20). Eleven studies received *'Yes'* ratings only for the MMAT qualitative category. Across all the other MMAT categories, a single study received *'Yes'* ratings only (37). Table 3 summarizes the included views studies and their MMAT ratings (see Additional File 5 for further details of the views studies' characteristics).

Table 3: Views studies' summaries and Mixed Methods Appraisal Tool ratings

Education interventions

Outcomes studies

Five outcomes studies investigated pre-operative education interventions (Table 4).

Table 4: Education intervention components and delivery approaches

In four studies, superior outcomes in the intervention group were identified for the number of physical therapy visits required and time taken to meet inpatient physical therapy discharge criteria (38), expectations/change in expectations on specific topics (39), knowledge/change in knowledge (40, 41), change in specific beliefs (41) and/or pain (40). The commonest education topics covered by these studies' interventions were precautions (e.g. falls prevention), discharge instructions/information, rehabilitation, and returning to daily activities. The commonest overall delivery approach involved using more than one format with a single session delivered by a nurse or physical therapist.

The study by Wilson et al. (42) did not identify any superior outcomes in the intervention group. This study's intervention focused predominantly on pain management and was delivered using a booklet, individual teaching session and follow-up telephone call by the principal investigator (PI).

Views studies

Twenty views studies reported participants' views of pre-operative education intervention components and/or delivery approaches (Table 4). Key findings included the following.

1. Value of comprehensive pre-operative education

   Patients and health professionals emphasized the value of multiple education topics. The most frequently mentioned were rehabilitation (n=9) and recovery expectations (n=7). Despite the apparent value of comprehensive education, health professionals highlighted that receiving a large volume of information could be difficult for patients to process (43) or result in *'information fatigue'* (44: p.187).

2. Importance of appropriate pre-operative education delivery

   The approaches used to deliver pre-operative education appeared to influence its value. For example, patients had difficulties remembering information provided straight after deciding to undergo surgery (45). Positives and negatives were highlighted for specific delivery approaches. For example, both patients and health professionals highlighted benefits of group sessions, including the opportunity to interact with peers (45-48). Conversely, hearing peers discussing serious complications could be frightening for patients (47). Employing multiple delivery formats was suggested to help account for patients' varying needs (48).

3. Insufficiencies in pre-operative education

   Patients highlighted insufficiencies in certain education topics, such as rehabilitation (49, 50), recovery expectations (46, 49, 50) and return to work (51). Furthermore, some patients felt that the pre-operative education they received was insufficiently tailored to their individual needs (50, 51).

Integration of the outcomes studies and views studies

Table 4 juxtaposes the education intervention components and delivery approaches identified in the outcomes studies and views studies. Of all the intervention components identified, 55% were noted in both study types. Contrastingly, only 29% of the delivery approaches were noted in both study types. The latter is partly attributable to the large number of delivery approaches identified in the views study by Causey-Upton et al. (48, 52).

The integration highlights factors that may have contributed to the lack of intervention benefits identified by Wilson et al. (42). For example, the intervention covered pain management, asking for antiemetics and preventing dehydration, rather than a comprehensive range of topics. In contrast, three of the four RCTs that identified superior outcomes in the intervention group investigated interventions covering at least six topics (38, 39, 41). Furthermore, all three of these interventions covered rehabilitation, the most frequently mentioned topic in the views studies.

Exercise interventions

Outcomes studies

Twenty outcomes studies investigated pre-operative exercise interventions (Table 5).

Table 5: Exercise intervention components and delivery approaches

Sixteen studies identified superior outcomes in the intervention group(s) for at least one of the following: patient-reported outcomes (36, 53-65), performance-based outcomes (54, 56-60, 62-70) and length of hospital stay (54, 68). Most of these studies employed more than one exercise type (n=14). The most commonly employed exercise type was lower limb strengthening/resistance exercises (n=14). Commonly employed delivery approaches included using more than one delivery format (n=11) and personal tailoring (n=10).

Three studies involved a control arm and two intervention arms, allowing different exercise types/delivery approaches to be compared (60-62). Blasco et al. (60) conducted an RCT in which the intervention groups participated in a hospital- or home-based strength and balance training intervention. In another RCT performed by the same research group (62), the intervention groups participated in strength training only or strength and balance training. Doiron-Cadrin et al. (61) conducted a pilot study in which the intervention groups participated in a multicomponent exercise program delivered in-person or via an internet-based telecommunication mobile application. All three studies identified superior outcomes in the intervention group

for at least one outcome, but did not identify any significant differences between the two intervention groups at any follow-up time point.

The remaining four studies of exercise interventions did not identify any superior outcomes in favor of the intervention group (71-74). Two of these (Brown et al. (71) and Huber et al. (72)) investigated interventions that were similar to those investigated in studies that identified a significant between-group difference in favor of the intervention group for at least one outcome (Brown et al. (53) and Villadsen et al. (59, 65) respectively).

Views studies

Three views studies reported participants' views of pre-operative exercise intervention components and/or delivery approaches (Table 5). In a consensus development study by Westby et al. (37), a proposed quality indicator (QI) states that patients undergoing TKR should commence an individually tailored, progressive exercise program at least eight weeks pre-operatively and lists specific exercise components that should be included. Bin Sheeha et al. (75) conducted a qualitative study in which two participants reported that they valued receiving pre-operative exercise guidance from a physiotherapist. Conversely, three participants did not recommend pre-operative physiotherapy because they did not find it helpful or felt that the same exercises could be obtained online (75). In a qualitative study by Sharif et al. (76), health professionals identified that web-based written information, mobile health and remote monitoring technologies could play a role in pre-operative exercise provision, encouragement and/or monitoring.

Integration of the outcomes studies and views studies

Table 5 juxtaposes the exercise intervention components and delivery approaches identified in the outcomes studies and views studies. In line with the exercise QI proposed by Westby et al. (37), 10 outcomes studies employed an individually tailored, progressive exercise program. Seven of these identified superior outcomes in the intervention group. Except for gait training, all the exercise intervention components recommended by Westby et al. (37) were included in the interventions of at least one outcomes study.

A key area of dissonance was the exercise program timing/duration. The QI proposed by Westby et al. (37) states that patients should commence an exercise program at least eight weeks pre-operatively (37). In contrast, 13 outcomes studies involved programs that did not last at least eight weeks, 11 of which identified superior outcomes in the intervention group.

Psychological interventions

Outcomes studies

Two outcomes studies investigated pre-operative psychological interventions (Table 6).

Table 6: Psychological intervention components and delivery approaches

Medina-Garzón (77) conducted an RCT investigating a nursing intervention based on motivational interviewing. The anxiety scores at four weeks post-intervention were significantly lower in the intervention group compared to the control group (77). Das Nair et al. (78) conducted a mixed methods feasibility study investigating a cognitive behavioral therapy (CBT)-based intervention. The only significant between-group difference was better patient-reported function at six months post-randomization in the intervention group, which Das Nair et al. (78) suggested was probably a chance finding arising from multiple comparisons.

Views studies

The aforementioned study by das Nair et al. (78) was the only views study that focused on a pre-operative psychological intervention (Table 6). Most participants reported finding the intervention beneficial, although some participants did not understand the intervention's rationale and felt it had limited value. Participants attributed the benefits to various factors including specific intervention techniques and personal tailoring of the intervention. Participants' views of the optimal setting and delivery format varied, with positives/negatives of hospital- versus home-based and group versus individual sessions being noted (78).

Integration of the outcomes studies and views study

Table 6 juxtaposes the psychological intervention components and delivery approaches identified in both studies of psychological interventions. The main area of agreement was that the interventions evaluated by Medina-Garzón (77) and Das Nair et al. (78) were tailored to patients' individual needs and participants in the qualitative component of Das Nair et al. (78) reported that they valued the personal tailoring.

Lifestyle interventions

Outcomes studies

Only one outcomes study investigated a pre-operative lifestyle intervention (Table 7).

Table 7: Lifestyle intervention components and delivery approaches

Rittharomya et al. (63) conducted an RCT investigating an exercise and dietary intervention. Superior outcomes in the intervention group were identified for patient-reported and performance-based outcomes during the 12-week program. Participants were not followed-up beyond the end of the program.

Views studies

Four views studies reported participants' views of pre-operative lifestyle intervention components or delivery approaches (Table 7). A QI proposed by Westby et al. (37)

states patients with a body mass index of 27 kg/m² or over should be given weight management information and referred to a weight management program (37). In a consensus development study by Plenge et al. (79), smoking cessation and alcohol cessation were identified as important elements of pre-operative TKR care.

The remaining two studies were mixed methods pilot and/or feasibility studies that investigated interventions aimed at reducing sedentary behaviour (80) or alcohol consumption (43). The only area of overlap was that both studies reported participants' views of personal tailoring. Patients in the study by Aunger et al. (80) felt their sedentary behavior reduction goals were well suited to their individual circumstances, but most patients still had difficulties attaining their goals. Health professionals in the study by Snowden et al. (43) highlighted that tailoring the alcohol consumption reduction intervention and associated screening to patients' individual needs helped keep their interactions positive.

Integration of the outcomes study and views studies

Table 7 juxtaposes the lifestyle intervention components and delivery approaches identified in the outcomes study and views studies. The most notable finding was that the intervention investigated by Rittharomya et al. (63) included diet control components, corresponding with the weight management QI proposed by Westby et al. (37).

Other pre-operative interventions

Outcomes studies

Five outcomes studies investigated other pre-operative TKR interventions (Table 8).

Table 8: Other pre-operative intervention components and delivery approaches

Superior outcomes in the intervention group were identified for cognitive function in an RCT investigating electroacupuncture (81) and the chair rise test and stair climb test in a pilot study investigating neuromuscular electrical stimulation (NMES) (82). No significant between group differences in favor of the intervention group were reported for RCTs investigating incentive spirometry (83), a dynamic knee extension device (84) and acupuncture plus exercise (74).

Views studies

The aforementioned qualitative study by Bin Sheeha et al. (75) was the only views study that addressed other pre-operative TKR interventions (Table 8). Bin Sheeha et al. (75) reported that two participants found acupuncture helpful before their surgery. However, it was unclear whether participants' views were about acupuncture delivered solely in the pre-operative phase.

Integration of the outcomes studies and views study

Table 8 juxtaposes the intervention components and delivery approaches identified in the outcomes studies and the views study. The only finding of note was that one outcomes study did not identify any significant benefits of an acupuncture plus exercise intervention (74), contrasting with the perceived value of acupuncture reported by Bin Sheeha et al. (75).

Discussion

This rapid review identified and synthesized recent literature on the content and delivery of pre-operative TKR interventions. Most of the 52 included studies focused on education or exercise interventions. Although many of the intervention components and delivery approaches identified were specific to particular intervention types, some similarities across intervention types were identified. Notably, personal tailoring was associated with improved outcomes and/or perceived as beneficial for education, exercise, psychological and lifestyle interventions. This corresponds with the emphasis on person-centered care in health policies (85). Despite this, person-centered TKR care does not appear to be consistently implemented in clinical practice (50, 51, 86).

Only three included studies compared the effectiveness of different intervention components or delivery approaches (60-62). The result of two RCTs suggest pre-operative TKR exercise programs are equally effective regardless of whether they include strength training only or strength plus balance training (62) and whether they are hospital or home-based (60). A pilot RCT provided preliminary evidence that a pre-operative TKR exercise program has similar effects when it is delivered in-

609 person or via telecommunication software (61). However, a fully-powered RCT is
610 required to confirm this. These findings correspond with a Cochrane systematic
611 review, which identified that the benefits of exercise programs for people with OA are
612 not limited to specific exercise types or delivery modes (87).
613
614 The findings of the present review suggest that pre-operative TKR education should
615 cover a comprehensive range of topics. Thirty-two topics were identified, of which
616 rehabilitation and recovery expectations appear particularly important (Table 4).
617 Despite this, some patients perceived education on these topics as insufficient. This
618 review's findings also demonstrate the importance of optimizing pre-operative
619 education delivery. Both positives and negatives were identified for certain education
620 delivery approaches, such as group classes. Using a combination of delivery formats
621 could help overcome the limitations of individual formats and account for patients'
622 differing needs (48). Correspondingly, employing more than one delivery format was
623 associated with improved outcomes for education interventions, exercise
624 interventions, a combined diet and exercise intervention and a NMES intervention.
625
626 *Relationship to previous reviews*
627
628 This review provides a more comprehensive overview of pre-operative TKR
629 education intervention components and delivery approaches than the
630 aforementioned review by Louw et al. (19). For example, none of the four TKR RCTs
631 included by Louw et al. (22) employed videos, web-based or virtual reality delivery
632 formats, all of which were identified in this review. A review by Buus et al. (16)
633 highlighted patients value receiving pre-operative information before knee

replacement and noted inadequacies in its content and delivery. The present review expands on this by also exploring health professionals' views of pre-operative TKR education. Previous reviews have suggested that definitive evidence on the optimal content and delivery of pre-operative TKR exercise interventions is lacking (88, 89). The present review supports this and provides information to help guide future research by summarizing the pre-operative TKR exercise intervention components and delivery approaches extracted from 23 studies (Table 5).

Strengths and limitations

A key strength of this review is its breadth, with all types of non-pharmacological pre-operative TKR interventions being considered. The mixed methods design enabled a more in-depth insight to be gained than would have been achieved through a purely quantitative or qualitative design (90). Systematic approaches were used during all stages of the review. However, the rapid review methodology involved streamlining various aspects of standard systematic review methods. For example, the searches were limited to electronic databases and reference lists of eligible studies, increasing the likelihood that relevant studies may have been missed (91).

Outcomes studies were dichotomized based on whether they identified a statistically significant difference in favor of the intervention group for at least one outcome. This was considered appropriate given that the review aimed to provide an overview of intervention components and delivery approaches rather than definitive evidence about their effectiveness. However, it involved relying on an arbitrary threshold (alpha=0.05) and statistically significant improvements are not necessarily clinically

relevant (92). This is an important limitation because previous research has suggested that the effects of pre-operative TKR interventions may not be large enough to be clinically important (93).

No primary study authors were contacted despite the intervention reporting of some studies being poor. Consequently, relevant information about intervention components and delivery approaches may have been missed. Where possible, the primary study authors' terminology was used to describe intervention components and delivery approaches. This led to some inconsistency in the coding. For example, stretches were considered part of the cool-down in some studies but listed separately in others. This review's findings also need to be interpreted in light of the limitations of the included studies. The MMAT ratings suggested that most of the included qualitative studies are high quality, whereas all the other included studies present at least some quality issues.

Implications for clinical practice and future research

A key implication of this review for clinical practice and future research is that personal tailoring and employing more than one delivery format appear to be valuable design elements for most pre-operative TKR intervention types. In addition, this review identified preliminary evidence that including balance training and hospital versus home delivery are not essential design elements for pre-operative TKR exercise interventions. The latter is particularly relevant due to the lower costs associated with home-based programs. Furthermore, the COVID-19 pandemic has highlighted the need for remote models of care (94, 95). Using digital tools to deliver

TKR care remotely offers multiple potential benefits, such as improved service efficiency and greater patient engagement (76, 94). Conversely, this review identified few studies that investigated the effectiveness of digital tools. This review also identified a paucity of studies focused on pre-operative psychological or lifestyle interventions, despite the negative impact of psychological distress and unhealthy lifestyle behaviors on TKR outcomes (96, 97). This highlights the need for future research investigating pre-operative TKR interventions that incorporate digital tools, provide psychological support and/or address lifestyle behaviors.

Another clinically relevant finding is that some patients perceive pre-operative TKR education as insufficient. Potential strategies for addressing this include covering a comprehensive range of topics and ensuring that rehabilitation and recovery expectations are adequately addressed. The detailed tables of intervention components and delivery approaches developed in this review provide a resource for informing the design of pre-operative TKR interventions for clinical practice and future research (Tables 4-8). In particular, the intervention components and delivery approaches identified in multiple supposedly effective interventions warrant further investigation (98). Other important aspects to address are the areas of dissonance between the outcomes studies and views studies, such as the exercise program duration.

Conclusions

This review comprehensively synthesized literature on the content and delivery of pre-operative TKR interventions. The findings demonstrate that definitive evidence to

guide the design of pre-operative TKR interventions is lacking. Personal tailoring and employing more than one delivery format appear to be valuable design elements for most pre-operative TKR intervention types. Preliminary evidence was identified that suggests including balance training and hospital versus home delivery are not critical design elements for pre-operative TKR exercise interventions. Another key finding was that covering a comprehensive range of education topics, including rehabilitation and recovery expectations, could help address the insufficiencies in pre-operative TKR education perceived by some patients.

List of abbreviations

MMAT: Mixed Methods Appraisal Tool

NMES: Neuromuscular electrical stimulation

OA: Osteoarthritis

PI: Principal investigator

QI: Quality indicator

THR: Total hip replacement

TKR: Total knee replacement

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

AMA: study conception, study design, data acquisition, data analysis, data interpretation and drafting the manuscript. BTD: study design and data interpretation. DA: study design and data interpretation. ACR: study conception and study design. CC: study conception, study design and data interpretation. TOS: study design. GAM: study conception, study design and data interpretation. All authors contributed to revising the manuscript and read and approved the final manuscript.

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Figure Legends

Figure 1: PRISMA flow diagram

Pre-op pre-operative

Tables

Table 1: Eligibility criteria

	Outcomes studies	Views studies
Studies	Randomized trial (involve individual or cluster randomized allocation) Published as a full text in English between January 2009 and December 2020	Primary study of any design Published as a full text in English between January 2009 and December 2020
Participants[a]	Adults (aged ≥18 years) listed for primary TKR surgery[b]	Adults (aged ≥18 years) with experience of TKR care as: - A patient who is listed for and/or has undergone primary TKR surgery[b] - A health professional with experience of any phase of the primary TKR pathway e.g. nurses, physiotherapists etc.
Interventions/ comparator/ outcomes/ phenomena of interest	Include an intervention group that received a non-pharmacological pre-operative TKR intervention[c] Include at least one comparator group that received no pre-operative TKR interventions, standard care and/or an alternative pre-operative TKR intervention Assess at least one patient outcome (including patient-reported outcomes, objectively measured clinical outcomes, patient healthcare utilization and patient harms)	Explore participants' experiences and/or perspectives of at least one non-pharmacological pre-operative TKR intervention component or delivery approach[c] (Studies providing purely descriptive accounts of non-pharmacological pre-operative interventions components and delivery approaches were excluded)
Context	No limitations	No limitations

TKR total knee replacement

[a] Studies with mixed samples were only included if they reported at least one relevant finding separately for participants who met the criteria specified, and/or at least 80% of participants met the criteria specified (99)

[b] No limitations regarding patients' indication for TKR were applied

[c] Pre-operative TKR interventions were defined as interventions delivered solely in the pre-operative phase of the TKR pathway (the period between when a patient is listed for TKR surgery and the day they are admitted to hospital to undergo surgery (37)). Studies investigating an intervention delivered during more than one phase of the TKR pathway were excluded.

Table 2: Outcomes studies' summaries and Mixed Methods Appraisal Tool ratings

Study summary			Mixed Methods Appraisal Tool Ratings: Quantitative Randomized Controlled Trials[b]				
Citation, country	**Intervention type**	**Design[a]**	**Random allocation appropriately performed**	**Groups comparable at baseline**	**Complete outcome data**	**Outcome assessors blinded**	**Participants adhered to assigned intervention**
Bergin et al., 2014 (83), USA	Other: Incentive spirometry	RCT	?	?	N	N	?
Blasco et al., 2020 (60), Spain	Exercise	Three-arm RCT	Y	Y	?	N	?
Brown et al., 2012 (53), USA	Exercise	Pilot study	?	?	N	N	Y
Brown et al., 2014 (71), USA	Exercise	RCT	Y	Y	N	N	?
Calatayud et al., 2017 (54), Casaña et al., 2019 (66), Spain	Exercise	RCT	Y	Y	Y	N	?
das Nair et al., 2018 (78)[c], UK	Psychological	Mixed methods feasibility study	Y	Y	N	N	N
Doiron-Cadrin et al., 2019 (61), Canada	Exercise	Three-arm pilot study	Y	?	Y	N	?
Domínguez-Navarro et al., 2020 (62), Spain	Exercise	Three-arm RCT	Y	Y	N	N	Y

Eschalier et al., 2017 (41), France	Education	RCT	?	Y	Y	N	Y
Gränicher et al., 2020 (36), Switzerland	Exercise	Pilot study	Y	Y	Y	N	Y
Gstoettner et al., 2011 (67), Austria	Exercise	RCT	Y	Y	Y	N	?
Huber et al., 2015a (72), Switzerland	Exercise	RCT	Y	Y	N	N	Y
Jahic et al., 2018 (55), Bosnia and Herzegovina	Exercise	RCT	?	Y	?	N	?
Leal-Blanquet et al., 2013 (39), Spain	Education	RCT	?	Y	Y	N	?
Lin et al., 2019 (40), China	Education	RCT	?	Y	Y	N	?
Matassi et al., 2014 (68), Belgium	Exercise	RCT	?	Y	Y	N	Y
McKay et al., 2012 (73), Canada	Exercise	Pilot study	Y	Y	N	N	Y
Medina-Garzón, 2019 (77), Colombia	Psychological	RCT	?	Y	Y	N	?
Rittharomya et al., 2020 (63), Thailand	Exercise Lifestyle	RCT	?	Y	Y	N	?
Skoffer et al., 2016 (56), 2020 (70), Denmark	Exercise	RCT	Y	Y	N	N	Y
Soeters et al., 2018 (38), USA	Education	RCT	?	Y	?	N	Y
Soni et al., 2012 (74), UK	Exercise Other: Acupuncture	RCT	Y	Y	N	N	?
Stone et al., 2020 (84), USA	Other: Dynamic knee extension device	RCT	?	Y	Y	N	?
Swank et al., 2011 (69), USA	Exercise	RCT	?	Y	Y	N	Y
Topp et al., 2009 (57), USA	Exercise	RCT	?	Y	Y	N	?

Tungtrongjit et al., 2012 (58), Thailand	Exercise	RCT	?	Y	?	N	?
Villadsen et al., 2014a (59), 2014b (65), Denmark	Exercise	RCT	Y	Y	?	N	?
Walls et al., 2010 (82), Ireland	Other: NMES	Pilot study	?	?	N	N	Y
Wang et al., 2020 (64), China	Exercise	RCT	?	?	?	N	?
Wilson et al., 2016 (42), Canada	Education	RCT	Y	Y	N	N	?
Zhao et al., 2018 (81), China	Other: Electro-acupuncture	RCT	Y	Y	Y	N	?

N no, *NMES* neuromuscular electrical stimulation, *RCT* randomized controlled trial, *UK* United Kingdom, *USA* United States of America, *Y* yes, *?* can't tell

[a] All studies involved two arms unless otherwise stated.

[b] For studies with mixed populations, ratings were made specifically for participants listed for total knee replacement.

[c] das Nair et al. (2018) was also appraised using the qualitative and mixed methods categories of the Mixed Methods Appraisal Tool (all ratings reported in Table 3).

1172 **Table 3: Views studies' summaries and Mixed Methods Appraisal Tool ratings**

Study summary			Mixed Methods Appraisal Tool Ratings: Qualitative[b]				
Citation, country	**Intervention type**	**Design[a]**	**Qualitative approach appropriate**	**Data collection methods adequate**	**Findings adequately derived from data**	**Interpretation sufficiently substantiated by data**	**Coherence between data sources, collection, analysis and interpretation**
Aunger et al., 2020 (80), UK	Lifestyle	Mixed methods feasibility study (ratings for qualitative descriptive component with data collection via participants' sedentary behavior booklets and feasibility questionnaires)	Y	N	?	Y	Y
Bardgett et al., 2016 (51), UK	Education	Qualitative descriptive with data collection via a postal questionnaire	Y	N	Y	Y	Y
Berg et al., 2019 (49), Sweden	Education	Qualitative descriptive with data collection via semi-structured interviews	Y	Y	Y	Y	Y
Bin Sheeha et al., 2020 (75), UK	Education Exercise Other: Acupuncture	Phenomenological with data collection via a single focus group	Y	Y	Y	Y	Y
Causey-Upton and Howell, 2017 (100), USA	Education	Transcendental phenomenological with data collection via semi-structured interviews	Y	Y	Y	Y	Y
Causey-Upton et al., 2020b (48), USA	Education	Explanatory sequential mixed methods (ratings for qualitative descriptive component with data	Y	Y	Y	Y	Y

		collection via semi-structured interviews)					
das Nair et al., 2018 (78), UK	Psychological	Mixed methods feasibility study (ratings for qualitative component with data collection via semi-structured interviews)	Y	Y	Y	Y	Y
Drew et al., 2019 (101), Judge et al., 2020 (46), UK	Education	Ethnography with data collection via observations/job shadowing and semi-structured interviews	Y	Y	Y	?	Y
Goldsmith et al., 2017(50)[c], Canada	Education	Qualitative descriptive component of a mixed methods prospective cohort study with data collection via semi-structured interviews	Y	Y	Y	Y	Y
Høvik et al., 2017 (47), Norway	Education	Qualitative descriptive with data collection via focus groups	Y	Y	Y	Y	Y
Lucas et el., 2013a (102) , 2013b (103), UK	Education	Action research study	Y	Y	Y	Y	Y
Sharif et al., 2020 (76), UK	Education Exercise	Qualitative descriptive with data collection via semi-structured interviews	Y	Y	Y	Y	Y
Smith et al., 2018 (44), USA	Education	Qualitative descriptive with data collection via open-ended, structured interviews	Y	N	?	?	N
Snowden et al., 2020 (43), UK	Lifestyle Education (education	Mixed methods involving a non-randomized feasibility study followed by a pilot	Y	Y	Y	Y	Y

	addressed briefly in the feasibility study qualitative component)	study (ratings for qualitative descriptive components of the feasibility study and pilot study with data collection via focus groups and interviews)					
Specht et al., 2016 (45), Denmark	Education	Phenomenological-hermeneutic with data collection via observations and semi-structured interviews	Y	Y	Y	Y	Y

Study summary			**Mixed Methods Appraisal Tool Ratings: Quantitative Randomized Controlled Trials[b]**				
Citation, country	**Intervention type**	**Design[a]**	**Random allocation appropriately performed**	**Groups comparable at baseline**	**Complete outcome data**	**Outcome assessors blinded**	**Participants adhered to assigned intervention**
Aunger et al., 2020 (80)[d], UK	Lifestyle	Mixed methods feasibility study (ratings for quantitative component)	Y	?	?	N	?
das Nair et al., 2018 (78), UK	Psychological	Mixed methods feasibility study (ratings for quantitative component)	Y	Y	N	N	N
Eschalier et al., 2017 (41), France	Education	RCT	?	Y	Y	N	Y
Snowden et al., 2020 (43)[d], UK	Lifestyle Education	Mixed methods involving a non-randomized feasibility study followed by a pilot study (ratings for quantitative component of pilot study)	Y	?	?	N	Y

Study summary			**Mixed Methods Appraisal Tool Ratings: Quantitative Non-Randomized Studies[b]**				

Citation, country	Intervention type	Design[a]	Participants representative of target population	Measurements appropriate	Complete outcome data	Confounders accounted for	Intervention administered as intended
Snowden et al., 2020 (43), UK	Lifestyle Education	Mixed methods involving a non-randomized feasibility study followed by a pilot study (ratings for quantitative component of feasibility study)	N	Y	Y	Y	Y

Study summary			Mixed Methods Appraisal Tool Ratings: Quantitative Descriptive[b]				
Citation, country	**Intervention type**	**Design[a]**	**Relevance of sampling strategy**	**Sample representative of target population**	**Measurements appropriate**	**Risk of non-response bias low**	**Statistical analysis appropriate**
Barnes et al., 2018 (104), South Africa	Education	Cross-sectional survey with data collection via structured interviews	Y	?	N	?	Y
Causey-Upton et al., 2018 (105), USA	Education	Cross-sectional online 'pilot' survey	N	N	Y	N	Y
Causey-Upton et al., 2020a (52), USA	Education	Explanatory sequential mixed methods (ratings for cross-sectional survey)	Y	?	Y	N	Y
Eschalier et al., 2013 (106), France	Education	Survey embedded within an intervention validation study	?	?	Y	?	Y
Huber et al., 2015b (107), Switzerland	Education	Questionnaire development and psychometric testing embedded within an RCT	?	?	Y	?	Y
Plenge et al., 2018 (79), South Africa	Lifestyle	Delphi study	N	N	Y	?	Y

SooHoo et al., 2011 (108), USA	Education	Modified Delphi study	Y	?	N	?	Y
Snowden et al., 2020 (43), UK	Lifestyle Education	Mixed methods involving a non-randomized feasibility study followed by a pilot study (ratings for the COM-B questionnaire component of the intervention development)	?	?	Y	?	Y
Westby et al., 2018 (37), Canada	Education Exercise Lifestyle	Modified Delphi study	Y	Y	Y	Y	Y

Study summary			**Mixed Methods Appraisal Tool Ratings: Mixed Methods[b]**				
Citation, country	**Intervention type**	**Design[a]**	**Adequate rationale for mixed methods design**	**Different study components effectively integrated**	**Outputs of the integration adequately interpreted**	**Divergences and in-consistencies adequately addressed**	**Different components adhered to corresponding quality criteria**
Aunger et al., 2020 (80), UK	Lifestyle	Mixed methods feasibility study (ratings for overall study)	Y	N	N	Y	N
Causey-Upton et al., 2020a (52), 2020b (48), USA	Education	Explanatory sequential mixed methods (ratings for overall study)	N	N	N	Y	N
das Nair et al., 2018 (78), UK	Psychological	Mixed methods feasibility study (ratings for overall study)	?	Y	Y	Y	N
Snowden et al., 2020 (43), UK	Lifestyle Education	Mixed methods involving a non-randomized feasibility study followed by a pilot study (ratings for overall study)	?	Y	Y	Y	N

COM-B questionnaire Adapted version of the Capability, Opportunity, Motivation and Behavior model self-evaluation questionnaire*;* *N* no; *RCT* randomized controlled trial; *UK* United Kingdom; *USA* United States of America; *Y* yes; *?* can't tell

[a] All RCTs, pilot and feasibility studies involved two arms unless otherwise stated.

[b] For studies with mixed populations, ratings were made specifically for participants who met the review eligibility criteria.

[c] Reported the qualitative component of a mixed methods study, but the quantitative results are not reported in the same article; therefore, the study was appraised using the qualitative category of the Mixed Methods Appraisal Tool only.

[d] Quantitative outcome data were not presented separately for participants undergoing knee replacement; therefore, the study does not meet the criteria for an outcomes study.

1188 **Table 4: Education intervention components and delivery approaches**

Category	Intervention component or delivery approach	Leal-Blanquet et al. (39)[a]	Lin et al. (40)[a]	Soeters et al. (38)[a]	Wilson et al. (42)[b]	Eschalier et al. (41)[a]	Bardgett et al. (51)	Barnes et al. (104)	Berg et al. (49)	Bin Sheeha et al. (75)	Causey-Upton and Howell (100)	Causey-Upton et al. (105)	Causey-Upton et al. (48, 52)	Drew et al. (101) Judge et al.	Eschalier et al. (106)	Goldsmith et al. (50)	Høvik et al. (47)	Huber et al. (107)	Lucas et al. (102, 103)	Sharif et al. (76)	Smith et al. (44)	Snowden et al. (43)	SooHoo et al. (108)	Specht et al. (45)	Westby et al. (37)
Component: Education topic	Knee joint anatomy					O						V	V		V			V							
	Osteoarthritis					O									V										
	Alternative treatment options to TKR					O									V								V		
	Joint replacements in younger people													V[c]											
	Pre-op exercise/purpose of pre-op rehabilitation					O							V												
	Patient active involvement in their own management					O				V															
	Goal setting			O																					
	Obtaining/ using walking aids and other equipment			O									V	V					V						V
	Making home preparations			O		V						V	V	V[c]									V		V
	Arranging social support					V								V[c]											
	Transport												V												V
	What to expect during the hospital stay	O		O		V			V[c]				V												
	TKR surgical procedure			O		OV			V				V		V										V
	Risks of TKR surgery					V			V[c]							V							V		V
	Precautions		O	O	O	O							V		V										

	Pain expectations	O										V			V					V								
	Discharge instructions/what to expect following discharge	O		O		O								V														V
	Recovery expectations			O		O			V			V	V	V[c]		V									V			V
	Pain management		O		O	O							V			V					V							V
	Asking for antiemetics				O																							
	Edema management												V															
	Wound healing												V															
	Rehabilitation	O		O		O			V			V	V	V[c]	V	V		V	V									V
	Alternative and supplementary rehabilitation options															V												
	Addressing sleep difficulties												V															
	Returning to daily activities	O		O		O		V				V	V		V			V										
	Returning to sports					O									V													
	Returning to work					O	V								V													
	Physical activity					O																						
	Nutrition												V															
	Comorbidities												V															
	Other patients' experiences of TKR	O														V												
Component: Activity/ opportunity	Allow participation of a relative or other support									V		V														V[c]		V
	Combination of theory and active participation																	V										
	Asking/addressing questions	O		O	O					V		V				V		V		V					V		V	
	Practicing transfers, stairs, post-op exercises and/or mobilizing with or without aids			O															V									
	Goal setting			O																								
	Documentation of concerns, strategies and questions				O																							
Provider	Multidisciplinary team											V	V															V
	Researcher(s)				O																							

	Orthopaedic surgeon									V		V			V							V						
	Physician assistant											V																	
	Nurse/nurse practitioner	O	O										V						V				V					
	Physical therapist/ physiotherapist			O									V						V									
	Occupational therapist												V						V									
	Case manager											V	V										V					
	Social worker											V	V															
	Previous patients												V						V									
	Pain management provider												V															
	Home healthcare provider												V															
	Dietetics												V															
	Anesthetist												V															
	Pharmacist												V															
	Diabetes educator												V															
	Hospital concierge												V															
	Translator												V															
Delivery mode: Format	Single format					O							V															
	>1 format	O	O	O	O								V										V					
	Individual			O	O								V											V[c]				
	Group												V	V			V							V				
	Face-to-face/visit/session	O	O	O	O									V		V								V	V			
	Verbal												V	V[c]							V			V				
	Booklet/other written paper format		O		O	O	V						V	V	V		V	V					V	V	V			
	Video/DVD	O		O								V	V							V			V		V			
	Website/mobile health/other electronic format			O									V							V			V					
	Virtual reality																			V								
	Telecommunication				O															V					V			
	PowerPoint presentation												V					V										
	Workbook												V															

	Client demonstration or teach back method							V					
	Healthcare provider demonstration							V					
Delivery mode: Delivery with other patients	Delivered separately from education delivered to patients waiting for other orthopaedic surgery						V	V					
	Delivered with patients waiting for other orthopaedic surgery							V		V			
Setting	Pre-op assessment clinic				O							V	
Schedule: Number of sessions (contacts with education providers)	0 sessions							V					
	1 session	O	O	O				V					
	2 sessions				O			V					
	3 sessions							V			V		
	≥5 sessions							V					
Schedule: Timing of delivery	1 day pre-op		O										
	<1 week pre-op				O			V					
	~2 weeks pre-op			O				V					
	3 weeks pre-op							V					
	~4 weeks pre-op	O						V					
	≤4 weeks pre-op				O								
	4-6 weeks pre-op					O							
	6 or ≥8 weeks pre-op							V					
	Immediately after listing for surgery												V
	Far in advance of surgery							V	V[c]				
	Close to surgery							V	V[c]				
	On the same day as other appointments e.g. pre-op assessment or physician appointments	O		O	O	O		V					

Intensity: Duration of sessions (contacts with education providers)	<15, 15-29 or 30-59 min session												V											
	~20-30 min session			O																				
	~45 min session, including watching a 10-min DVD twice	O																						
	1 to <1.5, 1.5 to <2, 2 to <2.5, 2.5 to <3 or >3 hours session												V											
Intensity: Quantity of information	12 page booklet				O																			
	Large volume of information																				V	V		V
Tailoring	Tailored to patient-specific needs/individualised			O	O		V[c]						V			V				V				
	Consistent education for all patients												V											
	Lateralized (right versus left)			O																				
	Tailored to patients undergoing TKR			O																				

DVD audiovisual videodisc, *O* intervention component/delivery approach included in an intervention investigated in an outcomes study, *pre-op* pre-operative, *TKR* total knee replacement, *V* participants' experiences/perspectives of the intervention component/delivery approach reported in a views study

[a] Outcomes study in which a statistically significant difference in favor of the intervention group was identified for at least one outcome at one or more follow-up time points (alpha=0.05)

[b] Outcomes study in which no statistically significant differences in favor of the intervention group were identified for any outcomes at any follow-up time points (alpha=0.05)

[c] Finding is from a study with a mixed population and is not supported with evidence specifically for participants who met the review eligibility criteria

Table 5: Exercise intervention components and delivery approaches

Category	Intervention component or delivery approach	Blasco et al. (60)[a]	Brown et al. (53)[a]	Brown et al. (71)[b]	Calatayud et al. (54)[a] Casaña et al. (66)[a]	Doiron-Cadrin et al. (61)[a]	Domínguez-Navarro et al. (62)[a]	Gränicher et al. (36)[a]	Gstoettner et al. (67)[a]	Huber et al. (72)[b]	Jahic et al. (55)[a]	Matassi et al. (68)[a]	McKay et al. (73)[bc]	Rittharomya et al. (63)[a]	Skoffer et al. (56, 70)[a]	Soni et al. (74)[b]	Swank et al. (69)[a]	Topp et al. (57)[a]	Tungtrongjit et al. (58)[a]	Villadsen et al. (59, 65) [a]	Wang et al. (64)[a]	Bin Sheeha et al. (75)	Sharif et al. (76)	Westby et al. (37)
Component: Exercise type	Single exercise type													O					O					
	>1 exercise type	OH OD	O	O	O	OI OT	OS OB	O	O	O	O	O	O		O	O	O	O		O	O			V
	Warm-up[d]		O	O	O	OI OT	OS OB		O	O			O		O		O	O		O	O			
	Upper body strength exercises		O	O																				V
	Lower limb strength/resistance exercises	OH OD	O	O	O	OI OT	OS OB			O	O	O	O	O[e]	O	O[e]	O	O	O	O	O			V
	Upper limb stretches		O	O																				

	Trunk stretches		O	O																		
	Lower limb stretches/ flexibility training		O	O					O		O		O	O[e]								
	Lower limb joint mobilization/range of movement exercises					OI OT																V
	Lower limb PNF techniques							O														
	Endurance training							O														
	Step training		O	O										O[e]	O	O						
	Proprioceptive/ balance exercises	OH OD			O	OI OT	OB		O					O[e]					O			
	Postural orientation/ functional alignment exercises									O								O				
	Core stability/postural function exercises									O				O[e]				O				
	Functional exercises									O				O[e]				O	O			V
	Gait training, including instruction on using walking aids																					V
	Cool-down[f]		O	O	O		OS OB			O					O	O		O				
Component: Adjunct/ activity	Educational component[g]					OI OT		O					O									V
	Individually indicated interventions[h]							O														
	Walking aid adjustments					OI OT																
	Completion of a log book/calendar	OD	O	O		OI OT					O		O		O	O						
	Documentation of physical activity per training week									O												

	Pain self-monitoring during and after training									O												O				
	Remote monitoring by a professional(s)	OD												O													
	Goal setting			O																				O			
	Behavioral contracting			O																							
	Opportunity to ask questions													O													
	Feedback/praise/ encouragement from professionals			O						O		O	O	O								O					
Provider	Physical therapist/ physiotherapist(s)	OH OD			O	OI OT	OS OB	O	O	O					O	O						O			V		
	Nurses																							O			
	Kinesiologist											O															
	Researcher(s)		O	O							O		O				O	O						O			
Delivery mode	Single format	OH			O		OS OB			O		O			O	O						O					
	>1 format	OD	O	O		OI OT		O	O		O		O				O	O	O					O			
	Supervised sessions	OH	O	O	O	OI	OS OB	O	O	O		O			O	O	O	O				O		O			
	Telecommunication-delivered sessions e.g. via telephone or a web application					OT													O								
	Optional in-person appointment if pain increased					OT																					
	Instruction session (prior to unsupervised sessions)	OD									O																

	Information/ instruction sessions with a poster and DVD (prior to unsupervised sessions)												O									
	Review session (after 2 weeks of unsupervised sessions)	OD																				
	Unsupervised sessions	OD	O	O		OI OT		O	O			O		O				O	O	O			
	Booklet/other written instructions		O	O					O			O						O			O		
	Website/mobile health					OT																V
	Remote monitoring e.g. via telephone calls/mobile applications	OD												O								V
Setting[i]	Home and clinical setting		O	O		OI		O										O					
	Home and unspecified location for supervision																		O				
	Home	OD				OT					O	O		O						O			
	Clinical setting	OH					OS OB								O	O							
	Research facility												O										
Schedule: Session frequency	3 x daily										O									O			
	Daily					OI OT			O														
	5 x weekly											O											
	3 x weekly	OH OD	O	O	O		OS OB						O	O	O						O		

	≥3 x weekly																O	O						
	2 x weekly									O										O				
	5-9 supervised sessions within 3-4 weeks before surgery							O																
	Weekly for 4 weeks, then fortnightly for 4 weeks, then monthly until surgery															O								
Schedule: Program length	3 weeks																		O					
	4 weeks	OH OD					OS OB								O						O			
	4-8 weeks																O							
	4-12 weeks									O														
	6 weeks								O		O	O	O											
	8 weeks		O	O	O															O				
	Start ≥8 weeks before surgery																							V
	12 weeks					OI OT								O										
	Months (rather than days/weeks)																					V		
	Variable depending on time available pre-operatively									O								O						
Intensity: Session duration	~30 min												O											
	30-40 min						OS														O			
	45min								O															
	~50 min		O	O																				
	45-60 min						OB																	
	60 min									O					O					O				
Intensity:	5 min (unweighted leg joint movements or walking)		O	O													O	O						

Warm-up duration	5-10 min (walking)								O															
	10 min (aerobic activities)				O	OI OT	OS OB			O			O		O					O				
	15 min (total duration)				O																			
	Perceived exertion 'somewhat hard' (leg cycling)									O										O				
	2 sets of 20 reps (step-ups, calf raises)				O																			
	5 reps per 'extension'																				O			
Intensity: Strength/ resistance exercises	High intensity				O										O									
	Low to moderate resistance																O							
	Moderately fatiguing		O	O													O							
	'As tolerated'																							V
	1 set of 10 reps (≥6 sec hold per rep)																		O					
	1-2 sets of 10 reps		O	O													O							
	2 sets of 10-12 reps					OI OT																		
	2-3 sets of 10-15 reps									O										O				
	4 sets of 10 reps	OH OD																						
	5-10 sec hold x 30 or 10 sec hold x 10																				O			
	1 warm-up set of 10 reps with light resistance, then 5 sets of 10 reps at 10 RM				O																			
	Maximum 20 reps											O												
	2 sets of 8 reps starting at 60% of 1 RM and increasing by 1-2kg per week as												O											

	tolerated (except for calf raises, which were performed with body weight only)															
	3 sets at 12 RM progressing to 8 RM													O		
	3 sets of 10 reps at 50% 10 RM with/ without progression to 100% RM; or 5 min per exercise					OS OB										
	10-20%, 30-50% or 50-80% of 1 RM						O									
	60-100 daily												O			
Intensity: Flexibility exercises (stretches)	2 sets of 20 sec	O	O													
	3 sets of 20 sec							O								
	3 sets of 30 sec													O		
	4 sets of 30 sec										O					
Intensity: Endurance training	10-45 min at 40-70% maximum HR without pain provocation						O									
Intensity: Step training	1 set of 8 reps, progressing to 1 set of 20 reps per direction	O	O													O
Intensity: Proprioceptive/ balance exercises	30 sec per exercise				OI OT											
	3-4 sets of 30-60 sec per exercise						O									
	4 sets of 15 or 30 sec per exercise			O												
	1 rep, 10-15 reps or 10 sec hold per exercise with eyes open then eyes closed if possible							O								

	2-4 min per exercise	OH OD																				
	5 min per exercise						OB															
Intensity: Function-focused exercises	2-3 sets of 1-15 reps									O									O			
Intensity: Cool down	5 min (unweighted leg joint movements, stretches or walking)		O	O	O											O	O					
	10 min (total duration)									O									O			
	2 sets of 30sec (stretches)						OS OB															
	10 min (ice application)						OS OB															
Intensity: Progression	Progressive	OH OD	O	O		OI OT	OS OB		O	O		O	O		O	O			O			V
Tailoring	Tailored according to needs/ability/ individualised	OH OD	O	O	O	OI OT	OS OB	O	O	O			O		O				O	O		V

1201

1202 *B* strengthening plus balance/proprioceptive exercise group, *D* domiciliary group, *H* hospital group, *HR* heart rate, *I* in-person
1203 prehabilitation group, *O* intervention component/delivery approach included in an intervention investigated in an outcomes study,
1204 *PNF* proprioceptive neuromuscular facilitation, *reps* repetitions, *RM* repetition maximum, *S* strengthening group, *T* telerehabilitation
1205 prehabilitation group, *V* participants' experiences/perspectives of the intervention component/delivery approach reported in a views
1206 study

[a] Outcomes study in which a statistically significant difference in favor of the intervention group was identified for at least one outcome at one or more follow-up time points (alpha=0.05)

[b] Outcomes study in which no statistically significant differences in favor of the intervention group were identified for any outcomes at any follow-up time points (alpha=0.05)

[c] The control group participated in an upper body strength training program that involved the same warm-up and delivery approaches as the intervention group's lower limb strength training program

[d] Warm-up included at least one of the following activities: aerobic activities e.g. cycling or walking; joint movements; and/or dynamic body weight exercises

[e] Exercises grouped into types by the reviewers (all other exercises grouped according to the primary authors' terminology)

[f] Cool-down included at least one of the following activities: walking; stretches; ice application; and/or joint movements

[g] Education covered at least one of the following topics: pain management; coping strategies; self-training at home; pre-operative and post-operative procedures; appropriate movement patterns; knee osteoarthritis progression; the benefits of exercise and diet control; and/or physical activity

[h] Individually indicated interventions included: strengthening exercises; sensori-motor training (including balance exercises); and/or electromyostimulation training according to the individual's needs

[i] Setting where exercises were performed (excluding instruction/information/optional/review sessions)

Table 6: Psychological intervention components and delivery approaches

Category	Intervention component or delivery approach	Medina-Garzón (77)[a]	das Nair et al. (78)[a]
Component	Motivational interviewing	O	
	Psychoeducation on mood and pain		OV
	Values-based goal setting		O
	Self-management and behavioral activation		O
	Relaxation and mindful breathing		OV
	Cognitive restructuring		OV
	Post-surgical planning		O
	Signposting to relevant services		V
	Post-op reminders of the session content		V
Provider	Nurse	O	
	Psychologist		OV
Delivery mode	Single format		O
	Face-to-face		O
	Individual		OV
	Group		V
Setting	Hospital or home, according to the patients' preference		O
	Hospital		V
	Home		V
Schedule	3 sessions over a 20 day period	O	
	Up to 10 sessions delivered once or twice weekly		O
Intensity	Session length: ~40 min	O	
	Session length: ~1 hour		O
Tailoring	Tailored to each individual's needs	O	OV

O intervention component/delivery approach included in an intervention investigated in an outcomes study, *V* participants' experiences/perspectives of the intervention component/delivery approach reported in a views study

[a] Outcomes study in which a statistically significant difference in favor of the intervention group was identified for at least one outcome at one or more follow-up time points (alpha=0.05)

Table 7: Lifestyle intervention components and delivery approaches

Category	Intervention component or delivery approach	Rittharomya et al. (63)[a]	Aunger et al. (2020) (80)	Plenge et al. (2018) (79)	Snowden et al. (2020) (43)	Westby et al. (2018) (37)
Component	Diet control	O				
	Information on knee OA progression and the benefits of quadriceps exercise and diet control	O				
	Weight management information					V
	Weight management program					V
	Smoking cessation			V		
	Alcohol cessation			V		
	Alcohol specialist service				V	
	Alcohol consumption advice/behavior change counselling				V	
	Alcohol screening questionnaire completion				V	
	Sedentary behavior reduction		V			
	Goal setting		V			
	Environmental modifications		V[b]			
	Social support		V[b]			
	Opportunity to ask questions	O				

	Positive feedback, encouragement and compliments from a researcher	O			
	Remote monitoring by a researcher	O			
	Self-monitoring with a pedometer/health app		V		
Provider	Researcher	O	V[b]		
	Healthcare professionals in the pre-operative assessment clinic				V
	Pre-operative assessment nurses				V
Delivery mode	>1 format	O			
	Information/instruction sessions with a poster and DVD	O			
	Remote monitoring via telephone calls/a mobile application	O			
	Visual aids e.g. infographics or poster	O			V
	Booklet		V[b]		
Setting	Pre-operative assessment clinic				V
	Home and unspecified location for information/instructions	O			
Schedule	12 week program	O			
	Additional protected time in pre-operative assessment clinic				V
	Booster session				V
Tailoring	Tailored to each individual's circumstances/needs		V		V

BMI Body Mass Index*, O* intervention component/delivery approach included in an intervention investigated in an outcomes study, *OA* osteoarthritis, *V* participants' experiences/perspectives of the intervention component/delivery approach reported in a views study

[a] Outcomes study in which a statistically significant difference in favor of the intervention group was identified for at least one outcome at one or more follow-up time points (alpha=0.05)

[b] Finding is from a study with a mixed population and is not supported with evidence specifically for participants who met the review eligibility criteria

Table 8: Other pre-operative intervention components and delivery approaches

Category	Intervention component or delivery approach	Bergin et al. (83)[b]	Soni et al. (74)[b]	Stone et al. (84)[b]	Walls et al. (82)[a]	Zhao et al. (81)[ac]	Bin Sheeha et al. (75)
Component	Incentive spirometry	O					
	Self-monitoring e.g. through completion of a logbook	O			O		
	Acupuncture		O				V
	Electroacupuncture					O	
	NMES				O		
	Dynamic knee extension device			O			
Provider	Physiotherapist		O				
	Acupuncturist					O	
Delivery mode	Single format		O			O	
	>1 format	O			O		
	Single instruction session (prior to unsupervised sessions)	O			O		
	Unsupervised sessions	O					
	Unsupervised sessions with written instructions				O		
	Face-to-face group sessions		O				

	Face-to-face (not specified if group or individual)					O
Setting	Home	O			O	
	Outpatient gym		O			
Schedule	Every 2 or 6 hours while awake for 1 week prior to surgery	O				
	Weekly for 4 weeks, then fortnightly for 4 weeks, then monthly until surgery		O			
	Once daily for 5 consecutive days pre-operatively					O
	3 x daily until surgery			O		
	Alternate days for 2 weeks then 5 x weekly for 6 weeks				O	
Intensity	Incentive spirometry device use: 10 times per session	O				
	Acupuncture needles left in situ for 20 min		O			
	Electroacupuncture for 30mins using a device that provides a dilatational wave, 2/100Hz, 3mA					O
	Dynamic knee extension device worn for up to 30 min at once			O		
	NMES session length: 20 min				O	
	NMES intensity as high as the patient can tolerate				O	
Tailoring	Frequency of incentive spirometry device use tailored to baseline incentive spirometry volume	O				

1242

NMES neuromuscular electrical stimulation, *O* intervention component/delivery approach included in an intervention investigated in an outcomes study, *V* participants' experiences/perspectives of the intervention component/delivery approach reported in a views study

[a] Outcomes study in which a statistically significant difference in favor of the intervention group was identified for at least one outcome at one or more follow-up time points (alpha=0.05)

[b] Outcomes study in which no statistically significant differences in favor of the intervention group were identified for any outcomes at any follow-up time points (alpha=0.05)

[c] The control group received 'placebo electroacupuncture' that involved the same provider, delivery mode and schedule as the intervention group's electroacupuncture (81)

Additional files

Additional File 1

Format: Word (AF1_PRISMA_Checklist_VKS1a_SR_1.1_16Jun22.docx)

Title: PRISMA checklist

Description: Completed PRISMA checklist (Supplementary Table 1)

Additional File 2

Format: Word (AF2_Search_Strategies_ SR_1.0_28Jun21.docx)

Title: Database search strategies

Description: Search strategies employed for all electronic databases searched

Additional File 3

Format: Word (AF3_Data_Items_VKS1a_SR_1.1_16Jun22.docx)

Title: Data items

Description: Data items extracted for outcomes studies (Supplementary Table 2) and views studies (Supplementary Table 3)

Additional File 4

Format: Word (AF4_Outcomes_Studies_VKS1a_SR_1.1_16Jun22.docx)

Title: Outcomes studies' characteristics and results

Description: Characteristics and results of the included outcomes studies (Supplementary Table 4)

Additional File 5

Format: Word (AF5_Views_Studies _VKS1a_ SR_1.1_16Jun22.docx)

Title: Views studies' characteristics and findings

Description: Characteristics and findings of the included views studies (Supplementary Table 5)

Content and delivery of pre-operative interventions for patients undergoing total knee replacement: a rapid review

Additional File 1: Completed PRISMA checklist

Supplementary Table 1: Completed PRISMA checklist

Section and topic	#	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Pages 2-3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Pages 4-6
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 6
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Pages 8, 9, 11 Table 1 (page 49)
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 9
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 9 Additional File 2

Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 10
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 10-12
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 10 Additional File 3
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 10 Additional File 3
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 12
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 11
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Pages 12-13
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	N/A – no methods were required to prepare the data for presentation or synthesis
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Pages 12-13
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Pages 12-13

	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/A – no methods were used to explore possible causes of heterogeneity
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	N/A – no sensitivity analyses were conducted
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	N/A – no methods were used to assess risk of bias due to missing results in the syntheses
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	N/A – no methods were used to assess certainty in the body of evidence
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 13 Figure 1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 13
Study characteristics	17	Cite each included study and present its characteristics.	Pages 14-25 Tables 2-8 (pages 50-78) Additional Files 4-5
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Pages 14-15 Tables 2-3 (pages 50-58)
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Pages 15-25 Tables 4-8 (pages 59-78) Additional Files 4-5 (narrative summaries only because the review focused on interventions rather than outcomes and followed rapid review methodology)

Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Pages 14-25 Tables 4-8 (pages 62-82) (Risk of bias not summarised for each individual synthesis to avoid repetition)
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	N/A – no statistical syntheses were conducted
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/A – no investigations of possible causes of heterogeneity were conducted
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	N/A – no sensitivity analyses were conducted
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/A – no assessments of risk of bias due to missing results were conducted
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	N/A – no assessments of certainty were conducted
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Pages 25-29
	23b	Discuss any limitations of the evidence included in the review.	Pages 27-28
	23c	Discuss any limitations of the review processes used.	Pages 27-28
	23d	Discuss implications of the results for practice, policy, and future research.	Pages 28-29
OTHER INFORMATION			

Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 7
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 7
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Page 9
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 31
Competing interests	26	Declare any competing interests of review authors.	Page 31
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Page 31

Checklist from: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/

Content and delivery of pre-operative interventions for patients undergoing total knee replacement: a rapid review

Additional File 2: Database search strategies

The search strategies presented below are for the initial database searches conducted on 11th September 2019. All the searches were subsequently updated to 31st December 2020.

Medline (Ovid)

1 Arthroplasty, Replacement, Knee/ (22063)

2 Knee Prosthesis/ (11206)

3 (TKA or TKR).tw,kw. (11739)

4 1 or 2 or 3 (30266)

5 Knee/ (13711)

6 Knee Joint/ (52242)

7 Osteoarthritis, Knee/ (18298)

8 knee?.tw,kw. (139011)

9 5 or 6 or 7 or 8 (154624)

10 Arthroplasty, Replacement/ (5872)

11 (arthroplast* or replace*).tw,kw. (425753)

12 10 or 11 (427000)

13 9 and 12 (34513)

14 4 or 13 (39999)

15 Preoperative Care/ (60281)

16 Preoperative Period/ (6405)

17 (preop* or pre-op* or presurg* or pre-surg* or ?prehab* or ?pre-hab* or teleprehab* or tele-prehab* or prepar*).tw,kw. (1184603)

18 15 or 16 or 17 (1211482)

19 Patient Education as Topic/ (82785)

20 Health Education/ (59265)

21 exp Consumer Health Information/ (8221)

22 Teach-Back Communication/ (28)

23 exp Educational Technology/ (107154)

24 Patient Education Handout/ (5007)

25 ((health* or educat* or inform* or knowledge or teach*) adj3 (class* or group? or program* or school? or booklet? or leaflet? or DVD? or YouTube or video? or website? or "web platform" or "web platforms" or "web page" or "web pages" or web-page? or microsite? or app? or application? or multimedia)).tw,kw. (255384)

26 ((patient? adj2 educat*) or psychoeducat* or psycho-educat*).tw,kw. (33748)

27 exp Exercise/ (182510)

28 exp Exercise Therapy/ (47249)

29 exp Exercise Movement Techniques/ (7683)

30 Rehabilitation/ (17926)

31 Hospitals, Rehabilitation/ (34)

32 Rehabilitation Centers/ (8017)

33 Rehabilitation Nursing/ (1397)

34 Rehabilitation Research/ (129)

35 Recreation Therapy/ (114)

36 Telerehabilitation/ (277)

37 "Physical and Rehabilitation Medicine"/ (3122)

38 Physical Therapy Modalities/ (35459)

39 Occupational Therapy/ (12741)

40 Hydrotherapy/ (2511)

41 ((joint? or knee? or motor or physical* or cardio* or strength* or propriocept* or balance or neuromuscular or aerobic or weight or stretch* or resistance or endurance or aqua*) adj2 (school* or train* or activit* or fit* or program* or class* or therap*)).tw,kw. (243474)

42 (?rehab* or ?prehab* or ?pre-hab* or telerehab* or tele-rehab* or teleprehab* or tele-prehab or ?exercis* or ?physiotherap* or hydrotherap* or "occupational therapy" or swim* or cycl* or bik* or self-management or "self management").tw,kw. (1572703)

43 exp Psychotherapy/ (189129)

44 exp Mind-Body Therapies/ (48979)

45 Counseling/ (34516)

46 Distance Counseling/ (36)

47 exp Directive Counseling/ (3807)

48 (psychotherap* or "guided imagery" or CBT or relax* or hypnosis or "motivational interviewing" or mindfulness or counsel* or "pain coping skills training").tw,kw. (328178)

49 ((psychologic* or behavio?r* or cognitive or emotion* or mind) adj2 (intervention* or technique* or therap* or treat* or prepar* or restructur* or reframe* or distract*)).tw,kw. (73859)

50 exp Health Promotion/ (73339)

51 exp Diet Therapy/ (52287)

52 exp Life Style/ (88041)

53 Alcohol Abstinence/ (557)

54 Smoking Cessation/ (27171)

55 Smoking Reduction/ (28)

56 "Tobacco Use Cessation"/ (1094)

57 ("physical activity" or "weight loss" or "weight reduction" or diet*).tw,kw. (688013)

58 ((behavio?r* or lifestyle* or health*) adj2 (chang* or modif* or motivat* or promot* or educat* or inform* or teach*)).tw,kw. (232005)

59 ((smoking or tobacco or alcohol) adj2 (cessat* or reduc* or stop* or quit*)).tw,kw. (42910)

60 Nutrition Therapy/ (2086)

61 exp Dietary Supplements/ (70536)

62 Functional Food/ (1668)

63 exp Micronutrients/ (636727)

64 exp Minerals/ (159185)

65 ((nutrition* adj2 supplement*) or probiotic* or prebiotic* or synbiotic* or "functional food" or nutraceutical* or nutrient* or glucosamine or chondroitin or curcumin or "fish oil" or "fish oils" or "omega 3" or vitamin* or mineral* or "trace

element" or "trace elements" or flavonoid* or (hydroly* adj2 collagen)).tw,kw. (623531)

66 Transcutaneous Electric Nerve Stimulation/ (4486)

67 (electrotherap* or "transcutaneous electrical nerve stimulation" or TENS).tw,kw. (17392)

68 exp Therapy, Soft Tissue/ (6707)

69 Trigger Points/ (474)

70 (massag* or "soft tissue therapy" or "trigger point" or "trigger points").tw,kw. (12297)

71 exp Orthotic Devices/ (12585)

72 (orthotic* or orthos* or insole* or "arch support" or (knee adj2 brace*)).tw,kw. (24743)

73 Acupuncture/ (1626)

74 exp Acupuncture Therapy/ (23292)

75 (acupuncture or acupressure or "dry needling").tw,kw. (21980)

76 Rehabilitation, Vocational/ (9329)

77 ((occupation* or vocation*) adj2 rehab*).tw,kw. (3749)

78 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74 or 75 or 76 or 77 (4522618)

79 14 and 18 and 78 (1629)

80 exp Animals/ (22584094)

81 Humans/ (17966945)

82 80 not 81 (4617149)

83 79 not 82 (1616)

84 limit 83 to (english language and yr="2009 -Current") (1092)

Embase (Ovid)

1 exp knee arthroplasty/ (25198)

2 exp knee prosthesis/ (8393)

3 (TKA or TKR).tw,kw. (15077)

4 1 or 2 or 3 (36587)

5 knee/ (49542)

6 knee arthritis/ (3154)

7 knee osteoarthritis/ (28779)

8 knee pain/ (15736)

9 knee?.tw,kw. (156466)

10 5 or 6 or 7 or 8 or 9 (167696)

11 arthroplasty/ (15518)

12 replacement arthroplasty/ (1152)

13 total arthroplasty/ (754)

14 (arthroplast* or replace*).tw,kw. (458936)

15 11 or 12 or 13 or 14 (463474)

16 10 and 15 (42423)

17 4 or 16 (51128)

18 preoperative period/ (49610)

19 preoperative education/ (501)

20 preoperative care/ (28649)

21 preoperative treatment/ (10396)

22 (preop* or pre-op* or presurg* or pre-surg* or ?prehab* or ?pre-hab* or teleprehab* or tele-prehab* or prepar*).tw,kw. (1150599)

23 18 or 19 or 20 or 21 or 22 (1177889)

24 health education/ (67431)

25 patient education/ (92268)

26 preoperative education/ (501)

27 psychoeducation/ (7367)

28 educational technology/ (2969)

29 health literacy/ (9852)

30 ((health* or educat* or inform* or knowledge or teach*) adj3 (class* or group? or program* or school? or booklet? or leaflet? or DVD? or YouTube or video? or website? or "web platform" or "web platforms" or "web page" or "web pages" or web-page? or microsite? or app? or application? or multimedia)).tw,kw. (291538)

31 ((patient? adj2 educat*) or psychoeducat* or psycho-educat*).tw,kw. (51288)

32 exp exercise/ (271748)

33 exp kinesiotherapy/ (64422)

34 rehabilitation/ (57520)

35 community based rehabilitation/ (729)

36 geriatric rehabilitation/ (868)

37 home rehabilitation/ (631)

38 rehabilitation care/ (15503)

39 rehabilitation center/ (11090)

40 functional training/ (1121)

41 recreational therapy/ (511)

42 telerehabilitation/ (626)

43 rehabilitation medicine/ (8725)

44 rehabilitation nursing/ (1370)

45 rehabilitation patient/ (1134)

46 rehabilitation research/ (917)

47 physiotherapy/ (70574)

48 occupational therapy/ (16351)

49 hydrotherapy/ (2470)

50 ((joint? or knee? or motor or physical* or cardio* or strength* or propriocept* or balance or neuromuscular or aerobic or weight or stretch* or resistance or endurance or aqua*) adj2 (school* or train* or activit* or fit* or program* or class* or therap*)).tw,kw. (302632)

51 (?rehab* or ?prehab* or ?pre-hab* or telerehab* or tele-rehab* or teleprehab* or tele-prehab or ?exercis* or ?physiotherap* or hydrotherap* or "occupational therapy" or swim* or cycl* or bik* or self-management or "self management").tw,kw. (1656013)

52 exp psychotherapy/ (180922)

53 counseling/ (52184)

54 patient guidance/ (1215)

55 directive counseling/ (836)

56 e-counseling/ (161)

57 motivational interviewing/ (4415)

58 patient counseling/ (39786)

59 peer counseling/ (553)

60 (psychotherap* or "guided imagery" or CBT or relax* or hypnosis or "motivational interviewing" or mindfulness or counsel* or "pain coping skills training").tw,kw. (329822)

61 ((psychologic* or behavio?r* or cognitive or emotion* or mind) adj2 (intervention* or technique* or therap* or treat* or prepar* or restructur* or reframe* or distract*)).tw,kw. (94898)

62 health promotion/ (82448)

63 exp lifestyle/ (114190)

64 diet therapy/ (42225)

65 diet restriction/ (85270)

66 exp low calorie diet/ (471)

67 low fat diet/ (9722)

68 caloric restriction/ (11571)

69 nutritional counseling/ (2469)

70 alcohol abstinence/ (5985)

71 smoking cessation/ (52928)

72 smoking reduction/ (149)

73 ("physical activity" or "weight loss" or "weight reduction" or diet*).tw,kw. (742277)

74 ((behavio?r* or lifestyle* or health*) adj2 (chang* or modif* or motivat* or promot* or educat* or inform* or teach*)).tw,kw. (286920)

75 ((smoking or tobacco or alcohol) adj2 (cessat* or reduc* or stop* or quit*)).tw,kw. (51680)

76 diet supplementation/ (78109)

77 functional food/ (3950)

78 mineral supplementation/ (1509)

79 vitamin supplementation/ (31009)

80 ((nutrition* adj2 supplement*) or probiotic* or prebiotic* or synbiotic* or "functional food" or nutraceutical* or nutrient* or glucosamine or chondroitin or curcumin or "fish oil" or "fish oils" or "omega 3" or vitamin* or mineral* or "trace element" or "trace elements" or flavonoid* or (hydroly* adj2 collagen)).tw,kw. (656277)

81 transcutaneous electrical nerve stimulation/ (1510)

82 (electrotherap* or "transcutaneous electrical nerve stimulation" or TENS).tw,kw. (15658)

83 soft tissue therapy/ (120)

84 massage/ (12085)

85 trigger point/ (2205)

86 (massag* or "soft tissue therapy" or "trigger point" or "trigger points").tw,kw. (13922)

87 orthotics/ (2671)

88 knee brace/ (568)

89 (orthotic* or orthos* or insole* or "arch support" or (knee adj2 brace*)).tw,kw. (28153)

90 exp acupuncture/ (36848)

91 (acupuncture or acupressure or "dry needling").tw,kw. (25792)

92 vocational rehabilitation/ (5042)

93 ((occupation* or vocation*) adj2 rehab*).tw,kw. (3392)

94 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74 or 75 or 76 or 77 or 78 or 79 or 80 or 81 or 82 or 83 or 84 or 85 or 86 or 87 or 88 or 89 or 90 or 91 or 92 or 93 (4193496)

95 17 and 23 and 94 (2418)

96 exp animal/ (18670046)

97 exp human/ (15771110)

98 96 not 97 (2898936)

99 95 not 98 (2404)

100 limit 99 to (english language and yr="2009 -Current") (1850)

PsycINFO (Ovid)

1 (TKA or TKR).tw. (170)

2 knee/ (939)

3 knee?.tw. (3452)

4 2 or 3 (3471)

5 (arthroplast* or replace*).tw. (19930)

6 4 and 5 (473)

7 1 or 6 (483)

8 (preop* or pre-op* or presurg* or pre-surg* or ?prehab* or ?pre-hab* or teleprehab* or tele-prehab* or prepar*).tw. (66823)

9 health education/ (8501)

10 client education/ (2167)

11 health information/ (2062)

12 digital information/ (76)

13 psychoeducation/ (3321)

14 health literacy/ (2682)

15 ((health* or educat* or inform* or knowledge or teach*) adj3 (class* or group? or program* or school? or booklet? or leaflet? or DVD? or YouTube or video? or website? or "web platform" or "web platforms" or "web page" or "web pages" or web-page? or microsite? or app? or application? or multimedia)).tw. (129848)

16 ((patient? adj2 educat*) or psychoeducat* or psycho-educat*).tw. (12512)

17 exp exercise/ (19525)

18 rehabilitation/ (12631)

19 rehabilitation centers/ (270)

20 recreation therapy/ (231)

21 telerehabilitation/ (131)

22 movement therapy/ (958)

23 physical therapy/ (2124)

24 occupational therapy/ (3691)

25 hydrotherapy/ (25)

26 ((joint? or knee? or motor or physical* or cardio* or strength* or propriocept* or balance or neuromuscular or aerobic or weight or stretch* or resistance or endurance or aqua*) adj2 (school* or train* or activit* or fit* or program* or class* or therap*)).tw. (51813)

27 (?rehab* or ?prehab* or ?pre-hab* or telerehab* or tele-rehab* or teleprehab* or tele-prehab or ?exercis* or ?physiotherap* or hydrotherap* or "occupational therapy" or swim* or cycl* or bik* or "self-management" or "self management").tw. (142318)

28 exp psychotherapy/ (102554)

29 mind body therapy/ (177)

30 exp cognitive techniques/ (6634)

31 exp cognitive behavior therapy/ (19861)

32 counseling/ (12303)

33 group counseling/ (1457)

34 peer counseling/ (412)

35 exp hypnosis/ (2836)

36 online therapy/ (2675)

37 anxiety management/ (403)

38 stress management/ (2764)

39 exp relaxation therapy/ (552)

40 muscle relaxation/ (231)

41 (psychotherap* or "guided imagery" or CBT or relax* or hypnosis or "motivational interviewing" or mindfulness or counsel* or "pain coping skills training").tw. (142948)

42 ((psychologic* or behavio?r* or cognitive or emotion* or mind) adj2 (intervention* or technique* or therap* or treat* or prepar* or restructur* or reframe* or distract*)).tw. (69442)

43 health promotion/ (20809)

44 exp behavior modification/ (15811)

45 exp lifestyle/ (8394)

46 physical activity/ (17517)

47 weight control/ (3239)

48 weight loss/ (2834)

49 diets/ (8791)

50 dietary restraint/ (1244)

51 exp alcohol treatment/ (3919)

52 sobriety/ (976)

53 smoking cessation/ (10299)

54 ("physical activity" or "weight loss" or "weight reduction" or diet*).tw. (61027)

55 ((behavio?r* or lifestyle* or health*) adj2 (chang* or modif* or motivat* or promot* or educat* or inform* or teach*)).tw. (92052)

56 ((smoking or tobacco or alcohol) adj2 (cessat* or reduc* or stop* or quit*)).tw. (16603)

57 dietary supplements/ (1754)

58 exp vitamins/ (3363)

59 ((nutrition* adj2 supplement*) or probiotic* or prebiotic* or synbiotic* or "functional food" or nutraceutical* or nutrient* or glucosamine or chondroitin or curcumin or "fish oil" or "fish oils" or "omega 3" or vitamin* or mineral* or "trace element" or "trace elements" or flavonoid* or (hydroly* adj2 collagen)).tw. (13584)

60 (electrotherap* or "transcutaneous electrical nerve stimulation" or TENS).tw. (1459)

61 massage/ (441)

62 (massag* or "soft tissue therapy" or "trigger point" or "trigger points").tw. (1443)

63 (orthotic* or orthos* or insole* or "arch support" or (knee adj2 brace*)).tw. (1574)

64 acupuncture/ (1022)

65 (acupuncture or acupressure or "dry needling").tw. (1504)

66 exp vocational rehabilitation/ (3276)

67 occupational guidance/ (3149)

68 ((occupation* or vocation*) adj2 rehab*).tw. (2288)

69 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 (637241)

70 7 and 8 and 69 (69)

71 limit 70 to (human and english language and yr="2009 -Current") (50)

CINAHL (EBSCOhost)

#	Query	Limiters/Expanders	Results
S97	S96	Limiters - English Language; Published Date: 20090101-20190931 Search modes - Boolean/Phrase	1,014

S96	S92 NOT S95	Search modes - Boolean/Phrase	1,281
S95	S93 NOT S94	Search modes - Boolean/Phrase	75,189
S94	(MH "Human")	Search modes - Boolean/Phrase	1,968,486
S93	(MH "Animals+")	Search modes - Boolean/Phrase	83,568
S92	S13 AND S17 AND S91	Search modes - Boolean/Phrase	1,285
S91	S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48 OR S49 OR S50 OR S51 OR S52 OR S53 OR S54 OR S55 OR S56 OR S57 OR S58 OR S59 OR S60 OR S61 OR S62 OR S63 OR S64 OR S65 OR S66 OR S67 OR S68 OR S69 OR S70 OR S71 OR S72 OR S73 OR S74 OR S75 OR S76 OR S77 OR S78 OR S79 OR S80 OR S81 OR S82 OR S83 OR S84 OR S85 OR S86 OR S87 OR S88 OR S89 OR S90	Search modes - Boolean/Phrase	1,437,068
S90	TI ((occupation* or vocation*) n1 rehab*) OR AB ((occupation* or vocation*) n1 rehab*)	Search modes - Boolean/Phrase	2,531
S89	(MH "Rehabilitation, Vocational")	Search modes - Boolean/Phrase	5,421
S88	TI (acupuncture or acupressure or "dry needling") OR AB (acupuncture or acupressure or "dry needling")	Search modes - Boolean/Phrase	11,497
S87	(MH "Dry Needling")	Search modes - Boolean/Phrase	189
S86	(MH "Acupuncture+")	Search modes - Boolean/Phrase	14,315

S85	TI (orthotic* or orthos* or insole* or "arch support" or (knee n1 brace*)) OR AB (orthotic* or orthos* or insole* or "arch support" or (knee n1 brace*))	Search modes - Boolean/Phrase	8,041
S84	(MH "Orthoses+")	Search modes - Boolean/Phrase	9,122
S83	TI (massag* or "soft tissue therapy" or "trigger point" or "trigger points") OR AB (massag* or "soft tissue therapy" or "trigger point" or "trigger points")	Search modes - Boolean/Phrase	10,659
S82	(MH "Trigger Point")	Search modes - Boolean/Phrase	1,237
S81	(MH "Massage+")	Search modes - Boolean/Phrase	13,936
S80	TI (electrotherap* or "transcutaneous electrical nerve stimulation" or TENS) OR AB (electrotherap* or "transcutaneous electrical nerve stimulation" or TENS)	Search modes - Boolean/Phrase	238,919
S79	(MH "Transcutaneous Electric Nerve Stimulation")	Search modes - Boolean/Phrase	2,005
S78	TI ((nutrition* n1 supplement*) or probiotic* or prebiotic* or synbiotic* or "functional food" or nutraceutical* or nutrient* or glucosamine or chondroitin or curcumin or "fish oil" or "fish oils" or "omega 3" or vitamin* or mineral* or "trace element" or "trace elements" or flavonoid* or (hydroly* n1 collagen)) OR AB ((nutrition* n1 supplement*) or probiotic* or prebiotic* or synbiotic* or "functional food" or nutraceutical* or nutrient* or glucosamine or chondroitin or curcumin or "fish oil" or "fish oils" or "omega 3" or vitamin* or mineral* or "trace element" or "trace elements" or flavonoid* or (hydroly* n1 collagen))	Search modes - Boolean/Phrase	82,749
S77	(MH "Minerals+")	Search modes - Boolean/Phrase	9,781

S76	(MH "Vitamins+")	Search modes - Boolean/Phrase	46,693
S75	(MH "Functional Food")	Search modes - Boolean/Phrase	2,514
S74	(MH "Dietary Supplements+")	Search modes - Boolean/Phrase	25,640
S73	TI ((smoking or tobacco or alcohol) n1 (cessat* or reduc* or stop* or quit*)) OR AB ((smoking or tobacco or alcohol) n1 (cessat* or reduc* or stop* or quit*))	Search modes - Boolean/Phrase	20,423
S72	TI ((behavio#r* or lifestyle* or health*) n1 (chang* or modif* or motivat* or promot* or educat* or inform* or teach*)) OR AB ((behavio#r* or lifestyle* or health*) n1 (chang* or modif* or motivat* or promot* or educat* or inform* or teach*))	Search modes - Boolean/Phrase	113,484
S71	TI ("physical activity" or "weight loss" or "weight reduction" or diet*) OR AB ("physical activity" or "weight loss" or "weight reduction" or diet*)	Search modes - Boolean/Phrase	162,092
S70	(MH "Smoking Cessation Programs")	Search modes - Boolean/Phrase	2,115
S69	(MH "Smoking Cessation")	Search modes - Boolean/Phrase	18,502
S68	(MH "Alcohol Rehabilitation Programs")	Search modes - Boolean/Phrase	1,763
S67	(MH "Nutritional Counseling")	Search modes - Boolean/Phrase	2,088
S66	(MH "Restricted Diet")	Search modes - Boolean/Phrase	2,277
S65	(MH "Diet, Low Carbohydrate")	Search modes - Boolean/Phrase	950
S64	(MH "Diet, Fat-Restricted")	Search modes - Boolean/Phrase	2,192

S63	(MH "Diet, Reducing")	Search modes - Boolean/Phrase	3,924
S62	(MH "Life Style+")	Search modes - Boolean/Phrase	196,359
S61	(MH "Health Promotion")	Search modes - Boolean/Phrase	57,641
S60	TI ((psychologic* or behavio#r* or cognitive or emotion* or mind) n1 (intervention* or technique* or therap* or treat* or prepar* or restructur* or reframe* or distract*)) OR AB ((psychologic* or behavio#r* or cognitive or emotion* or mind) n1 (intervention* or technique* or therap* or treat* or prepar* or restructur* or reframe* or distract*))	Search modes - Boolean/Phrase	33,357
S59	TI (psychotherap* or "guided imagery" or CBT or relax* or hypnosis or "motivational interviewing" or mindfulness or counsel* or "pain coping skills training") OR AB (psychotherap* or "guided imagery" or CBT or relax* or hypnosis or "motivational interviewing" or mindfulness or counsel* or "pain coping skills training")	Search modes - Boolean/Phrase	85,656
S58	(MH "Motivational Interviewing")	Search modes - Boolean/Phrase	2,886
S57	(MH "Peer Counseling")	Search modes - Boolean/Phrase	946
S56	(MH "Counseling")	Search modes - Boolean/Phrase	25,608
S55	(MH "Hypnosis+")	Search modes - Boolean/Phrase	2,665
S54	(MH "Mind Body Techniques+")	Search modes - Boolean/Phrase	36,676
S53	(MH "Relaxation Techniques+")	Search modes - Boolean/Phrase	10,907

S52	(MH "Psychotherapy, Group")	Search modes - Boolean/Phrase	4,641
S51	(MH "Cognitive Therapy+")	Search modes - Boolean/Phrase	20,938
S50	(MH "Behavior Therapy")	Search modes - Boolean/Phrase	9,786
S49	(MH "Psychotherapy+")	Search modes - Boolean/Phrase	166,983
S48	TI ((rehab* or prehab* or pre-hab* or telerehab* or tele-rehab* or teleprehab* or tele-prehab or exercis* or physiotherap* or hydrotherap* or "occupational therapy" or swim* or cycl* or bik* or "self-management" or "self management")) OR AB ((rehab* or prehab* or pre-hab* or telerehab* or tele-rehab* or teleprehab* or tele-prehab or exercis* or physiotherap* or hydrotherap* or "occupational therapy" or swim* or cycl* or bik* or self-management or "self management"))	Search modes - Boolean/Phrase	284,913
S47	TI ((joint# or knee# or motor or physical* or cardio* or strength* or propriocept* or balance or neuromuscular or aerobic or weight or stretch* or resistance or endurance or aqua*) n1 (school* or train* or activit* or fit* or program* or class* or therap*)) OR AB ((joint# or knee# or motor or physical* or cardio* or strength* or propriocept* or balance or neuromuscular or aerobic or weight or stretch* or resistance or endurance or aqua*) n1 (school* or train* or activit* or fit* or program* or class* or therap*))	Search modes - Boolean/Phrase	106,503
S46	(MH "Hydrotherapy+")	Search modes - Boolean/Phrase	5,861
S45	(MH "Occupational Therapy")	Search modes - Boolean/Phrase	18,446

S44	(MH "Physical Therapy")	Search modes - Boolean/Phrase	31,370
S43	(MH "Telerehabilitation")	Search modes - Boolean/Phrase	120
S42	(MH "Recreational Therapy")	Search modes - Boolean/Phrase	1,349
S41	(MH "Research, Rehabilitation")	Search modes - Boolean/Phrase	1,050
S40	(MH "Rehabilitation Nursing")	Search modes - Boolean/Phrase	1,498
S39	(MH "Functional Training")	Search modes - Boolean/Phrase	965
S38	(MH "Rehabilitation Patients")	Search modes - Boolean/Phrase	3,007
S37	(MH "Rehabilitation, Geriatric")	Search modes - Boolean/Phrase	2,799
S36	(MH "Rehabilitation, Community-Based")	Search modes - Boolean/Phrase	909
S35	(MH "Home Rehabilitation+")	Search modes - Boolean/Phrase	1,893
S34	(MH "Rehabilitation Centers")	Search modes - Boolean/Phrase	7,038
S33	(MH "Rehabilitation")	Search modes - Boolean/Phrase	14,759
S32	(MH "Walking+")	Search modes - Boolean/Phrase	27,951
S31	(MH "Upper Extremity Exercises+")	Search modes - Boolean/Phrase	344
S30	(MH "Muscle Strengthening+")	Search modes - Boolean/Phrase	20,125
S29	(MH "Therapeutic Exercise+")	Search modes - Boolean/Phrase	49,447

S28	(MH "Aerobic Exercises+")	Search modes - Boolean/Phrase	38,423
S27	(MH "Prehabilitation")	Search modes - Boolean/Phrase	90
S26	(MH "Exercise+")	Search modes - Boolean/Phrase	100,946
S25	TI ((patient# n1 educat*) or psychoeducat* or psycho-educat*) OR AB ((patient# n1 educat*) or psychoeducat* or psycho-educat*)	Search modes - Boolean/Phrase	19,363
S24	TI ((health* or educat* or inform* or knowledge or teach*) n2 (class* or group# or program* or school# or booklet# or leaflet# or DVD# or YouTube or video# or website# or "web platform" or "web platforms" or "web page" or "web pages" or web-page# or microsite# or app# or application# or multimedia)) OR AB ((health* or educat* or inform* or knowledge or teach*) n2 (class* or group# or program* or school# or booklet# or leaflet# or DVD# or YouTube or video# or website# or "web platform" or "web platforms" or "web page" or "web pages" or web-page# or microsite# or app# or application# or multimedia))	Search modes - Boolean/Phrase	113,365
S23	(MH "Health Literacy")	Search modes - Boolean/Phrase	3,538
S22	(MH "Educational Technology")	Search modes - Boolean/Phrase	1,804
S21	(MH "Psychoeducation")	Search modes - Boolean/Phrase	2,821
S20	(MH "Preoperative Education")	Search modes - Boolean/Phrase	1,421
S19	(MH "Health Education")	Search modes - Boolean/Phrase	23,086

S18	(MH "Patient Education")	Search modes - Boolean/Phrase	59,103
S17	S14 OR S15 OR S16	Search modes - Boolean/Phrase	150,619
S16	TI (preop* or pre-op* or presurg* or pre-surg* or prehab* or pre-hab* or teleprehab* or tele-prehab* or prepar*) OR AB (preop* or pre-op* or presurg* or pre-surg* or prehab* or pre-hab* or teleprehab* or tele-prehab* or prepar*)	Search modes - Boolean/Phrase	138,468
S15	(MH "Preoperative Care+")	Search modes - Boolean/Phrase	19,525
S14	(MH "Preoperative Period")	Search modes - Boolean/Phrase	4,842
S13	S3 OR S12	Search modes - Boolean/Phrase	19,081
S12	S8 AND S11	Search modes - Boolean/Phrase	15,797
S11	S9 OR S10	Search modes - Boolean/Phrase	75,409
S10	TI (arthroplast* OR replace*) OR AB (arthroplast* OR replace*)	Search modes - Boolean/Phrase	74,320
S9	(MH "Arthroplasty, Replacement")	Search modes - Boolean/Phrase	3,613
S8	S4 OR S5 OR S6 OR S7	Search modes - Boolean/Phrase	61,090
S7	TI knee# OR AB knee#	Search modes - Boolean/Phrase	55,099
S6	(MH "Osteoarthritis, Knee")	Search modes - Boolean/Phrase	10,366
S5	(MH "Knee Joint")	Search modes - Boolean/Phrase	15,719
S4	(MH "Knee")	Search modes - Boolean/Phrase	8,494

S3	S1 OR S2	Search modes - Boolean/Phrase	15,499
S2	TI (TKA OR TKR) OR AB (TKA OR TKR)	Search modes - Boolean/Phrase	5,729
S1	MH "Arthroplasty, Replacement, Knee"	Search modes - Boolean/Phrase	14,527

Cochrane Central Register of Controlled Trials (Cochrane Library)

ID	Search	Hits
#1	MeSH descriptor: [Arthroplasty, Replacement, Knee] this term only	2327
#2	MeSH descriptor: [Knee Prosthesis] this term only	680
#3	(TKA OR TKR):ti,ab,kw	2926
#4	#1 OR #2 OR #3	4359
#5	MeSH descriptor: [Knee] this term only	754
#6	MeSH descriptor: [Knee Joint] this term only	3011
#7	MeSH descriptor: [Osteoarthritis, Knee] this term only	3631
#8	knee*:ti,ab,kw	26320
#9	#5 OR #6 OR #7 OR #8	26320
#10	MeSH descriptor: [Arthroplasty, Replacement] this term only	151
#11	(arthroplast* or replace*):ti,ab,kw	39106
#12	#10 OR #11	39106
#13	#9 AND #12	7670
#14	#4 OR #13	7876
#15	MeSH descriptor: [Preoperative Care] this term only	4062
#16	MeSH descriptor: [Preoperative Period] this term only	254
#17	(preop* or presurg* or *prehab* or teleprehab* or prepar*):ti,ab,kw	80705
#18	#15 or #16 or #17	80705
#19	MeSH descriptor: [Patient Education as Topic] this term only	8337
#20	MeSH descriptor: [Health Education] this term only	3700
#21	MeSH descriptor: [Consumer Health Information] explode all trees	445

#22 MeSH descriptor: [Teach-Back Communication] this term only 7

#23 MeSH descriptor: [Educational Technology] explode all trees 3641

#24 MeSH descriptor: [Patient Education Handout] this term only 0

#25 ((health* or educat* or inform* or knowledge or teach*) NEAR/2 (class* or group* or program* or school* or booklet* or leaflet* or DVD* or YouTube or video* or website* or "web platform" or "web platforms" or "web page" or "web pages" or web-page* or microsite* or app or application* or multimedia)):ti,ab,kw 34544

#26 ((patient* NEAR/1 educat*) or psychoeducat*):ti,ab,kw 16450

#27 MeSH descriptor: [Exercise] explode all trees 22364

#28 MeSH descriptor: [Exercise Therapy] explode all trees 12291

#29 MeSH descriptor: [Exercise Movement Techniques] explode all trees 1903

#30 MeSH descriptor: [Rehabilitation] this term only 305

#31 MeSH descriptor: [Hospitals, Rehabilitation] this term only 1

#32 MeSH descriptor: [Rehabilitation Centers] this term only 305

#33 MeSH descriptor: [Rehabilitation Nursing] this term only 54

#34 MeSH descriptor: [Rehabilitation Research] this term only 3

#35 MeSH descriptor: [Recreation Therapy] this term only 18

#36 MeSH descriptor: [Telerehabilitation] this term only 82

#37 MeSH descriptor: [Physical and Rehabilitation Medicine] this term only 18

#38 MeSH descriptor: [Physical Therapy Modalities] this term only 3438

#39 MeSH descriptor: [Occupational Therapy] this term only 708

#40 MeSH descriptor: [Hydrotherapy] this term only 186

#41 ((joint* or knee* or motor or physical* or cardio* or strength* or propriocept* or balance or neuromuscular or aerobic or weight or stretch* or resistance or

endurance or aqua*) NEAR/1 (school* or train* or activit* or fit* or program* or class* or therap*)):ti,ab,kw 59864

#42 (*rehab* or *prehab* or telerehab* or teleprehab* or *exercis* or *physiotherap* or hydrotherap* or "occupational therapy" or swim* or cycl* or bik* or "self management" or self-management):ti,ab,kw 201739

#43 MeSH descriptor: [Psychotherapy] explode all trees 22131

#44 MeSH descriptor: [Mind-Body Therapies] explode all trees 5852

#45 MeSH descriptor: [Counseling] this term only 3897

#46 MeSH descriptor: [Distance Counseling] this term only 10

#47 MeSH descriptor: [Directive Counseling] explode all trees 1086

#48 (psychotherap* or "guided imagery" or CBT or relax* or hypnosis or "motivational interviewing" or mindfulness or counsel* or "pain coping skills training"):ti,ab,kw 56223

#49 ((psychologic* or behavio* or cognitive or emotion* or mind) NEAR/1 (intervention* or technique* or therap* or treat* or prepar* or restructur* or reframe* or distract*)):ti,ab,kw 34075

#50 MeSH descriptor: [Health Promotion] explode all trees 5902

#51 MeSH descriptor: [Diet Therapy] explode all trees 5514

#52 MeSH descriptor: [Life Style] explode all trees 4886

#53 MeSH descriptor: [Alcohol Abstinence] this term only 62

#54 MeSH descriptor: [Smoking Cessation] this term only 3779

#55 MeSH descriptor: [Smoking Reduction] this term only 9

#56 MeSH descriptor: [Tobacco Use Cessation] this term only 94

#57 ("physical activity" or "weight loss" or "weight reduction" or diet*):ti,ab,kw 108647

#58 ((behavio* or lifestyle* or health*) NEAR/1 (chang* or modif* or motivat* or promot* or educat* or inform* or teach*)):ti,ab,kw 32720

#59 ((smoking or tobacco or alcohol) NEAR/1 (cessat* or reduc* or stop* or quit*)):ti,ab,kw 11986

#60 MeSH descriptor: [Nutrition Therapy] this term only 122

#61 MeSH descriptor: [Dietary Supplements] explode all trees 11356

#62 MeSH descriptor: [Functional Food] this term only 105

#63 MeSH descriptor: [Micronutrients] explode all trees 3348

#64 MeSH descriptor: [Minerals] explode all trees 3650

#65 ((nutrition* NEAR/1 supplement*) or probiotic* or prebiotic* or synbiotic* or "functional food" or nutraceutical* or nutrient* or glucosamine or chondroitin or curcumin or "fish oil" or "fish oils" or "omega 3" or vitamin* or mineral* or "trace element" or "trace elements" or flavonoid* or (hydroly* NEAR/1 collagen)):ti,ab,kw 61835

#66 MeSH descriptor: [Transcutaneous Electric Nerve Stimulation] this term only 1035

#67 (electrotherap* or "transcutaneous electrical nerve stimulation" or TENS):ti,ab,kw 2901

#68 MeSH descriptor: [Therapy, Soft Tissue] explode all trees 1365

#69 MeSH descriptor: [Trigger Points] this term only 101

#70 (massag* or "soft tissue therapy" or "trigger point" or "trigger points"):ti,ab,kw 5674

#71 MeSH descriptor: [Orthotic Devices] explode all trees 1307

#72 (orthotic* or orthos* or insole* or "arch support" or (knee NEAR/1 brace*)):ti,ab,kw 5345

#73 MeSH descriptor: [Acupuncture] this term only 141

#74 MeSH descriptor: [Acupuncture Therapy] explode all trees 4361

#75 (acupuncture or acupressure or "dry needling"):ti,ab,kw 14658

#76 MeSH descriptor: [Rehabilitation, Vocational] explode all trees 428

#77 ((occupation* or vocation*) NEAR/1 rehab*):ti,ab,kw 733

#78 #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR #55 OR #56 OR #57 OR #58 OR #59 OR #60 OR #61 OR #62 OR #63 OR #64 OR #65 OR #66 OR #67 OR #68 OR #69 OR #70 OR #71 OR #72 OR #73 OR #74 OR #75 OR #76 OR #77 448388

#79 #14 and #18 and #78 651

#80 MeSH descriptor: [Animals] explode all trees 15483

#81 MeSH descriptor: [Humans] explode all trees 8286

#82 #80 NOT #81 7197

#83 #79 NOT #82 651

#84 #79 NOT #82 with Publication Year from 2009 to 2019, in Trials 530

Content and delivery of pre-operative interventions for patients undergoing total knee replacement: a rapid review

Additional File 3: Data items

Supplementary Table 2: Outcomes study data items

Data area	Data item	Definition
General study information	Number	Study number (allocated by reviewer)
	Title	Study title
	First author	First author of study
	Year	Year of publication
	Country	Country of origin
Study characteristics	Aim	Study aim and/or objectives
	Design	Study design
	Methods overview	Brief summary of study methods, including details of any comparator group(s) and co-interventions
	Sample size calculation	Sample size calculation if reported
	Outcomes	All outcomes reported for patients undergoing TKR that are directly relevant to patients and the assessment time points (this includes patient-reported outcomes, objectively measured patient outcomes, patient healthcare utilisation and patient harms, but does **not** include costs, healthcare workload or blood test results)
Participant characteristics	Eligibility criteria	Eligibility criteria e.g. type of surgery, time pre- or post-surgery, age threshold etc.
	Total number randomized	Total number of participants randomized

	Completion number	Number of participants who completed outcomes at the final assessment time point
	Number per subgroup	Number of participants in specific subgroups if applicable e.g. THR versus TKR etc.
	Number per intervention/ control group	Number of participants in the intervention and control groups
	Age	Mean ± SD for all participants undergoing TKR if provided, otherwise any details about participant age
	Gender/sex	% female for all participants undergoing TKR if provided, otherwise any details about participant gender/sex
	BMI	Mean ± SD for all participants undergoing TKR if provided, otherwise any details about participant BMI
Intervention overview	Type	Type of intervention based on the following categories: education, exercise, psychological, lifestyle, other. A single intervention may be classified as more than one type if appropriate
	Summary	Brief overview of the intervention e.g. high-intensity strength training programme, educational website, CBT-based intervention etc.
	Rationale[a]	Details about the rationale, theory or goals of the intervention. These may refer to the intervention overall or to specific intervention components e.g. the aim of the educational component of the intervention was to augment patients' knowledge and engagement in exercises, the intervention was based on the principles of self-efficacy etc.
Intervention components	Component(s)[a]	Any types of exercise, educational topics or other activities included in the intervention or used to support engagement with the intervention e.g. strengthening exercises, information on pain management, goal setting etc. (for informational materials such as a booklet, only the information topics should be listed here, with the type of delivery format being listed in the 'delivery mode(s)' column)
Intervention delivery approaches	Provider(s)[a]	The person/people who provided the intervention, including their disciplinary background e.g. nurses, specially trained physiotherapists, expert patients etc.
	Delivery mode(s)[a]	How the intervention was delivered, including whether it was provided to individuals or a group e.g. face-to-face supervised sessions in groups of three, booklet etc.
	Setting(s)[a]	The types of location where the intervention was delivered e.g. patient's home, hospital, outpatient clinic etc.
	Schedule[a]	When the intervention was delivered, the number of times the intervention was delivered and/or the time period over which the intervention was delivered e.g. 3 sessions per week

		delivered for 8 weeks prior to surgery, up to 10 sessions delivered between being listed for surgery and undergoing surgery etc.
	Intensity[a]	The duration, intensity and dose of individual sessions of an intervention e.g. 20 minute educational sessions, 60 minute exercise sessions with a training intensity starting at 14 repetitions maximum and progressing to 10 repetitions maximum. Progression is only included if the authors state that the exercises were progressed/increased (or equivalent)
	Tailoring[a]	Whether the intervention was personalised according to participants' individual needs e.g. lifting weights was based on repetitions maximum, the cognitive behavioural therapy intervention was tailored to each patient etc. Providing an opportunity to ask questions alone is not sufficient to class the intervention as tailored
Study findings	Summary	Brief summary of the overall study findings, including reasons for dropouts and adherence to the intervention if reported. Only record TKR-specific findings for studies with multiple subgroups where appropriate.
	Outcomes improved	Patient outcomes for which there were statistically significant between group differences (alpha = 0.05) in favour of the intervention group, including p-values (but not effect sizes)
	Outcomes not improved	Patient outcomes for which there were **not** statistically significant between group differences (alpha = 0.05) in favour of the intervention group, including p-values (but not effect sizes)
	Harms	Details of any harms associated with the intervention

BMI body mass index, *THR* total hip replacement, *TKR* total knee replacement, *SD* standard deviation

[a] The intervention data items were based on the Template for Intervention Description and Replication (TIDieR) checklist and guide (1).

Supplementary Table 3: Views study data items

Data area	Data item	Definition
General study information	Number	Study number (allocated by reviewer)
	Title	Study title
	First author	First author of study
	Year	Year of publication
	Country	Country of origin
Study characteristics	Aim	Study aim and/or objectives
	Design	Study design
	Methods overview	Brief summary of study methods, including the phenomenon of interest, context, data collection methods, data analysis methods and any theories used to interpret the results as appropriate
Participant characteristics	Eligibility criteria	Eligibility criteria e.g. type of surgery, time pre- or post-surgery, BMI threshold etc.
	Total number enrolled	Total number of participants in the study
	Completion number	Number of participants who completed the study
	Number per subgroup	Number of participants in specific subgroups if applicable e.g. THR versus TKR etc.
	Age	Mean ± SD for all participants who met the review eligibility criteria, otherwise any details about participant age
	Gender/sex	% female for all participants who met the review eligibility criteria, otherwise any details about participant gender/sex
	BMI	Mean ± SD for all participants who met the review eligibility criteria, otherwise any details about participant BMI
Study findings	Summary	Brief summary of the study findings. Only record TKR-specific findings for studies with multiple subgroups where appropriate.
	Intervention type(s)[a]	Any intervention types for which intervention component(s) or delivery approach(es) are described
	Component(s)[a]	Details of participants' experiences and perspectives of specific intervention components, linked to a specific type of intervention where possible

	Provider(s)[a]	Details of participants' experiences and perspectives of specific intervention provider(s), linked to a specific type of intervention where possible
	Delivery mode(s)[a]	Details of participants' experiences and perspectives of specific intervention delivery modes, linked to a specific type of intervention where possible
	Setting(s)[a]	Details of participants' experiences and perspectives of specific intervention settings, linked to a specific type of intervention where possible
	Schedule[a]	Details of participants' experiences and perspectives of specific intervention schedules, linked to a specific type of intervention where possible
	Intensity[a]	Details of participants' experiences and perspectives of specific intervention intensities, linked to a specific type of intervention where possible
	Tailoring[a]	Details of participants' experiences and perspectives of intervention tailoring, linked to a specific type of intervention where possible

BMI body mass index, *TKR* total knee replacement, *THR* total hip replacement, *SD* standard deviation

[a] The study findings data items were based on the Template for Intervention Description and Replication (TIDieR) checklist and guide (1)

Reference

1. Hoffmann TC, Glasziou PP, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. BMJ. 2014;348:g1687.

Content and delivery of pre-operative interventions for patients undergoing total knee replacement: a rapid review

Additional File 4: Outcomes studies' characteristics and results

Supplementary Table 4: Characteristics and results of the included outcomes studies

Citation, country	Primary aim	Design	Participants[ab]	Patient outcomes[a]	Key findings[ac]
Bergin et al., 2014 (1), USA	To investigate the effects of pre-op incentive spirometry education on post-op outcomes amongst patients undergoing TKR or THR	**Quantitative: Two-arm RCT** Participants were recruited from a single community not-for-profit hospital. **Control group:** Attended a pre-op education class involving provision of an incentive spirometry device and informal education about its use. Were asked to complete daily study diaries on incentive spirometry use for up to 1 week post-op. **Intervention group:**	**Control group:** N=27 **Intervention group** N=21 (N is the number of participants included in the analysis for the outcomes listed. Participants who had not achieved their baseline	Average hours for incentive spirometry volume to return to baseline post-op Pain at return to baseline incentive spirometry volume	Average hours for incentive spirometry volume to return to baseline was significantly greater in the intervention group compared to the control group. Pain at return to baseline incentive spirometry volume did not differ significantly between groups.

		Attended the same pre-op education class as the control group. Following the main education class, also received formal education about incentive spirometry and were instructed to use the incentive spirometry device for 1 week pre-op. Were asked to complete daily study diaries on incentive spirometry use for 1 week pre-op and up to 1 week post-op.	incentive spirometry volume by the time of discharge were excluded)		
Blasco et al., 2020 (2), Spain	To investigate the effects of pre-op balance training on early post-op balance and functional outcomes amongst patients undergoing TKR and assess whether hospital and domiciliary training are equally effective	**Quantitative: Three-arm RCT** Participants were recruited from one hospital. **Control group:** Did not receive a pre-op intervention and were instructed to continue their usual activities. **Hospital (H) group:** Participated in a 12-session strength and balance/ proprioceptive training program for 4 weeks pre-op. The program included 4-5 balance and proprioceptive exercises per session. The sessions were all supervised by physiotherapists in a hospital setting. **Domiciliary (D) group:** Participated in a 12-session strength and balance/	**Control group:** N=29 Age: 70.9±9.5 Sex: 58% BMI: 31.2±4.6 **H group:** N=28 Age: 70.2±7.2 Sex: 76% BMI: 32.5±4.9 **D group:** N=29 Age: 72.3±4.5 Sex: 73% BMI: 30.8±5.7 (Demographic details are for the 26 control group, 25 H	BBS, KOOS, TUG, functional reach test, isometric knee extensor strength and active knee flexion and extension ROM at baseline (5-8 weeks pre-op), 1 week pre-op, 2 weeks post-op and 6 weeks post-op One-leg standing test at baseline, 1 week pre-op and 6 weeks post-op EQ-5D at baseline and 6 weeks post-op	No adverse events related to the pre-op interventions occurred. The functional reach test scores differed significantly between groups at baseline. Significant between-group differences in favor of the H and D groups compared to the control group were identified for: - change from baseline to 1 week pre-op in all outcomes except for knee flexion ROM - change from baseline to 6 weeks post-op in the BBS No other significant between-group differences were identified.

		proprioceptive training program for 4 weeks pre-op. The program involved similar exercise types and volume to the H group program. The program was delivered via one instruction session, followed by unsupervised sessions, a review session after two weeks and weekly telephone calls to check compliance.	group and 26 D group participants who were included in the analysis)		
Brown et al., 2012 (3), USA	To investigate whether patients with knee OA who participate in an exercise program before TKR surgery report higher quality of life at 3 months post-op compared to patients who do not participate in a pre-op exercise program	**Quantitative: Pilot two-arm RCT** Participants were recruited from an individual doctor's office. **Control group:** Received usual care only (usual pre-op care not described). **Intervention group:** Participated in an exercise program three times weekly (one supervised session, two unsupervised sessions) for 8 weeks pre-op. The exercise program included a warm-up, eight resistance exercises, six flexibility exercises, three step exercises and a cool-down.	**Control group:** N=15 BMI: 34.6±7.6 **Intervention group:** N=17 BMI: 38.8±8.8	SF-36 at 3 months post-op	Amongst the intervention group participants, the adherence rate was 89% and the average length of the pre-op exercise program was 6.3±1.5 weeks. The SF-36 physical function scores were significantly higher in the intervention group than the control group at 3 months post-op. No other significant between-group differences were identified.
Brown et al., 2014 (4), USA	To investigate whether patients with knee OA who participate in an exercise program before TKR surgery	**Quantitative: Two-arm RCT** Participants were recruited from a single orthopaedic surgery clinic. **Control group:**	**Control group:** N=18 Age: 67±9.5 Gender/sex: 56% BMI: 34.6±7.6	Self-efficacy to exercise scale and outcome expectations for exercise scale at 8 weeks pre-op, 1 week pre-op, 1	No significant between-group differences were identified for any outcome at any time point.

	report higher self-efficacy to exercise and outcome expectations for exercise compared to patients who do not participate in a pre-op exercise program	Received usual care only (2-3 hour educational program provided ~2 weeks pre-op). **Intervention group:** Participated in a pre-op exercise program three times weekly (one supervised session, two unsupervised sessions) for 8 weeks pre-op. The exercise program was based on the constructs of the Social Cognitive Theory and included a warm-up, eight resistance exercises, six flexibility exercises, three step exercises and a cool-down.	**Intervention group:** N=19 Age: 60±8.3 Gender/sex: 45% BMI: 38.8±8.8 (Demographic details are for the 15 control and 16 intervention group participants who were retained at the final data collection point)	week post-op and 2 weeks post-op	
Calatayud et al., 2017 (5) Casaña et al., 2019 (6), Spain	To investigate the effects of a pre-op high intensity resistance exercise program, with secondary balance component, on outcomes and length of hospital stay amongst patients undergoing TKR	**Quantitative: Two-arm RCT** Participants were recruited from a single hospital. **Control group:** Did not receive any supervised exercise training but were advised to perform two isometric knee extension strengthening exercises and one isometric hip flexion strengthening exercise every day. **Intervention group:** Participated in a supervised pre-op high-intensity exercise program three times weekly for 8	**Control group:** N=25 Age: 66.7±3.1 Gender: 86.4% BMI: 31±3.8 **Intervention group:** N=25 Age: 66.8±4.8 Gender: 81.8% BMI: 32±4.2 (Demographic details are for the 22 control	WOMAC; SF-36 (physical functioning scale only); 10cm VAS pain scale; isometric knee flexion, knee extension and hip abduction strength; active knee flexion and extension ROM; TUG, stair ascent-descent test and center of pressure	Significant between-group differences in favor of the intervention group were identified for: - WOMAC; SF-36; VAS pain scores; isometric knee flexion and hip abduction strength; knee flexion and extension ROM; TUG; stair ascent-descent test; and the center of pressure area during both Romberg tests at all follow-up time points

		weeks pre-op. The exercise program included a warm-up, four lower limb strength exercises, two balance exercises and a cool-down.	group and 22 intervention group included in the analysis)	during the Romberg test with eyes open and eyes closed at 8 weeks pre-op, after 8 weeks of training (pre-op), 1 month post-op and 3 months post-op Length of hospital stay	- most of the additional center of pressure measurements at one or more follow-up time points. - isometric knee extension strength at all follow-up time points other than 1 month post-op. - length of hospital stay
das Nair et al., 2018 (7), UK	To investigate the feasibility of conducting an RCT to evaluate the clinical and cost-effectiveness of a CBT-based pre-op psychological intervention for patients undergoing TKR due to knee OA	**Mixed methods: Two-arm feasibility RCT** Participants were recruited from two NHS hospital knee surgery pathways. Only individuals with anxiety or depression (defined as a score of >7 on the anxiety or depression subscale of the HADS) were eligible to participate. **Control group:** Received usual care (no psychologist input or focus on the participant's psychological state). **Intervention group:** Received usual care plus up to 10 sessions of a CBT-based pre-op psychological intervention. The psychological intervention was delivered by a psychologist in the participant's home or at a hospital and included psychoeducation on	**Control group:** N=25 Age: 66.7±9.9 Gender: 36% **Intervention group:** N=25 Age: 65.7±8.6 Gender: 56% (One additional participant was randomized but did not meet the inclusion criteria so their data were excluded from the analyses)	WOMAC, Intermittent and Constant Osteoarthritis Pain Scale, Beck Depression Inventory, Beck Anxiety Inventory and EQ-5D-5L at baseline, 4 months post-randomization and 6 months post-randomization Service use questionnaire	Six intervention group participants completed the intervention as planned. The number of intervention sessions received was 2-8 (mode=3). WOMAC function scores were significantly lower (indicating better function) in the intervention group than the control group at 6 months post-randomization, but the authors suggested that this was probably a chance finding due to multiple comparisons. No other significant between group differences in outcomes were identified. The authors concluded that a definitive RCT is feasible with changes to the intervention and study procedures.

		mood and pain, values-based goal setting, self-management and behavioral activation, relaxation and mindful breathing, cognitive restructuring and post-op planning.			
Doiron-Cadrin et al., 2019 (8), Canada	To investigate the feasibility and potential effects on pain and disability of a telerehabilitation prehabilitation programme in comparison to in-person prehabilitation or usual care amongst patients listed for TKR or THR	**Quantitative: Pilot three-arm RCT** Participants were recruited from one tertiary care hospital and one community hospital. Only individuals with access to a high-seed internet connection were eligible. **Control group:** Did not receive any prehabilitation but did receive the hospital's usual pre-op care (single home visit from a community physiotherapist involving provision of a booklet on the surgery, medication and rehabilitation). **In-person prehabilitation (I) group:** Participated in a 12-week pre-op exercise program involving two in-person supervised sessions and five unsupervised sessions per week. The program included education, walking aid adjustment, a warm-up, hip and knee strengthening exercises, hip and knee mobility exercises,	**Control group:** N=6 **I group:** N=5 **T group:** N=6	French-Canadian versions of the LEFS, WOMAC and SF-36; self-paced walk test, TUG and timed stair test at baseline and 12 weeks later French-Canadian version of the GRC scale at the 12 week follow-up (success was defined as a GRC score of +2 or higher, failure was defined as a GRC score of +1 or lower) Participants in the T group completed a satisfaction questionnaire but the results are not reported separately for	Of the 12 participants in the T group (six TKR, six THR), one withdrew due to shoulder pain and four requested in-person appointments due to increased pain/other musculoskeletal problems. Issues with the planned videoconferencing application meant two additional video conferencing applications and telephone calls were used to deliver some of the T group supervised sessions. The proportions of success based on the GRC scale scores were significantly higher in the I and T groups compared to the control group. No other significant between-group differences were identified. The authors concluded that the telerehabilitation prehabilitation program appears safe, feasible and satisfactory for patients and a

		proprioceptive exercises and completion of a log book. **Telerehabilitation prehabilitation (T) group:** Participated in a 12-week pre-op exercise program involving two sessions supervised via an internet-based telecommunication mobile application per week and five unsupervised sessions per week. If the participant's pain increased during the program, they could have an in-person appointment. The exercise program involved the same components at the I group exercise program.		patients listed for TKR	fully-powered RCT of the program is warranted.
Domínguez-Navarro et al., 2020 (9), Spain	To investigate the effects of pre-op combined strength and balance training on balance and functional outcomes amongst patients undergoing TKR, and compare the combined training to strength training only and no intervention	**Quantitative: Three-arm RCT** Participants were recruited from one hospital. **Control group:** Did not receive any pre-op experimental interventions. **Strengthening (S) group:** Participated in a 12-session strength-training program for 4 weeks pre-op. The program included a warm-up, six lower limb strengthening exercises and a cool-down. **Strengthening plus balance and proprioceptive exercise (B) group:**	**Control group:** N=28 Age: 70.2±5.6 Gender/sex: 66.7% **S group:** N=28 Age: 70.8±5.4 Gender/sex: 58.3% **B group:** N=26 Age: 70.4±6.4 Gender/sex: 65.0%	BBS, KOOS, TUG, functional reach test, isometric knee extensor strength and active knee flexion and extension ROM at baseline (5-8 weeks pre-op), 1 week pre-op (end of pre-op intervention), 2 weeks post-op, 6 weeks post-op and 1 year post-op	No adverse events directly related to the pre-op interventions occurred. Overall adherence to the pre-op interventions was 11.2 sessions (SD 0.7, adherence for each group not reported). Significant between-group differences in favor of the S and B groups compared to the control group were identified for: - change from baseline to 1 week pre-op in BBS, KOOS-ADL, KOOS-symptoms, KOOS-pain,

		Participated in a 12-session strength and balance/ proprioceptive training program for 4 weeks pre-op. The program included all elements of the ST group program plus approximately 4-5 balance and proprioceptive exercises per session.	(Demographic details are for the 21 control, 24 S and 20 B participants who completed the 6-week post-op assessments)	Single leg stance and EQ-5D at baseline, 1 week pre-op, 6 weeks post-op and 1 year post-op	knee extensor strength and TUG - change from baseline to 6 weeks pre-op in knee extensor muscle strength - single-leg stance test at 1 year post-op No other significant between-group differences were identified.
Eschalier et al., 2017 (10), France	To investigate the effects of an information booklet on TKR-focused knowledge amongst patients undergoing TKR	**Quantitative: Two-arm RCT** Participants were recruited from a single teaching Hospital. **Control group:** Received standard oral pre-op information from their surgeon. **Intervention group:** Received standard oral pre-op information from their surgeon. At the end of their pre-anesthesia appointment, also received an information booklet and were asked to read it multiple times. The booklet included 10 chapters covering numerous topics related to TKR. The booklet was developed and validated through a previous research study[1]	**Control group:** N=20 Age: 66.8±5.8 Sex: 50% BMI: 31.6±5.4 **Intervention group:** N=22 Age: 68.1±4.7 Sex: 45% BMI: 31.2±5.1	TKR knowledge questionnaire and patient beliefs questionnaire assessed at baseline (4-6 weeks pre-op), day 1 pre-op and 3-6 weeks post-op Satisfaction with the information received at 3-6 weeks post-op Surgery-ward length of stay Proportion of patients discharged home	Mean total knowledge score did not differ significantly between groups at any time point. Improvements in the knowledge score from baseline to day 1 pre-op and from baseline to 3-6 weeks post-op were significantly greater in the intervention group than the control group. From baseline to day 1 pre-op, the proportion of expected responses for the beliefs questionnaire significantly increased for two items and significantly decreased for one item in the intervention group, and these changes were

[1] Eschalier B, Descamps S, Boisgard S, Pereira B, Lefevre-Colau MM, Claus D, et al. Validation of an educational booklet targeted to patients candidate for total knee arthroplasty. Orthop Traumatol Surg Res. 2013;99(3):313-9.

					significantly greater than in the control group. No significant between-group differences were identified for any other outcomes.
Gränicher et al., 2020 (11), Switzerland	To investigate the effects of pre-op physiotherapy on post-op functional, subjective and socio-economic outcomes amongst patients undergoing TKR	**Quantitative: Pilot two-arm RCT** Participants were recruited from one University hospital. **Control group:** Were asked to maintain the same activity level as before their baseline assessment and not start any new therapy/training in the pre-op phase. **Intervention group:** Participated in 5-9 sessions of individualised physiotherapy within 3-4 weeks pre-op. The physiotherapy sessions included endurance training, education (including on self-training at home), hamstring and quadriceps PNF contract-relax-antagonist-contract techniques and individually indicated interventions (lower limb strengthening, sensorimotor training and/or electromyostimulation training)	**Control group:** N=10 Age: 68.1±7.7 Gender/sex: 50% **Intervention group:** N=10 Age: 66.6±7.5 Gender/sex: 30%	Stair climbing test, active knee flexion ROM and German versions of the Lysholm Scale and Tegner Activity Scale at baseline (3-4 weeks pre-op), immediately pre-op and 3 months post-op PGIC at 3 months post-op (clinically significant improvement was defined as a score of 1 or 2) Length of stay at inpatient rehabilitation Daily pre-op NRS pain scores Pre-op MET based on participant-recorded daily activities (excluding	No adverse events occurred. 80% of intervention group participants completed nine physiotherapy sessions as planned. Significant group by time interactions were identified for the Lysholm Scale pain score and Tegner Activity Scale score, with higher scores in the intervention group compared to the control group at both follow-up time points. However, the significance of between-group differences at the follow-up time points is not reported. Pre-op METs were significantly higher in the intervention group compared to the control group. No other significant between-group differences were identified.

				intervention-related activities) Participant-reported duration of post-op medication consumption	
Gstoettner et al., 2011 (12), Austria	To investigate the effects of a pre-op proprioceptive exercise program on post-op balance and function amongst patients undergoing TKR	**Quantitative: Two-arm RCT** Participants were recruited from an orthopaedic department. **Control group:** No details reported. **Intervention group:** Participated in a proprioceptive exercise program daily (one supervised session, six unsupervised sessions) for 6 weeks pre-op. The exercise program included a warm-up, five lower limb stretches and four proprioceptive/balance exercises.	**Control group:** N=20 Age: 66.9 Gender/sex: 70% BMI: 28.2 **Intervention group:** N=18 Age: 72.8 Gender/sex: 88.9% BMI: 27.4 (SD not reported)	Standing balance test (antero-posterior stability index, medio-lateral stability index and overall stability index), timed 60m walk, stair ascent and descent test, WOMAC and KSS at 6 weeks pre-op, after the exercise training program (pre-op, intervention group only) and 6 weeks post-op	At baseline, the WOMAC function scores were significantly lower (indicating better function) in the intervention group compared to the control group. At 6 weeks post-op, the antero-posterior stability index was significantly lower (indicating greater stability) in the intervention group compared to the control group. No other significant between-group differences were identified.
Huber et al., 2015a (13), Switzerland	To investigate the effects of a pre-op neuromuscular exercise program combined with a pre-op education program	**Quantitative: Two-arm RCT** Participants were recruited by orthopaedic surgeons from two hospitals. **Control group:** Attended a pre-op knee school that started ~4 weeks pre-op and consisted of three individual or	**Control group:** N=23 Age: 71.9±8.1 Gender: 43.5% BMI: 29.9±5.5 **Intervention group:**	CST, KOOS, isometric knee flexor and extensor strength bilaterally, maximal number of knee-bending in 30 sec, knee	63.6% of intervention group participants reported increased pain 24 hours after exercising. One intervention group participant missed two exercise sessions due to increased pain.

	compared to the pre-op education program alone on pain and function amongst patients undergoing TKR due to knee OA	group sessions (one per week) delivered by a specially-trained physiotherapist. The knee school focused on educating patients about knee OA, the preparation phase for TKR and the acute rehabilitation phase following TKR. **Intervention group:** Attended the same pre-op knee school as the control group participants and participated in a supervised group-based neuromuscular exercise program twice weekly for 4-12 weeks pre-op. The exercise program included a warm-up, circuit program with four exercise circles (core stability/postural function, postural orientation/functional alignment, lower limb muscle strength and functional exercises) and a cool-down.	N=22 Age: 68.8±8.0 Gender: 50% BMI: 30.8±4.9	flexion and extension ROM bilaterally, timed 20m walk test, TUG, physical activity using the SenseWear armband, adapted NHANES III METs, SF-36 and EQ-5D at baseline, 1 week pre-op, 6 weeks post-op (self-report questionnaires only), 3 months post-op and 12 months post-op (self-report questionnaires only)	76.2% of the intervention group participants met the pre-defined adherence goal of attending ≥8 training sessions. No significant between group differences were identified for any outcomes at any time point.
Jahic et al., 2018 (14), Bosnia and Herzegovina	To investigate the effects of a pre-op exercise program on post-op outcomes amongst patients undergoing TKR compared to a control group	**Quantitative: Two-arm RCT** Recruitment location not explicitly stated but all participants underwent TKR surgery at the same clinic. **Control group:** Received detailed information about surgery and were advised	**Control group:** N=10 Gender/sex: 70% BMI: 27.2±1.7 **Intervention group:** N=10	KSS and BMI at 6 weeks pre-op, immediately pre-op, 'post-op' (specific time point post-op not stated), 3 months post-op, 6 months	Significant between group differences in favor of the intervention group were identified for: - KSS function score immediately pre-op - KSS knee score immediately pre-op, 'post-

		not to gain weight pre- and post-op and to take care with their diet. **Intervention group:** Received the same information and advice as the control group and participated in a pre-op unsupervised exercise program three times daily for 6 weeks pre-op. The exercise program involved quadriceps strengthening, flexibility exercises and resistance training.	Gender/sex: 70% BMI: 27.1±2.1	post-op and 12 months post-op	op', 3 months post-op and 6 months post-op. No other significant between group differences were identified.
Leal-Blanquet et al., 2013 (15), Spain	To investigate whether an educational DVD influences pre-op expectations about post-op recovery amongst patients undergoing TKR (secondary aim was to find a biophysical profile of patients for whom the DVD could be most effective)	**Quantitative: Two-arm RCT** Participants were recruited from a single center. **Control group:** Received verbal information about TKR during their initial appointment with the orthopaedic surgeon; a specialist nurse appointment immediately after their initial surgeon appointment; and a second nurse appointment 4 weeks later. **Intervention group:** Received the same verbal information about TKR as the control group. Also watched an educational DVD during their second nurse appointment. The DVD covered the hospital stay, outpatient care, pain, function and rehabilitation.	**Control group:** N=50 Age: 73.4±6.5 Sex: 78% BMI: 31.7±6.1 **Intervention group:** N=42 Age: 72.1±7.4 Sex: 74% BMI: 30.5±4.7	KRES at the first nurse appointment (pre-intervention) and second nurse appointment (post-intervention)	For the KRES total score, the mean pre- and post-intervention expectations and the change in mean expectations from pre- to post-intervention did not differ significantly between groups. For the individual KRES items, the only significant between-group differences identified were: - lower post-intervention expectations for going up the stairs in the intervention group - greater change in mean expectations from pre- to post-intervention for going up the stairs and going down the stairs in the intervention group

		Participants watched the DVD twice (once with no interruptions, then again section by section with the opportunity to ask questions).			- greater change in mean expectations from pre- to post-intervention for knee ROM in the control group A biophysical profile of patients for whom the DVD could be most effective was not identified.
Lin et al., 2019 (16), China	To investigate whether pre-op CFNB education improves post-op analgesic efficacy amongst patients undergoing TKR (and whether the education reduces nurse PCA-related workload)	**Quantitative: Two-arm RCT** Participants were recruited from a single hospital. **Control group:** Received PCA pump operation training before returning to the ward and bedside PCA education on the ward. **Intervention group:** Received the same PCA pump training and education as the control group. Also attended a nurse-led educational session the day before their TKR. The educational session focused on an educational pamphlet focused on PCA (including falls prevention).	**Control group:** N=30 Age: 66.6±6.5 Gender: 73% BMI: 26.4±4.1 **Intervention group:** N=30 Age: 66.5±8.1 Gender: 90% BMI: 26.7±4.0	Knee flexion ROM, 10 item questionnaire assessing participants' knowledge of CFNB and PCA and VAS pain scores at rest and during movement at days 1 and 2 post-op	No adverse events occurred. Significant between-group differences in favor of the intervention group were identified for: - knowledge questionnaire scores at day 1 post-op - VAS pain scores at rest and during movement at days 1 and 2 post-op. No other significant between-group differences were identified.
Matassi et al., 2014 (17), Belgium	To investigate the effects of a pre-op home exercise program on pre-op ROM and post-op ROM and	**Quantitative: Two-arm RCT** Participants were recruited from a single hospital. **Control group:** Continued their usual activities pre-op.	**Control group:** N=61 Age: 67±7.7 Gender: 42.6% BMI: 28±3.7	Exercise adherence Knee extension ROM, active and passive knee flexion ROM and	Two participants experienced exercise-related problems (increasing knee pain that resulted in the participant stopping the exercises, ipsilateral adductor tendinitis).

	function amongst patients undergoing TKR	**Intervention group:** Participated in a pre-op home exercise program five times weekly for 6 weeks pre-op. The exercise program consisted of quadriceps stretches, hamstring stretches and four lower limb strengthening exercises.	**Intervention group:** N=61 Age: 66±7.2 Gender: 54.1% BMI: 29±4.3	KSS at 6 weeks pre-op, immediately pre-op, 6 weeks post-op, 6 months post-op and 12 months post-op Duration in days before reaching 90° knee flexion post-op Length of hospital stay	Amongst the intervention group participants, adherence to the exercise program was 79.4%±23%. Significant between-group differences in favor of the intervention group were identified for: - duration in days before reaching 90° knee flexion post-op - length of hospital stay No other significant between group differences were identified. There was a significant relationship between exercise adherence and the change in passive knee flexion ROM and the KSS knee score, but no other outcomes.
McKay et al., 2012 (18), Canada	To investigate the effects of a *'simple and easy-to-implement'* pre-op lower limb strengthening exercise program on quadriceps strength amongst patients undergoing TKR	**Quantitative: Pilot two-arm RCT** Participants were recruited from a single orthopaedic surgeon's outpatient clinic. **Control group:** Participated in a supervised upper body strengthening program three times weekly for 6 weeks pre-op. **Intervention group:** Participated in a supervised lower limb strengthening exercise program three times weekly for 6	**Control group:** N=12 Age: 60.6±8.1 Gender: 66.7% BMI: 33.8±7.1 **Intervention group:** N=10 Age: 63.5±4.9 Gender: 50% BMI: 35.0±6.1	Isometric quadriceps strength, flat surface walking test, stair ascent-descent test, WOMAC, SF-36 and ASES at 6 weeks pre-op, immediately post-intervention (pre-op), 6 weeks post-	Attendance at the training sessions 93% in the control group and 98% in the intervention group. No significant between-group differences were identified for any outcomes at any time point. (A significant time-by-group interaction was identified for the SF-36 mental component scores but no significant

		weeks pre-op. The exercise program involved four lower limb strengthening exercises. The exercise programs of the control and intervention groups involved the same aerobic warm-up, intensity and progression.		op and 12 weeks post-op	between-group differences were identified at any individual time points).
Medina-Garzon, 2019 (19), Colombia	To investigate the effects of a pre-op nursing intervention based on motivational interviewing on pre-op anxiety amongst patients undergoing TKR	**Quantitative: Two-arm RCT** Participants were recruited from a single specialized clinic. **Control group:** Received standard care only, which included a one-to-one pre-op education session with a nurse covering *'the surgical preparation and the procedure'.* **Intervention group:** Received standard care and three sessions of a pre-op motivational interviewing intervention delivered by a nurse over a 20-day period. The intervention sessions were 'mainly based on participants establishing their own goals to slowly change their lifestyles.'	**Control group:** N=28 Age: 73.7±16.6 Sex: 44.4% **Intervention group:** N=28 Age: 76.3±16.1 Sex: 50% (Demographic details are for the 27 control group and 28 intervention group participants who were included in the analysis)	Amsterdam Preoperative Anxiety and Information Scale at baseline and 4 weeks after completion of the intervention	The Amsterdam Preoperative Anxiety and Information Scale scores were significantly lower (indicating lower anxiety) in the intervention group compared to the control group post-intervention.
Rittharomya et al., 2020 (20), Thailand	To investigate the effects of a *'Preoperative Quadriceps Exercise and Diet Control*	**Quantitative: Two-arm RCT** Participants were recruited from a single University hospital. **Control group:**	**Control group:** N=48 Age: 52.3% aged 60-69; 47.7% aged 70-79	Self-Efficacy Expectation Questionnaire with quadriceps exercise and diet control sections at	Significant between-group differences in favor of the intervention group were identified for: - Self-Efficacy Expectation Questionnaire quadriceps

	Program' on self-efficacy for quadriceps exercise and diet control behaviour, BMI, pain, quadriceps strength, mobility and HRQOL amongst older adults listed for TKR surgery	Received standard care only, which involved provision of pre-op advice via a leaflet. **Intervention group:** Received standard care and a 12-week *'Preoperative Quadriceps Exercise and Diet Control Program'*. The intervention was based on Bandura's self-efficacy theory and involved quadriceps exercises and diet control. The intervention was delivered by a researcher in two group sessions in week 1, with monitoring via telephone or LINE application in weeks 2-12.	Gender: 88.6% 65.9% with BMI ≥25 **Intervention group:** N=48 Age: 54.2% aged 60-69; 45.8% aged 70-79 Gender: 89.6% BMI: 79.2% with BMI ≥25 (Demographic details are for the 44 control group and 48 intervention group participants who were included in the analysis)	baseline, 2 weeks, 8 weeks and 12 weeks NRS for knee pain intensity over the past 24 hours, quadriceps strength bilaterally, knee flexion ROM, TUG and adapted Thai version of the Mini-OAKHQOL at baseline, week 8 and week 12	exercise and diet control sections at weeks 2, 8 and 12 - right and left quadriceps strength, left knee flexion ROM, NRS pain score, TUG and adapted Thai version of the Mini-OAKHQOL at weeks 8 and 12 - right knee flexion ROM at week 12 Right knee flexion ROM at week 8 and BMI at weeks 8 and 12 did not differ significantly between groups.
Skoffer et al., 2016, 2020 (21, 22), Denmark	To investigate the effects of 4 weeks of pre-op and 4 weeks of post-op progressive resistance training compared to 4 week of post-op	**Quantitative: Two-arm RCT** Participants were recruited from the orthopaedic departments of one University hospital and one regional hospital. **Control group:** Were instructed to live as usual in the 4 weeks pre-op. Participated in a supervised progressive	**Control group:** N=29 Age: 70.1±6.4 Gender/sex: 58.6% BMI: 31.8 (range 24.3-42.2)	Dropout rate Adverse events CST, TUG, 10m walk test, 6 min walk test, isometric knee flexion and extension strength bilaterally, isokinetic affected	No participants missed exercise sessions or withdrew from the study due to intervention-related adverse events. Amongst the intervention group participants, adherence to the pre-op training program was 94.0±8.4%.

	progressive resistance training only on function, strength and patient-reported outcomes amongst patients undergoing TKR	resistance training program three times weekly for 4 weeks post-op. **Intervention group:** Participated in a supervised progressive resistance training program for three times weekly for 4 weeks pre-op and 4 weeks post-op. The pre-op and post-op training programs were the same and involved a warm-up, six lower limb resistance exercises and three lower limb stretches.	**Intervention group:** N=30 Age: 70.7±7.3 Gender/sex: 63.3% BMI: 30.0 (range 22.6-42.5)	knee flexion and extension strength, active and passive affected knee flexion and extension ROM, affected knee joint circumference, KOOS, 11 point NRS for knee pain (current pain, worst pain in past 14 days and average pain during past 14 days), prescribed and non-prescribed medication and HRQOL rating scale from 0 – 100 at 6 weeks pre-op, 1 week pre-op, 1 week post-op (strength testing of the affected leg not reported for this time point), 6 weeks post-op, 12 weeks post-op and 12 months post-op (isokinetic strength	Significant between group differences in favor of the intervention group were identified for the change from baseline in: - affected knee flexion and extension isometric muscle strength at 1 week pre-op, 6 weeks post-op, 12 weeks post-op and 12 months post-op - CST at 1 week pre-op, 6 weeks post-op and 12 weeks post-op - TUG at 1 week pre-op, 1 week post-op and 6 weeks post-op (p = 0.050 at 12 weeks post-op) - affected knee flexion and extension isokinetic muscle strength at 6 weeks post-op and 12 weeks post-op - isometric knee extension strength of the non-affected leg and KOOS sports/recreation scores at 6 weeks post-op - NRS pains scores at 1 week pre-op The change from baseline in knee circumference was significantly higher (indicating

				and medication not reported at this time point) Limb symmetry indices for normalized knee extension and knee flexion strength were calculated at 12 months post-op	greater effusion) amongst participants in the intervention group compared to the control group at 1 week pre-op but no other time points. No other significant between group differences were identified.
Soeters et al., 2018 (23), USA	To investigate whether a pre-op physical therapy session and access to a web-based microsite influences readiness to discharge from physical therapy, length of stay and WOMAC at 4-6 weeks post-op amongst patients undergoing TKR or THR	**Quantitative: Two-arm RCT** Participants were recruited from a single *'specialized orthopaedic institution'*. **Control group:** Received standard pre-op education (group pre-op education class and information booklet) **Intervention group:** Received the same standard pre-op education as the control group. Also received a single one-to-one pre-op physical therapy session and access to a web-based microsite. The physical therapy session covered multiple TKR-related topics and provided an opportunity to practice tasks, ask questions and set goals. The microsite was focused on rehabilitation and reinforced the	**Control group:** N=31 **Intervention group:** N=32	Number of post-op physical therapy visits required and length of time taken to meet inpatient physical therapy discharge criteria Length of hospital stay (WOMAC scores not reported separately for participants listed for TKR)	96% of all the intervention group participants (including 31 participants undergoing THR) reported using the microsite pre-op. Significant between-group differences in favor of the intervention group were identified for: - number of post-op physical therapy visits required to meet inpatient physical therapy discharge criteria - length of time taken to meet inpatient physical therapy discharge criteria Length of hospital stay did not differ significantly between groups.

		information provided at the physical therapy session.			
Soni et al., 2012 (24), UK	To investigate the effects of a pre-op combined exercise and acupuncture intervention on pre- and post-op pain and function amongst patients undergoing TKR	**Quantitative: Two-arm RCT** Recruitment location not explicitly stated but all authors were from a single NHS hospital. **Control group:** Received an exercise and advice leaflet. **Intervention group:** Received a pre-op combined exercise and Western medical style acupuncture intervention delivered by a physiotherapist once weekly for 4 weeks, then fortnightly for 4 weeks and then monthly until their surgery. The exercise program involved a circuit of 10 exercises.	**Control group:** N=28 Age: 69.9±7.9 Sex: 46.4% BMI: 31.1±4.9 **Intervention group:** N=28 Age: 66.9±9.8 Sex: 53.6% BMI: 31.4±4.2	OKS, 10cm pain VAS, HADS, 50m timed walk, BMI and analgesic use at baseline (pre-intervention), 6 weeks post-intervention, 12 weeks post-intervention and 3 months post-op	No adverse events occurred. VAS pain scores were significantly higher in the intervention group than the control group at baseline. No other significant between-group differences were identified for any outcomes at any time point. Seven participants decided not have surgery due to improved symptoms (six intervention group participants, one control group participant, odds ratio 7.64, 95% confidence interval 0.86 to 68.20, p=0.101). After 2 years, the six intervention group participants had still not undergone knee surgery but the control group participant had undergone bilateral TKR.
Stone et al., 2020 (25), USA	To assess the maximum change in extension from study enrolment to pre-op and two weeks post-op amongst patients using a	**Quantitative: Two-arm RCT** Participants were recruited from one institution. **Control group:** Received standard care only, which included standardized physical therapy and home exercise programs for at least 4 weeks pre-op.	**Control group:** N=59 Age: 69.0±8.0 Gender: 61.8% BMI: 32.7±5.9 **Intervention group:** N=56	Knee joint extension ROM (flexion contracture), KOOS and KSS function and knee scores at enrolment, the pre-op	No adverse events related to the device occurred. At enrolment, the mean flexion contracture was significantly greater (worse) in the intervention group compared to the control group. At the pre-op appointment, the mean flexion contracture was

	dynamic knee extension device. The secondary objective was to investigate between group differences in patient-reported outcomes.	**Intervention group:** Received standard care and wore a dynamic knee extension device (KneeMD) for up to 30 min three times daily until their surgery. The device was patient controlled, aimed to improve knee extension ROM and could be used during active and passive stretching.	Age: 68.4±8.9 Gender: 65.2% BMI: 33.1±7.4 (Demographic details are for the 55 control group and 46 intervention group participants who were included in the analysis)	appointment and 2 weeks post-op	lower (better) in the intervention group compared to the control group and the between-group difference approached significance (p=0.059). At 2 weeks post-op, there was no significant between-group difference in the percentage of participants with a flexion contracture of <5°. The authors do not report whether there were any statistically significant between-group differences in the KOOS and KSS, but the figures indicate the intervention group and control group confidence intervals for these outcomes overlap.
Swank et al., 2011 (26), USA	To investigate the effects of a 4-8 week pre-op TKR exercise program on lower limb strength and function amongst patients with severe knee OA	**Quantitative: Two-arm RCT** Participants were recruited from a single orthopaedic surgeon's office. **Control group:** Were advised to continue their normal activities prior to their TKR. **Intervention group:** Participated in an exercise program at least three times weekly (one supervised session, at least two unsupervised	**Control group:** N=35 Age: 62.6±7.6 Gender: 62.9% BMI: 32.9±5.7 **Intervention group:** N=36 Age: 63.1±7.3 Gender: 66.7% BMI: 35.9±8.5	6 min walk test, 30 sec sit-to-stand test, stair ascent and descent test, isokinetic knee flexion and extension strength bilaterally and VAS 1-10 pain scale after completing each of the above tests at 4-8 weeks pre-op	Amongst the intervention group participants, average compliance with the exercise sessions was 90%. Significant group by time interactions in favor of the intervention group were identified for: - sit-to-stand test - stair ascent time - peak extension torque of the affected leg

		sessions) for 4-8 weeks pre-op. The exercise program involved a warm-up, nine lower limb resistance exercises, forwards and lateral step training and a cool-down.		(pre-randomization) and during the week prior to the participant's TKR	No other significant group by time interactions were identified.
Topp et al. 2009 (27), USA	To investigate the effects of a pre-op TKR exercise program on pre- and post-op knee pain, function and quadriceps strength amongst patients with knee OA	**Quantitative: Two-arm RCT** Participants were recruited from a single orthopaedic surgeon's office. **Control group:** Were advised to continue their normal activities prior to their TKR. **Intervention group:** Participated in an exercise program at least three times weekly (one supervised session, at least two unsupervised sessions) for at least 4 weeks pre-op. The exercise program involved a warm-up, nine lower limb resistance exercises, forwards and lateral step training and a cool-down.	**Control group:** N=28 Age: 63.5±6.7 Gender: 36% BMI: 32.0±6.1 **Intervention group:** N=26 Age: 64.1±7.1 Gender: 27% BMI: 32.2±5.9 (Gender recorded as reported in Table 1 but the text suggests the reported percentages are for males rather than females)	6 min walk test, 30 sec sit-to-stand test, stair ascent and descent test, isokinetic knee extension strength bilaterally, isokinetic knee extension strength asymmetry and 10cm VAS for pain in the affected knee immediately after completion of each of the functional tasks at baseline (pre-randomization, minimum of 4 weeks pre-op), 1 week pre-op, 1 month post-op and 3 months post-op	Amongst intervention group participants, the average number of exercise sessions completed was 13.04±7.5. Significant between group differences in favor of the intervention group were identified at 1 week pre-op for: - sit-to-stand test - VAS pain scores after the 6 min walk test and the stair ascent test No other significant between group differences were identified. (Significance of between group-differences calculated by the review authors due to lack of reporting by the primary study authors).
Tungtrongjit et al., 2012	To compare post-op pain, ROM,	**Quantitative: Two-arm RCT**	**Control group:** N=30 Age: 65.9±7.2	10cm VAS knee pain scale, quadriceps	Significant between group differences in favor of the

(28), Thailand	quadriceps strength and quality of life between patients who participate in a pre-op quadriceps exercise program and patients who receive usual care only	Recruitment location not explicitly stated but all authors were from a single hospital. **Control group:** Were advised to continue their normal activities prior to their TKR. **Intervention group:** Participated in a home-based quadriceps strengthening exercise program three times daily for 3 weeks pre-op. Participants received weekly instructions about the exercise program via telephone. The exercise program involved seated knee extensions only.	Sex: 80.0% BMI: 25.3±3.8 **Intervention group:** N=30 Age: 63.0±7.6 Sex: 86.7% BMI: 24.3±2.4	strength, knee flexion, extension and total ROM and modified WOMAC score (Thai version) at baseline (3 weeks pre-op), 1 month post-op, 3 months post-op and 6 months post-op	intervention group were identified for: - VAS pain scores, all the modified WOMAC scores and quadriceps strength at 1 and 3 months post-op - modified WOMAC pain subscale scores at 6 months post-op No other significant between group differences were identified.
Villadsen et al., 2014a, 2014b (29, 30), Denmark	To investigate the effects of a pre-op neuromuscular exercise program on immediate and 3 month post-op outcomes amongst patients undergoing TKR or THR	**Quantitative: Two-arm RCT** Participants were recruited from a single hospital. **Control group:** Received standard pre-op education consisting of written information, an exercise leaflet and a 3-hour information session delivered in clinic by health professionals at 1 week pre-op. **Intervention group:** Received standard pre-op education and attended a supervised group-based neuromuscular exercise program twice weekly for 8 weeks pre-op.	**Control group:** N=40 Age: 65.1±9.0 Sex: 60.0% BMI: 33.4±5.8 **Intervention group:** N=41 Age: 67.1±8.8 Sex: 61.0% BMI: 30.8±4.9	KOOS; EQ-5D; 20m walk; five timed repeated chair stands; maximal knee bends in 30 sec; and dynamic power of knee extension, hip extension, hip abduction and multi-joint leg extension at baseline, post-intervention (pre-op), 6 weeks post-	One participant with hip OA stopped the exercise program due to increased pain, but no adverse events occurred amongst the participants undergoing TKR. Significant between group differences in favor of the intervention group were identified for the mean change from baseline in: - KOOS quality of life subscale, chair stands and knee bends of the operated leg at the post-intervention time point

		The exercise program included a warm-up, circuit program with four exercise circles (core stability/postural function, postural orientation, lower limb muscle strength and functional exercises) and a cool-down. Intervention group participants accepted an additional wait of up to 5 weeks for their TKR (the Danish Health Care System guarantees patients will receive TKR within 1 month of being listed for TKR).		op (self-report questionnaires only) and 3 months post-op	- KOOS activities of daily living subscale, KOOS pain subscale and EQ-5D VAS at 6 weeks post-op - hip abduction power bilaterally at 3 months post-op No other significant between-group differences were identified.
Walls et al., 2010 (31), Ireland	To assess compliance with a pre-op home-based NMES training program amongst patients undergoing TKR	**Quantitative: Pilot two-arm RCT** Participants were recruited from the pre-op assessment clinic of an elective orthopaedic unit. **Control group:** Received individual guidance from a physiotherapist on knee ROM and quadriceps strengthening exercises (recommended exercise frequency was twice daily). **Intervention group:** Participated in a home-based unsupervised NMES training program for 8 weeks pre-op. NMES was applied unilaterally to the quadriceps femoris muscle of the affected limb on alternate	**Control group:** N=5 Age: 63.2±11.4 Gender/sex: 80.0% BMI: 32.8±6.3 **Intervention group:** N=9 Age: 64.4±8.0 Gender/sex: 66.7% BMI: 30.7±3.0 (N and demographic details are for the participants	Isometric quadriceps strength, chair rise test, 25m timed walk, stair climb test, WOMAC and SF-36 at baseline, week 8 pre-op, week 6 post-op and week 12 post-op Length of post-op hospitalization (Quadriceps femoris cross-sectional area was also assessed but not classed as a	Compliance with the NMES training program was 99.4% and 90.0% according to patient and stimulator reports respectively. Significant between group differences in favor of the intervention group were identified for: - chair rise test at week 8 pre-op and week 12 post-op - stair climb test at week 12 post-op. No other significant between group differences were identified.

		days for 2 weeks and then five times weekly for 6 weeks.	who completed the study only)	patient outcome in this review)	
Wang et al., 2020 (32), China	To investigate the effectiveness of a pre-op Otago exercise program on lowering post-op limb swelling and falls occurrence and improving knee function and modified falls efficacy scale scores amongst patients undergoing TKR	**Quantitative: Two-arm RCT** Participants were recruited from one hospital. **Control group:** Received usual orthopaedic nursing care, including health education, perioperative functional exercise and regular follow-up telephone calls. **Intervention group:** Received usual orthopaedic nursing care and participated in an individualised Otago exercise program three times weekly for 4 weeks pre-op. The exercise program included a warm-up, four knee strengthening exercises and balance training.	**Control group:** N=110 Gender: 44% **Intervention group:** N=110 Gender: 46% (Gender is for the 100 control and 100 intervention group participants who were included in the analysis)	Active knee flexion ROM at pre-op (exact time point not reported) and the 1st, 3rd, 7th and 14th days post-op Barthel index for ADLs, HSS knee score and WOMAC at pre-op and the 14th day post-op MFES at pre-op and 1 month post-op	Significant between-group differences in favor of the intervention group were identified for: - active knee flexion ROM at the 7th and 14th days post-op - HSS knee scores and Barthel index scores at the 14th day post-op - MFES scores at 1 month post-op No other significant between-group differences were identified.
Wilson et al., 2016 (33), Canada	To investigate the effects of a pre-op individualised education intervention on post-op pain-related interference with usual activities, pain and nausea amongst patients undergoing TKR	**Quantitative: Two-arm RCT** Participants were recruited from a single orthopaedic preadmission clinic. **Control group:** Received standard care, which included an educational session delivered by a physiotherapist, a video about TKR and post-op routines and education about PCA delivered by nurses. **Intervention group:**	**Control group:** N=70 Age: 66±8 Sex: 61% **Intervention group:** N=73 Age: 67±8 Sex: 63%	Modified Brief Pain Inventory Interference sub-scale at day 3 post-op Short Form McGill Pain Questionnaire, Overall Nausea Index and opioid and anti-emetic administration at	No significant between-group differences were identified for any outcomes at any time point (however the significance of between-group differences in anti-emetic administration is not specifically stated).

		Received the same standard care as the control group. Also received a pre-op individualised education intervention, which included a booklet, an individualised education session and a follow-up telephone call. The intervention focused primarily on pain management.		days 1, 2 and 3 post-op	
Zhao et al., 2018 (34), China	To investigate the effectiveness of electro-acupuncture preconditioning for reducing post-op cognitive impairments and post-op cognitive dysfunction amongst elderly patients undergoing TKR, and assess the safety of electro-acupuncture amongst elderly patients	**Quantitative: Two-arm RCT** Participants were recruited through hospital-based advertisements in the outpatient clinics and wards of the orthopaedic departments of two hospitals. **Control group:** Received placebo electroacupuncture once daily for five consecutive days pre-op. **Intervention group:** Received real electroacupuncture preconditioning once daily for five consecutive days pre-op. The same acupoints were used in both groups.	**Control group:** N=30 Age: 66.7±3.8 Gender: 53.3% **Intervention group:** N=30 Age: 65.2±4.0 Gender: 60%	MMSE at 24 hours pre-op, 24 hours post-op and 72 hours post-op. Post-op cognitive dysfunction (defined as post-op MMSE score at least 2 points lower than pre-op MMSE score) at 24 hours post-op and 72 hours post-op Adverse events (Serum concentrations of inflammatory cytokines were also assessed but not classed as patient outcomes in this review)	No adverse events occurred. The MMSE global scores were significantly lower in both groups at 24 hours and 72 hours post-op compared to baseline. The decline in MMSE global scores at 72 hours post-op was significantly greater in the control group compared to the intervention group. No other significant between group differences in MMSE scores or post-op cognitive dysfunction were identified.

ADLs activities of daily living, *ASES* Arthritis Self-Efficacy Scale, *B* Strengthening plus balance and proprioceptive exercise (group), *BBS* Berg Balance Scale, *BMI* body mass index, *CFNB* continuous femoral nerve block, *CST* Chair Stand Test, *D* domiciliary (group), *DVD* audiovisual videodisc, *EQ-5D* EuroQol 5 Dimension Health Questionnaire, *GRC* Global Rating of Change, *H* hospital (group), *HADS* Hospital Anxiety and Depression Scale, *HRQOL* health-related quality of life, *HSS* Hospital for Special Surgery, *I* in-person prehabilitation (group), *KOOS* Knee Injury and Osteoarthritis Outcome Score, *KRES* Hospital for Special Surgery Knee Replacement Expectations Survey, *KSS* Knee Society Score, *LEFS* Lower Extremity Functional Scale, *MET* Metabolic equivalent of task, *MFES* Modified falls efficacy scale, *Mini-OAKHQOL* Mini-Osteoarthritis of Knee and Hip Quality of Life, *MMSE* Mini-Mental State Examination, *NHANES* National Health and Nutrition Examination Survey, *NHS* National Health Service, *NMES* neuromuscular electrical stimulation, *NRS* numeric rating scale, *OA* osteoarthritis, *OKS* Oxford Knee Score, *PCA* patient-controlled analgesia, *PGIC* Patient Global Impression of Change questionnaire, *PNF* proprioceptive neuromuscular facilitation, *post-op* post-operative, *pre-op* pre-operative, *RCT* randomized controlled trial, *ROM* range of motion, *S* strengthening (group), *SD* standard deviation, *SF-36* Standard Form-36 Health Survey, *T* tele-rehabilitation prehabilitation (group), *THR* total hip replacement, *TKR* total knee replacement, *TUG* Timed Up and Go test, *UK* United Kingdom, *USA* United States of America, *VAS* Visual Analogue Scale, *WOMAC* Western Ontario and McMaster Universities Osteoarthritis Index.

[a] For studies with mixed populations, details of the participants, outcomes and findings are only provided if the primary source reported them separately for participants listed for total knee replacement unless otherwise stated.

[b] N indicates the number of participants randomized unless otherwise stated. When reported in the primary source, age and BMI are presented as mean ± standard deviation in years and kg/m² respectively and gender/sex is presented as the percentage of females. Gender/sex is specified as either gender or sex if clearly reported in the primary source.

[c] Significance refers to a statistically significant difference between the intervention group and the control group with alpha = 0.05.

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Content and delivery of pre-operative interventions for patients undergoing total knee replacement: a rapid review

Additional File 5: Views studies' characteristics and findings

Supplementary Table 5: Characteristics and findings of the included views studies

Citation, country	Primary aim	Design	Participants[ab]	Key findings[a]
Aunger et al., 2020 (1), UK	To assess the feasibility of conducting an RCT investigating a novel intervention aimed at reducing sedentary behaviour in adults aged ≥60 years old listed for hip or knee replacement	**Mixed methods: Two-arm feasibility RCT** Participants were recruited from one NHS hospital and randomised with 2:1 allocation to a control group or an intervention group. **Control group:** Received usual orthopaedic care (did not involve any pre-op 'training'). Control group participants were contacted by telephone biweekly to check the status of their ongoing care, but the calls were not pre-planned and did not include behaviour change techniques.	**Patients ≥60 years old listed for elective knee replacement** **Control group:** N=5 (Patients ≥60 years old listed for elective hip replacement: N=6) **Intervention group:** N=13 (Patients ≥60 years old listed for elective hip replacement: N=11)	Key findings from the feasibility questionnaires and participants' comments in the sedentary behaviour booklets included: - Participants reported physical and mental benefits from engaging with the intervention. - All participants felt that participating in the study had at least a 'positive impact' on their post-operative recovery and did not expose them to risk of physical harm. - Three participants reported finding chair rises difficult, but other participants reported enjoying them[c]. - Some participants reported exercising in the evening was difficult due to issues such as tiredness, pain and wanting to relax.

	Intervention group: Received a behaviour change intervention aimed at reducing sedentary behaviour. The intervention was based on Self-Determination Theory and included education, motivational interviewing, individualised feedback, individualised incremental goal setting, environmental modification, self-monitoring with a pedometer and social support. The intervention was delivered pre-op by a researcher in two home visits, which could be combined to a single visit, and three biweekly phone calls. Data were collected through study statistics; participant questionnaires, objective assessments and blood tests; participants' sedentary behaviour booklets; an interview with the primary study research nurse and intervention fidelity assessments. The participant questionnaires included a 'feasibility questionnaire' with closed and open-ended questions. Quantitative data from the feasibility questionnaire were analysed descriptively. Qualitative	Of all the intervention group participants (knee and hip), 21 completed the feasibility questionnaire in the week prior to surgery and 16 wrote comments in the sedentary behaviour booklet.	- Most participants reported having at least 'some problems' attaining their goals but no problems achieving environmental modifications[c]. - Barriers to goal attainment included physical, social and environmental difficulties, with the most commonly reported barriers being pain and weather. - Participants felt their goals suited their individual circumstances. - Some participants reported that they enjoyed using the pedometer but some participants highlighted issues with it, including that it was difficult to open and was poor at tracking the steps of people with mobility difficulties. Some participants overcame this using alternatives e.g. a health app. - Some participants reported benefitting from the social support they gained from participating in the study, including from 'chatting to the researcher'[c]. - Most participants felt the sedentary behaviour booklet was useful but a few felt the 'worksheets' section was confusing and more writing space was needed[c]. Four of the five criteria for progressing to an RCT were met. The remaining criterion was not met due to unpredictable surgery scheduling. Exploratory analyses suggested the intervention may have benefits, including reducing sedentary time. The authors

		data from the feasibility questionnaires and the sedentary behaviour booklets were analysed using thematic analysis. Exploratory analyses of outcome data were performed. The quantitative results were not reported separately for participants undergoing knee replacement. Five criteria for progression to an RCT were pre-specified.		concluded that an RCT investigating the intervention is feasible with some modifications.
Bardgett et al., 2016 (2), UK	To explore patients' views of factors that affect return to work following TKR or THR	**Qualitative: Qualitative descriptive** Participants were recruited from the Freeman Joint Registry (clinical audit at a hospital in the UK). Data were collected using a cross-sectional survey administered via post. The survey explored patients' views of potential barriers and facilitators to return to work following TKR or THR. The questionnaire included closed-ended and open-ended questions, but the focus of the study was on the open-ended questions. Free text data were analysed using thematic analysis by one researcher, with verification by a second researcher. The themes and data were also discussed during team meetings.	**Patients between 6 months and 3 years post-TKR who were aged under 60 years old at the time of their TKR** N=50 (Patients post-THR: N=52)	The following three themes were identified: 1. Most participants experienced physical and psychological improvements post-op that enabled them to improve their performance at work. 2. Many participants reported not receiving any information about return to work in the pre- or post-op phase. The information they received, for example in a booklet, tended to be targeted at older retired individuals. Participants who had received return to work advice felt it was inconsistent and not individualised to their specific needs[c]. 3. Adaptations offered by employers e.g. phased return, workspace modifications etc. largely assisted participants' return to work.

Barnes et al., 2018 (3), South Africa	To investigate the breadth of pre-op education provided to, and the educational needs of, patients undergoing TKR or THR in the private sector in Bloemfontein	**Quantitative descriptive: Cross-sectional survey** Participants were recruited from three private hospitals using convenience sampling. Data were collected through structured interviews using a questionnaire developed by the research team. The questionnaire was based on the Patient Learning Needs Scale[2] and the Canadian Clinical Checklist[3]. It included questions about participants' demographics; rationale for undergoing surgery; pre-op education received; pre-op educational needs; and pre-op educational delivery approaches. Participants were given the opportunity to review their answers following the interview to confirm their accuracy. Categorical data were analysed using descriptive statistics.	**Patients 2-4 days post-primary TKR** N=36 (Patients post-THR: N=14)	The majority of the findings describe service provision rather than participants' views or experiences of the services. However, it is reported that 19% and 22% of participants post-TKR felt that they received insufficient 'information on post-operative information' (no additional details specified) and activities of daily living respectively. The descriptions of service provision for participants post-TKR revealed 98% of participants received pre-op education from their orthopaedic surgeon, with 25% receiving pre-op education from a physiotherapist. 89% of participants received education via a pamphlet, while 39% received verbal education. The education was mainly received months pre-op (57%) or weeks pre-op (39%). Seventy-four percent of participants did not receive any education about pre-op exercises. Additionally, only 39% of participants received pre-op information on pain relief.
Berg et al., 2019 (4), Sweden	To explore patients' views and	**Qualitative: Qualitative descriptive**	**Patients 3 months post-TKR** N=11	Three chronological phases of the care pathway were identified: preparation, hospital stay and recovery. The findings emphasized

[2] Bubela N, Galloway S, McCay E, McKibbon A, Nagle L, Pringle D et al. The Patient Learning Needs Scale: reliability and validity. J Adv Nurs.1990;15(10);1181-1187.

[3] Soever LJ, Mackay C, Saryeddine T, Davis AM, Flannery JF, Jaglal SB et al. Educational needs of patients undergoing total joint arthroplasty. Physiotherapy Canada. Physiotherapie Canada. 2010;62(3);206-214.

	experiences of the fast-track TKR and THR pathway	Participants were selected as a 'strategic sample' from one University hospital and two district hospitals. Data were collected using semi-structured interviews. The interviews focused on participants' experiences and views of all phases of the care pathway from the decision to undergo surgery until 3 months post-op. Data were analysed using inductive content analysis involving three team members.	Age: 63.6±8.0 Sex: 27% (Patients 3 months post-THR, N=13)	the importance of adopting a person-centered approach during all care phases. In the preparation phase, most participants felt the information provided about the surgery was adequate, but the amount of information participants wanted about the surgery and its risks varied widely [c]. Participants felt the information provided about post-op rehabilitation and recovery was insufficient. Receiving information about the planned length of stay in the pre-op phase helped ensure most participants were willing to be discharged at day 1 post-op[c]. Participants also received information from other sources, such as family, friends and the Internet. In some cases, this information was inaccurate.
Bin Sheeha et al., 2020 (5), UK	To understand patients' experiences, outcome expectations and satisfaction following TKR	**Qualitative: Phenomenology** Participants were purposively selected from one NHS hospital. Data were collected during a single focus group discussion using open-ended questions. The focus group explored participants' experiences and perspectives of their TKR surgery, outcomes and health service quality. Data were analysed using thematic analysis by two independent researchers.	**Patients one year post-primary unilateral TKR** N=7 Age: 76.7±4.4 Gender: 71% BMI: 33.9±6.1	The following four themes were identified: 1. Recovery experience 2. Experience before TKR 3. ADL changes one-year post-TKR 4. Outcome expectations following TKR Key findings related to pre-op interventions included: - Participants' surgeons played an important role in modifying their expectations and all participants reported having a positive experience with their surgeon. One participant specifically commented on his 'doctor' being 'very realistic'.

- Participants valued the pre-op education class and one participant specifically linked this to being told 'you have to work yourself as well'.
- Participants agreed that pre-op and post-op exercise is important to increase muscle strength. One participant recommended exercising for months (rather than days or weeks) pre-op.
- Participants' views of pre-op physiotherapy and the exercises they provided varied. Two participants recommended pre-op physiotherapy/praised their physiotherapist, whilst three did not recommend it because they did not find it helpful or felt the exercises provided by physiotherapist could be obtained online. Two participants had not received any pre-op physiotherapy.

Participants also commented on alternative treatments that they used before surgery, including: insoles, which two patients found helpful but one did not; a knee brace, which one patient found helpful; and acupuncture, which two patients found helpful. Participants' comments about insoles and a knee brace appeared to reflect their views about these treatments in general, rather than focusing specifically on their use in the pre-op phase. It was unclear whether participants' comments about acupuncture referred to acupuncture delivered solely in the pre-operative phase.

Causey-Upton and Howell 2017 (6), USA	To describe patients' experiences as they prepare for discharge home post-elective TKR	**Qualitative: Transcendental phenomenology** Participants were purposively selected from one hospital. Data were collected through semi-structured interviews conducted 1-2 days prior to discharge. The interviews explored participants' experiences of preparing for discharge home and factors influencing their discharge readiness. Data were analysed thematically using Moustakas' process of horizonalization[4]. Various steps were taken to help ensure trustworthiness, including participants' confirming the emerging themes and peer review of the research findings and decisions between the two authors.	**Patients who had undergone elective TKR surgery and were receiving inpatient physical and occupational therapy** N=4 Gender: 75%	Three themes were identified: 1. Being supported for discharge home 2. Having confidence in self, family and healthcare staff 3. Persevering: overcoming obstacles The second theme reported participants' perspectives of the pre-op education class, including: - Participants felt the class improved their confidence by enabling them to prepare for the future. Participants also reported that the class helped them understand what to expect regarding their recovery. - Participants identified that getting their questions addressed was a significant part of their pre-op education. - Participants reported that having family present increased their confidence because it meant their family member was also aware of the recommendations provided and post-op expectations.
Causey-Upton et al., 2018 (7), USA	To describe existing pre-op TKR education content, providers and delivery formats in the USA	**Quantitative descriptive: Cross-sectional survey** Participants were recruited from seven hospitals using convenience sampling (40 hospitals were contacted initially). Data were collected using an online survey administered via email. The survey was developed by the study team based on pre-op education	**Nurses** N=2 **Physical therapist** N=1 **Occupational therapists** N=4	The majority of the findings describe pre-op education service provision, rather than participants' views or experiences of the services. However, participants highlighted various changes to their current pre-op education program design that they felt would be beneficial, including (numbers in brackets are the percentage of participants who selected the response):

[4] Moustakas C. Phenomenological Research Methods. Thousand Oaks (CA): SAGE Publications, Inc.;1994.

		literature and a review of three existing pre-op TKR education programmes. The authors described the survey as a 'pilot survey.' The survey included 12 closed-ended and four open-ended questions. The questions covered participants' demographic details, current pre-op TKR education programmes, ideas about optimal pre-op TKR education programmes and perceptions of the survey itself. Data for closed-ended items were analysed using descriptive statistics. Data for open-ended items were collated together.		- Additional education topics: functional mobility (14.3%), instrumental ADLs (28.6%), home modifications (14.3%), caregiver training (28.6%, not included in the summary tables because the training is not delivered to patients), anatomy of the knee joint (14.3%) and expected functional outcomes (28.6%). - Additional education providers: case management (42.9%), social work (14.3%) and physician assistant and/or surgeon (14.3%). - Additional changes: involve patients from all physicians at the facility (14.3%), run separate classes for patients undergoing TKR and THR (14.3%) and provide a video of a TKR patient carrying out exercises (14.3%).
Causey-Upton et al., 2020a, 2020b (8, 9), USA	***Quantitative component*** To describe current pre-op TKR education design across the USA ***Qualitative component*** To explore providers' perceptions regarding current pre-op TKR education	**Mixed methods: Explanatory sequential** ***Quantitative component: Cross-sectional survey*** Participants were recruited from the National Association of Orthopaedic Nurses (3,955 members were sent the recruitment email). Data were collected using an online cross-sectional survey administered via email. The survey was a refined version of the pilot survey used in Causey-Upton et al. (2018) (7). The survey included 23	**Orthopaedic nurses** ***Quantitative component*** N=469 ***Qualitative component*** N=10 Sex: 90%	***Quantitative component*** Many of the findings describe current pre-op education program design, rather than participants' views or experiences of the programmes. Key findings regarding participants' perceptions of the ideal pre-op TKR program design include (numbers in brackets are the percentage of participants who selected the response): - The most frequently selected topics participants felt it would be beneficial to add to the pre-op education program, were nutrition (20.3%), caregiver training (14.5%, not included in the summary tables because the training is not

	programmes and the efficacy of different aspects of the programmes	closed-ended questions and one open-ended question. The questions covered participants' demographic details, current pre-op TKR education program design and perceptions of the ideal pre-op TKR education program design. Data for closed-ended items were analysed using descriptive statistics. Data for open-ended items were collated together. ***Qualitative component: Qualitative descriptive informed by phenomenology*** At the end of the above survey, participants were asked to give their contact details if they were interested in participating in a telephone interview. Potential participants were divided into groups by national region and years of experience providing pre-op education. A random number generator was then used to select participants from the groups who completed the survey at varying time points. Data were collected via semi-structured interviews. During the interviews, participants were asked to describe the pre-op TKR education program at their facility and share their views about their	delivered to patients), edema management (12.4%), instrumental ADLs (11.3%) and expected functional outcomes (11.1%). - The most frequently selected providers participants felt it would be beneficial to add to the pre-op education team were case management (29.4%), pain management (22.4%), home healthcare (16.4%), social work (15.8%) and dietetics (15.6%). - The most frequently selected delivery methods participants felt it would be beneficial to add to the pre-op educational program were online (47.3%), video (29.2%), client demonstration or the teach back method (22.2%) and workbook (10.2%). - 47.3% of participants felt it is best to educate patients awaiting TKR together with patients with other orthopaedic diagnoses, whilst 49.7% of participants felt it is better to educate patients awaiting TKR separately. - The most frequently preferred education delivery formats were combined group and individual (53.9%), group only (38.0%) and individual only (6.4%). - The most commonly preferred education delivery timings were 2 weeks pre-op (40.9%), 4 weeks pre-op (24.1%) and 3 weeks pre-op (19.0%).

	current and the ideal pre-op TKR program design. Data were analysed thematically using Moustakas' process of horizonalization[5]. Steps taken to help ensure trustworthiness included ‘expert peer review’ and triangulating the findings with survey data.	- The most commonly preferred number of pre-op education sessions were one (79.3%) and two (17.5%). - The most commonly preferred length of pre-op education sessions were 1 to <1.5 hours (40.3%), 1.5 to < 2 hours (25.8%) and 30-59 min (17.9%). **Qualitative component** Four themes were identified: 1. Knowledge is power for patients and providers: participants perceived pre-op TKR education has multiple benefits, such as patients being better prepared for the hospital stay and losing weight pre-op. Participants reported informal training, formal training and clinical orthopaedic experience helped them prepare for providing pre-op education and highlighted the importance of the 'right individuals' providing education. 2. Education should be consistent, individualised and evidence-based: participants felt that providing consistent information to all patients, and ensuring consistency across delivery modes, providers and time points, increased patient confidence and understanding. Participants also highlighted the importance of tailoring information to each individual's needs based on various factors e.g. learning style, previous

[5] Moustakas C. Phenomenological Research Methods. Thousand Oaks (CA): SAGE Publications, Inc.;1994.

				experience, language needs and comorbidities. Participants reported seeking to continually improve their programmes and ensure that they are evidence-based. 3. Inter-professional practice is important but is limited by barriers: participants felt that interdisciplinary provision of pre-op education offers multiple benefits, including improved patient outcomes, but also presents multiple challenges, such as location and timing issues. 4. The structure of pre-op education is guided by pragmatics: participants highlighted that all aspects of pre-op education are affected by pragmatic and contextual factors. For example, participants felt that providing education in a group format offers multiple benefits, such as improved efficiency, but also highlighted that patients may be more reluctant to ask personal questions in a group setting. Participants' also highlighted numerous considerations related to the timing of pre-op education sessions, number of sessions and duration of sessions.
das Nair et al., 2018 (10), UK	To investigate the feasibility of conducting an RCT to evaluate the clinical and	**Mixed methods: Two-arm feasibility RCT** Participants were recruited from two NHS hospital knee surgery pathways and randomised with 1:1 allocation to a control group or	**Patients with knee OA and anxiety or depression listed for TKR** **Control group:** N=25 (total)	Three main themes were identified from the qualitative data: 1. Experiences of being in the study: most participants understood the rationale for the study and randomization and the information provided.

	cost-effectiveness of a CBT-based pre-op psychological intervention for patients undergoing TKR due to knee OA	intervention group. Only patients with anxiety or depression (defined as a score of >7 on either of the HADS subscales) were eligible. **Control group:** Received usual care (no psychologist input or focus on the participant's psychological state). **Intervention group:** Received usual care plus up to 10 sessions of a CBT-based pre-op psychological intervention. The psychological intervention was delivered by a psychologist in the participant's home or at a hospital and included psychoeducation on mood and pain, values-based goal setting, self-management and behavioural activation, relaxation and mindful breathing, cognitive restructuring and post-op planning. Data were collected through self-report questionnaires. A purposively selected subsample of participants were invited to participate in semi-structured interviews. The interviews explored the acceptability, barriers, and facilitators of the intervention and the study procedures. The interview data were analysed using a framework approach.	N=12 (participants who completed interviews only) Age: 65.7±8.6 (total) Gender: 56% (total) **Intervention group:** N=25 (total) N=11 (participants who completed interviews only) Age: 66.7±9.9 (total) Gender: 36% (total) (One additional participant was randomised but did not meet the inclusion criteria so their data were excluded from the analyses)	2. Participants' views of the outcome measures: most participants felt the outcome measures were appropriate but some participants raised concerns about aspects such as the number and timing of questionnaires. 3. Treatment experiences of participants in the intervention group: participants were mostly positive about the intervention and understood the thoughts-mood-pain interaction and its link with TKR. However, some participants perceived pain as physical and did not believe in the thoughts-mood-pain interaction. Some, but not all, participants found the intervention beneficial. Reported benefits included reassurance, relaxation, calmness, positive thoughts, thinking differently and developing more realistic expectations. Participants who reported benefits of the intervention felt these were due to a range of factors, such as specific intervention techniques, personal tailoring of the intervention and the psychologists'. Participants' views of the optimal setting and delivery mode varied, with pros/cons of hospital versus home and group versus individual sessions being noted. The authors concluded a definitive RCT is feasible with changes to the intervention and study procedures.

Drew et al., 2019 (11), Judge et al., 2020 (12)	***Part 1*** To understand organizational processes that facilitate or impede the implementation of hip and knee replacement ERAS programmes ***Part 2*** To explore patients' experiences of hip and knee replacement ERAS programmes using the ethnographer Mol's work	**Qualitative: Ethnography** The study consisted of two parts. It was part of a larger project investigating the impact of hospital organization, surgical factors and ERAS programmes on hip and knee replacement patient outcomes and NHS costs. ***Part 1*** Four hospitals were selected as study sites using maximum variation sampling. Data were collected using observations/job shadowing (including informal interviews) and semi-structured interviews. The observations explored the clinical setting, activities occurring, treatment protocols and barriers/facilitators to service implementation. The data collected during the observations were used to develop a topic guide for the semi-structured interviews, which explored participants' perspectives and experiences of delivering ERAS programmes and barriers/facilitators to their implementation. The first phase of the data analysis involved inductive thematic analysis of the interview transcripts and field notes. 20% of transcripts were double coded. An abductive	***Part 1*** **Physiotherapists** N=7 **Occupational therapists** N=3 **Nurses** N=18 **Orthopaedic surgeons** N=5 **Anesthetist** N=1 **Matron** N=1 **Therapy technician assistants** N=2 **Theatre manager** N=1 Sex: 73.7% (all health professionals) ***Part 2*** **Patients who had undergone TKR at one of the study sites** N=13 Age: 71.8±10.1 Sex: 46% (Patients who had undergone THR at	***Part 1*** Seventeen CFIR constructs were considered to influence ERAS program implementation processes. These covered all five domains of the CFIR framework. The findings highlighted that implementation of hip and knee replacement ERAS programmes is influenced by multiple factors. Key findings related to pre-op education included: - The 'joint clinics' at one site were run by nurses, physiotherapists and occupational therapists, which was felt to encourage multidisciplinary collaboration. - Written information was considered useful for reinforcing information from patients' consultations and giving them something to refer back to. - Staff at one site felt that the patient information booklets provided pre-op are key to effective rehabilitation, but were concerned that they would not be able to provide them due to funding cuts. - Participants felt the 'group dynamic' of pre-op education classes helped create a safe environment for patients to ask questions and discuss their experiences. The face-to-face format of classes was considered useful for clarifying information. - Informal communication between staff at the pre-op education classes was seen as providing an opportunity to review

	approach was then used to transpose the inductively coded themes onto the 31 constructs of the CFIR, grouped into the five CFIR domains (intervention characteristics, outer setting, inner setting, characteristics of individuals and process). Interpretive accounts of the data were developed. ***Part 2*** Participants were recruited from the four study sites. Data were collected through semi-structured interviews. The interviews explored patients' perspectives and experiences of having a TKR/THR across the care pathway. Data were analysed using inductive thematic analysis. 10% of transcripts were double coded. Descriptive accounts of the data were developed.	one of the study sites N=23) (Data from Table 13 rather than the text)	outcomes data/'brainstorm' approaches for improving services. ***Part 2*** The findings were grouped into participants' perspectives and experiences of the following areas: referral process, pre-op education, pre-op preparation, waiting for the operation, anesthesia, pain management, inconsistencies in information, early post-op mobilization, discharge, post-operative (experiences), physiotherapy exercises, pain relief, post-discharge support, family and the future. Key findings related to pre-op education included: - Participants found information about the following topics particularly helpful: how to use crutches, post-op exercises, reorganizing the home, obtaining assistive devices and arranging social support [c]. - Participants reported wanting additional information about their recovery/expected progress to enable them to look after themselves [c]. - A few younger patients reported wanting additional information on joint replacements in younger people, particularly regarding recovery expectations [c]. - Participants found the pre-op education classes helpful and valued the opportunity to talk to other patients [c].

				- Participants awaiting their first joint replacement valued hearing from patients who had previously undergone surgery[c]. - Issues with the timing of pre-op education classes were highlighted, as some patients missed the class due to receiving a quick referral, whilst others forgot information from the class due to attending it too far in advance of their surgery[c].
Eschalier et al., 2013 (13), France	To validate a pre-op TKR educational booklet based on feedback from health professionals and patients	**Quantitative descriptive embedded within an intervention validation study: Survey** Participants were recruited from public or private hospitals and private practices. Data were collected through a postal questionnaire. The questionnaire asked participants to rate each of the 10 chapters included in a pre-op TKR education booklet on a 1-10 scale for content, didactic style and illustrations. Participants could also add comments about each chapter. The scores for each chapter were summed. Total scores of 7-10 were considered an indicator that no modifications to the chapter were required, unless specific and relevant comments about the chapter were also made.	**Rehabilitation physicians** N=5 **Orthopaedic surgeons** N=6 **Rheumatologists** N=2 **Primary-care physicians** N=4 **Anesthesiologist** N=1 **Physical therapists** N=3 **Occupational therapists** N=3 **Nurse** N=1 **Psychologist** N=1	Participants' scores for each of the 10 chapters were generally high for content, didactic style and illustrations. However, some criticisms and suggestions were made, including: - The diagram of knee anatomy lacked a figure legend - The explanation of knee biomechanics was too detailed - The topic 'Treatment options for knee osteoarthritis' might not be appropriate because the booklet was aimed at patients who had already been listed for TKR - Information about thromboembolism prophylaxis should be included in the chapter on 'Your surgery' rather than 'What can you do before your surgery?' - Extra information on contraindications should be included in the chapter on returning to sports activities

		The study also involved providing the booklet to patients and asking them to complete knowledge and beliefs questionnaires before and 2 days after receiving the booklet. However, patients' views of the booklet were not reported.	**Social worker** N=1	
Eschalier et al., 2017 (14), France	To investigate the effects of an information booklet on TKR-focused knowledge amongst patients undergoing TKR	**Quantitative: Two-arm RCT** Participants were recruited from one teaching Hospital. **Control group:** Received standard oral pre-op information from their surgeon. **Intervention group:** Received standard oral pre-op information from their surgeon. At the end of their pre-anesthesia appointment, also received an information booklet and were asked to read it multiple times. The booklet included 10 chapters covering numerous topics related to TKR. The booklet was developed and validated through a previous research study (13). One of the outcomes investigated was patients' satisfaction with the information received for four specific items (hospital stay, TKR and TKR-related risks, possibilities of making home modifications and availability of human and financial help). Participants were asked to	**Patients aged 55-75 years old with knee OA listed for primary TKR** **Control group:** N=20 Age: 66.8±5.8 Gender: 50% BMI: 31.6±5.4 **Intervention group:** N=22 Age: 68.1±4.7 Sex: 45% BMI: 31.2±5.1	There were no significant between group differences in participants' satisfaction ratings for any of the four items. In general participants' satisfaction with information on the hospital stay and TKR and TKR-related risks was high. However, participants' satisfaction with information on the possibility of making home modifications and the availability of human and financial help was generally lower and more varied between participants. In the discussion, the authors report some participants commented that the possibility of making home modifications and the availability of financial and home help were not mentioned by the surgeon.

		rate their satisfaction for each item on a 4-point Likert scale at 3-6 weeks post-op. The data were analysed using descriptive and inferential statistics.		
Goldsmith et al., 2017 (15), Canada	To explore patients' experience and satisfaction post-TKR	**Mixed methods: Qualitative descriptive component of a mixed methods prospective cohort study** Participants were purposively selected from a cohort study involving participants from six different sites across British Columbia. The authors were particularly interested in exploring dissatisfaction, so recruited as many participants as possible who reported dissatisfaction with their TKR on the 6-month post-op questionnaire. Data were collected using semi-structured interviews. The interviews focused on participants' experiences of TKR and their satisfaction with the outcomes. Data were analysed using a multi-step thematic coding process involving four coders and wider team discussions.	**Patients 8 months post-TKR** N=45 Age: 65 (SD not reported) Sex: 67%	Participants' views of their experiences of TKR were mainly focused on the aid/ assistance they received, which the authors described as 'support'. Participants' support expectations were formed across the care pathway. Participants whose support expectations were not met tended to report a negative experience of TKR. Participants' experiences of support were focused on three interacting areas: informational, clinical and personal. Participants felt information about preparing for TKR and post-op recovery was key. Although participants felt the pre-op education sessions and their surgeon were important sources of informational support, many participants felt the information they provided was inadequate. Additionally, some participants felt it was difficult to understand and retain the instructions provided at the pre-op education session, particularly because the session was delivered to patients undergoing TKR and patients undergoing THR together. Some participants reported that their surgeon did not have/make time to answer their questions and/or did not make an effort to treat them like an individual.

				Key areas in which participants wanted more information included: pain expectations, pain management and recovery trajectories. Participants felt gaining informational and emotional support from patients who had previously undergone TKR could be helpful and suggested providing 'recovery stories' of previous patients as part of the pre-op education.
Høvik et al., 2017 (16), Norway	To explore patients' experiences of the first 2 weeks post-op following fast-track TKR	**Qualitative: Qualitative descriptive** Participants were purposively selected from two different units of a University hospital. Data were collected through three focus groups. Each focus group consisted of 3-5 participants. The focus groups primarily aimed to explore patients' experiences of pain, exercise and daily activities once they had returned home. Data were analysed using systematic text condensation involving all three authors. An experienced qualitative researcher was also consulted to increase rigor.	**Patients 2 weeks post-TKR** N=13 Age: 64.2 (SD not reported) Gender: 62%	The key finding was that participants were resolute to cope at home. Four areas linked to this were identified: 1. Participants valued returning home. 2. Specific factors, including comprehensive education, helped participants prepare for early discharge and feel secure after returning home 3. Participants found sharing their experiences empowering. 4. Participants' post-op pain experiences varied but they generally felt equipped to manage their pain. Participants felt the pamphlet of written information was the most important source of information they received. Participants appreciated meeting others at the pre-op education class. However, some participants heard other patients' stories of serious complications during the class, which was frightening.
Huber et al., 2015b (17), Switzerland	To develop an instrument to assess the	**Quantitative descriptive embedded within an RCT:**	**Patients with knee OA listed for primary TKR**	Participants' responses to all the KOPEQ items were high, with the median for each item being 4 or 5. The KOPEQ covered

	validity of a pre-op education program and to explore the instrument's psychometric properties	**Questionnaire development and psychometric testing** Participants were recruited from two hospitals. The study was embedded in an RCT that involved all participants attending a pre-op education program known as the KOPEI. Data were collected through an instrument developed during the first stages of the study known as the KOPEQ. The KOPEQ was developed to assess the validity of the KOPEI and includes 16 items, each scored on a 5-point Likert scale. Data were analysed using descriptive statistics, internal consistency was evaluated using Cronbach's alpha and an exploratory factor analysis was performed.	N=35 Age:69.5±7.9 Gender/sex: 48.6% BMI: 30.5 ± 5.5	participants' overall impressions of the KOPEI and their views of intervention components and delivery approaches including: handouts, PowerPoint presentations, relation between theory and active participation, how well questions were answered, division of the education into three sessions and specific education sessions ('Anatomy and function', 'Recommended activities' and 'Rehabilitation phases after surgery'). The internal consistency of the KOPEQ was good. 61% of the variance was explained by a model with 4 factors, which the authors named 'didactics', 'addressability', 'empowerment' and 'theory'.
Lucas et al., 2013a, 2013b (18, 19), UK	To develop, implement and investigate the impact of a pre-op preparation program for patients undergoing TKR, including exploring the change	**Qualitative: Action research study** Health professional and patient participants for the Project Management group were purposively selected from one acute NHS Trust. Additional patient participants from the same Trust were also recruited to explore the impact of the changes.	***Project Management Group members*** **NHS Trust staff members** N=17 N=12 (interviewed) **Patients post-TKR** N=5 N=4 (interviewed)	The following action cycles were undertaken: 1. Development of an information booklet 2. Physical assessment and intervention in the pre-op clinic 3. Social assessment and intervention in the pre-op clinic 4. Service user involvement in the pre-op clinic Various changes were implemented through the action cycles, including patients being given the information booklet, a home

	processes involved using the Social Cognitive Theory	Data were collected through four action cycles focused on developing a patient education booklet and a multidisciplinary pre-op assessment/education clinic. The Social Cognitive Theory was used to frame the interventions. The lead researcher was an 'insider' (nurse practitioner) at the NHS Trust where the study was conducted. Data collection methods included observations, questionnaires, self-reporting, physiotherapist assessments, focus groups and semi-structured interviews. Qualitative data were analysed using the approach described by Burnard[6]. Quantitative data were analysed using descriptive statistics.	Age: 61 (total, SD not reported) Gender/sex: 60% (total) ***Participants recruited to explore the impact of the changes*** **Patients listed for TKR** N=23 (total) N=9 (participated in focus groups after their surgery)	circumstances assessment form and an invitation to attend the pre-op clinic on the day they were listed for TKR. The pre-op clinic was delivered by a nurse practitioner, physiotherapist, occupational therapist and service users. The clinic included crutch and leg length measurements, education, teaching of post-op exercises, assessment of patients' home circumstances and service users sharing their experiences. Patients felt the booklet and pre-op clinic increased their knowledge and self-efficacy. This helped them prepare for surgery and develop realistic expectations of the outcomes. Patients highlighted knowing how to use crutches and carry out post-op exercises as particularly helpful. Some patients felt the exercises and advice provided at the pre-op clinic helped them reduce their pain and improve their function. Various personal, environmental and behavioral factors that influenced the change process were identified. These included staff and services users' self-efficacy beliefs, resource limitations and effective teamwork. Physiotherapists', occupational therapists' and nurse practitioners' self-efficacy beliefs about their clinical skills in the pre-op clinic were high. Service users felt they benefitted from volunteering at the pre-op clinic because it

[6] Burnard P. A method of analysing interview transcripts in qualitative research. Nurse Educ Today. 1991,11(6):461-466.

				provided an opportunity to discuss their post-op recovery.
Plenge et al., 2018 (20), South Africa	To gain multi-disciplinary consensus on pre-op risk factors for poor outcomes, perioperative interventions for improving outcomes and important post-op outcomes for patients undergoing TKR and THR	**Quantitative descriptive: Delphi study** Participants were recruited from public sector regional and central hospitals. The study focused on the following categories related to the care of patients undergoing primary elective unilateral TKR or THR in South Africa: 1. Risk factors for poor outcomes 2. Pre-op, intraoperative and post-op interventions for improving post-op outcomes 3. Patient and clinical outcomes for benchmarking care The Delphi study consisted of four rounds. During the first round, participants were asked to make suggestions for each of the above categories. The suggestions were then grouped into statements. During the second and third rounds, participants were asked to rank the top 10 statements in each category and could also add further comments/references. During the fourth round, participants were offered the opportunity to participate in a Skype teleconference to discuss any disagreements with the rankings	**Orthopaedic surgeons** N=13 **Anesthetists** N=12 **Physiotherapists** N=8	The number of suggestions in the first round for risk factors, pre-op interventions, intraoperative interventions, post-op interventions and outcomes were 247, 166, 144, 181 and 164 respectively. The pre-op intervention suggestions were grouped into 14 statements for the second round and 11 statements for the third round. The prioritized list of pre-op interventions did not change after the second round and was as follows: 1. A patient optimization clinic 2. Multidisciplinary planning 3. Patient education 4. Infection prevention 5. Establishing high-volume units 6. Smoking cessation 7. Optimization of pre-op analgesia regimen 8. Minimize pre-op fasting 9. Establish a patient blood management program 10. Alcohol cessation

		from the third round. A reverse scoring system was used for the rankings and respondents' scores were summed to develop the ranked lists of priorities.		
Sharif et al., 2020 (21), UK	To gather an array of opinions on virtual healthcare technologies from key stakeholders within the NHS	**Qualitative: Qualitative descriptive** Participants were selected from one NHS hospital trust using a 'process map' to ensure consistent representation across the elective hip and knee surgery pre-op pathway. Data were collected using semi-structured interviews. The interviews explored participants' perspectives of the uses, benefits and problems with six key virtual health technologies identified in a systematic literature review. Data were analysed using thematic analysis, with cross-checking at each stage by other team members.	**GPs** N=2 **Orthopaedic surgeons** N=2 **Anesthetists** N=2 **Orthogeriatricians** N=3 **Nurses** N=3 **Occupational therapists** N=2 **Physiotherapists** N=2	A wide range of uses, benefits and problems were identified for the virtual health technologies. Pre-op education was perceived as a potential use for teleconsultations, web-based online videos, virtual reality, web-based written information/websites and m-health. Pre-op exercise provision/encouragement/ monitoring were perceived as potential uses for web-based written information/websites, m-health and remote patient monitoring. E-forms were also discussed, but their perceived uses focused on assessments/obtaining consent rather than pre-op interventions. Accessibility issues related to digital illiteracy were identified as a potential problem with most technologies. Perceived benefits/ problems for specific technologies included: - Teleconsultations: benefits – reduced patient travel and improved clinic efficiency; problems – hearing/ comprehension issues and lack of visual information - Web-based online videos: benefits – greater patient engagement and information retention; problems – lack of opportunity for patients to ask questions

				and difficulties providing individualised care - Virtual reality: main benefit – providing a visual aid; problems – risk of increasing patients' anxiety and being disorientating for older individuals - Web-based written information/websites: benefits – easy access for patients and their families and being 'more user-friendly'; main problem – limited accessibility due to digital illiteracy - M-health: benefits – being accessible to patients at all times and facilitating personalized care; problems – accessibility and compliance issues and 'lack of human touch' - Remote patient monitoring: benefits – providing more information to health professionals to facilitate management and streamlining the pathway; problems – possibility of abnormal readings alarming patients and accessibility issues due to digital illiteracy
Smith et al., 2018 (22), USA	To explore pain management and expectations pre- and post-TKR and THR surgery and identify barriers to post-op opioid tapering	**Qualitative: Qualitative descriptive** Health professional participants were purposively selected from one 'large, integrated care-delivery system'. Patient participants were also recruited through the same care system.	**Patients 6-12 months post-TKR who were in the top 1/3 of opioid users during the first 90 days post-op** N=4 Gender/sex: 100% **Surgeons** N=2	The findings were reported in 4 main topic areas: 1. Pre-op pain management expectations and education 2. Post-op pain management experience 3. Challenges related to post-op pain management 4. Recommendations and suggestions for educational materials

		Data were collected through structured interviews with open-ended questions. The interviews focused on participants' views of opioids, pain management and associated educational materials. If participants were willing, they were re-interviewed to help verify the interview findings and refine the educational materials developed. Data were analysed using content analysis by a qualitative researcher.	**Physician assistants** N=2 **Nurses** N=2 **Physical therapist** N=1 (Patients post-THR: N=7, one of whom had a TKR prior to their THR)	Most patients felt the booklet and video they received pre-op did not cover pain management sufficiently but information from their surgeon visit was clear and useful[c]. However, three patients did not remember discussing pain management with their surgeon[c]. Professionals reported that there is not often enough time to educate patients about opioids and highlighted patients receive extensive verbal and written information, which could result in 'information fatigue.' Endorsed recommendations highlight the importance of education on pain expectations and pain management (including opioids and non-opioid approaches).
Snowden et al., 2020 (23), UK	To investigate the feasibility of conducting a definitive trial of a brief behavioral intervention aimed at reducing pre-op alcohol consumption amongst patients listed for elective orthopaedic surgery	**Mixed methods: Non-randomized feasibility study followed by a two-arm pilot RCT** ***Defining the intervention and treatment as usual*** As part of the intervention development, healthcare professionals employed in the pre-assessment clinic of the primary study site completed an adapted version of the COM-B self-evaluation questionnaire focused on delivering alcohol screening and a behavioral intervention. The questionnaire responses were summarized descriptively.	***Adapted COM-B self-evaluation questionnaire*** **Healthcare professionals** N=12 ***Healthcare professional focus groups*** **Nurses** N=14 **Student nurse** N=1 **Substance use lead** N=1	***Adapted COM-B self-evaluation questionnaire*** Health professionals felt that they needed support to increase all three domains of capability, opportunity and motivation in order to deliver the screening and intervention effectively. Gaining more knowledge about the importance of pre-op alcohol cessation/reduction and having additional 'protected' time in the pre-assessment clinic were identified as particularly important. ***Healthcare professional focus groups*** Key findings from the focus groups included: - Patients are provided with a large volume of information in the pre-

	Treatment as usual in the pre-assessment clinic was characterized using focus groups with healthcare professionals from the three centers involved in the pilot RCT and a UK-wide electronic survey. Focus group data were analysed using framework analysis. Survey data were analysed descriptively. The survey data focused solely on describing service provision rather than exploring participants' views. ***Feasibility study*** Participants were recruited from one secondary care teaching hospital and screened for eligibility using the AUDIT-C. After consenting, they were asked to complete the full AUDIT. Participants who scored ≥8 on the AUDIT and/or consumed ≥6 units in one session weekly were eligible to receive the brief behavioral intervention. The intervention aimed to support participants to reduce their pre-op alcohol consumption. It was delivered by healthcare professionals working in the pre-assessment clinic in one face-to-face session at the clinic and involved:	**Pre-assessment lead/team leader** N=2 **Consultant anesthetist** N=1 Gender/sex (all healthcare professionals who participated in the focus groups): 100% ***Feasibility study*** **Adults listed for elective primary knee replacement who met the criteria for increased risk drinking** N=12 (Adults listed for elective primary hip replacement who met the criteria for increased risk drinking N=3) (13 participants completed an interview but details of these participants are not provided separately) **Health professionals**	assessment clinic, which could be difficult for patients to process. - Some health professionals were not aware of the available alcohol specialist services. Professionals who were aware of the services reported that patients usually declined them and some professionals were concerned that patients referred to the services may not receive additional treatment/support. ***Feasibility study and pilot RCT*** In the feasibility study, amendments to facilitate recruitment were made to the inclusion criteria, study title (including removal of the term 'risky drinking') and time-period for patients to consider their participation. Key findings from the qualitative interviews conducted during the feasibility study and pilot RCT included: - Patients and health professionals felt that the intervention was acceptable, but its impact on patients' alcohol consumption varied widely. Health professionals identified potential benefits of the intervention at personal, system and society levels. - Some patients reported changing their drinking behaviour due to information about the consequences of alcohol consumption on post-operative recovery. Health professionals also felt that informing patients about the impact of alcohol consumption on recovery

	- ~5 min of structured advice on alcohol consumption aimed at increasing the participant's motivation, guided by the participant's AUDIT score and a brief advice tool. - ~25 min of brief behaviour change counselling aimed at increasing the participant's volition, guided by a brief intervention tool. Participants received copies of the brief advice and brief intervention tools and a patient leaflet. An optional booster session was delivered approximately one week pre-op via telephone or face-to-face in the pre-assessment clinic. The booster session involved completion of the AUDIT tool, goal review, feedback on performance and discussion of self-monitoring. Data were collected through study statistics, intervention delivery fidelity assessments and qualitative interviews with patient participants and health professionals. Quantitative data were analysed descriptively. Qualitative data were analysed using framework analysis. ***Pilot RCT*** Participants were recruited from three secondary care hospitals and	**involved in the feasibility study** N=3 ***Pilot RCT*** **Adults listed for elective primary knee replacement who met the criteria for increased risk drinking** **Control group:** N=25 (total) N=6 (interviewed) (Adults listed for elective primary hip replacement who met the criteria for increased risk drinking N=10 (total), N=1 (interviewed)) **Intervention group** N=20 (total) N=5 (interviewed) (Adults listed for elective primary hip replacement who met the criteria for increased risk drinking N=13 (total), N=2 (interviewed)) **Healthcare professionals**	encouraged patients to engage with the intervention. - Patients were more familiar with the term 'unit' than 'standard drink' but their understanding of the term 'unit' varied. They were most comfortable discussing alcohol quantities in terms of pints or glasses. Patients' views of the terms 'harmful', 'hazardous' and 'risky' drinking varied. - Patients' opinions about whether patients would feel comfortable discussing their alcohol consumption varied. Health professionals felt that the discussions were a key part of the trial. - Health professionals felt that the brief advice tool and brief intervention tool were both useful and facilitated their communication with patients. - Some patients reported changing their drinking behaviour due to completing the AUDIT screening tool, which prompted them to think about how much they drink[c]. Health professionals also felt that the screening increased patients' awareness of their alcohol consumption and helped motivate them to change. - Two healthcare professionals felt that pre-op assessment nurses are best placed to deliver the screening and intervention - Health professionals felt that the infographic explaining standard drinks was especially helpful.

	randomized with 1:1 allocation to a control group or intervention group. **Control group:** Received treatment as usual and completed the AUDIT questionnaire. **Intervention group:** Received treatment as usual, completed the AUDIT questionnaire and received the brief behavioral intervention described above. Data were collected through study statistics, questionnaires/tools, intervention delivery fidelity assessments and qualitative interviews with patient participants and health professionals. Qualitative data were analysed using framework analysis. Quantitative data were analysed descriptively. The quantitative results were not reported separately for participants undergoing knee replacement. Two criteria for progression to a definitive trial were pre-specified.	**involved in the pilot RCT** N=5 Gender/sex: 100% (Demographic details are not provided separately for patients listed for knee replacement)	- Patients and health professionals felt that delivering the screening and intervention at the pre-assessment clinic was acceptable and highlighted that it was helpful to deliver the intervention around patients' existing appointments so that patients do not have to make a separate trip. - Health professionals highlighted the importance of having allocated time to deliver the intervention. - Patients' views about the possible benefits of the booster session varied. Some felt that it would be helpful whilst others felt that it would not make any difference. - Health professionals reported that tailoring the screening and interventions to patients' individual needs was important to keep their interactions positive. In the pilot RCT, only 12% of intervention group participants received a booster session. One of pre-specified criteria for proceeding to a definitive trial was met and the other was not. Not meeting the recruitment target was mitigated by the high retention and data completion rates. The authors concluded that a definitive trial of the intervention is feasible and identified various modifications that would be beneficial, including removing the booster session from the intervention.

SooHoo et al., 2011 (24), USA	To develop evidence-based QIs on care components that can be addressed to reduce differences in complication rates amongst surgeons performing TKR and THR	**Quantitative descriptive: Modified Delphi study** Participants were purposively selected through professional organizations related to total joint replacement. Data were collected using the RAND/UCLA Appropriateness Method. An initial list of 101 QIs was developed based on semi-structured interviews with leaders in orthopaedic surgery and relevant literature. The rating process involved two rounds in which participants anonymously rated the candidate QIs on a 1-9 validity scale, with a face-to-face discussion between the rounds. Data were analysed using descriptive statistics. The final list of QIs consisted of QIs with a median rating of ≥7 with agreement in the second round.	**Orthopaedic surgeons** N=10	All or part of 68 of the 101 candidate QIs were rated as valid with agreement by the panel and consisted of: - 18 pre-op process QIs - 9 intraoperative process QIs - 10 post-op process QIs - 8 structural QIs linked to implant selection and technology use - 13 structural QIs linked to privileging of providers - 10 outcome and comorbidity-related QIs Three QIs (16, 18 and 30) relate to pre-op education topics (treatment options, risks of surgery, functional outcomes, home modifications), delivery formats (written materials, electronic materials, videos) and/or providers (surgeon, nurse, case manager).
Specht et al., 2016 (25), Denmark	To explore the lived experience of patients undergoing fast-track primary TKR or THR between their first	**Qualitative: Phenomenological-hermeneutic** Participants were recruited from one hospital. Selection was stratified according to surgery and sex, but was otherwise random. Data were collected through observations and interviews. Participants were observed at various stages of the care pathway,	**Patients undergoing primary TKR** N=4 Age: 52.5±10.8 Sex: 50% (Patients undergoing THR: N=4)	Three themes were identified: 1. Dealing with pain 2. Feelings of confidence or uncertainty – the meaning of information 3. Readiness for discharge The information participants received created feelings of both reassurance and uncertainty. Participants valued meeting care providers and talking to other patients at the pre-op information session.

	outpatient visit and discharge	including the pre-op outpatient clinic appointment and pre-op information session. Each participant took part in a semi-structured interview prior to discharge (other than one participant who was interviewed via telephone post-discharge). The interviews focused on important aspects of the fast-track program. Data analysis was guided by Paul Ricoeur's theory of narrative and interpretation[7]. The data analysis was performed by one researcher but the findings were discussed with other researchers.		Participants did however feel private and personal matters should be discussed individually rather than in group settings[c]. Participants reporting having relatives present during the pre-op information session was helpful[c]. Participants felt it was difficult to take on board information during the nurse conversation immediately after the decision to undergo surgery had been made, so having a leaflet to refer to was useful. One participant specifically highlighted that a large volume of information is provided during the nurse conversation and it was *'quite mechanical'.*
Westby et al., 2018 (26), Canada	To develop QIs on pre-op and post-op rehabilitation for patients undergoing TKR or THR due to OA	**Quantitative descriptive: Modified Delphi study** Participants were recruited through a networks of contacts, patient/professional organizations and leading clinical/research centers. Data were collected using modified RAND/UCLA methodology. An initial list of 42 TKR QIs was developed from existing clinical practice guidelines, QIs, quality measures, systematic reviews, RCTs and cohort studies.	**Orthopaedic surgeons** N=5 **Family physician** N=1 **Physiotherapists** N=7 **Other allied health professionals** N=2 **Methodological expert (health professional**	No new TKR QIs were recommended during the rating process but wording alterations were made to the original QIs. Thirty six of the initial 42 TKR QIs were included in the final set of QIs and consisted of: - 16 pre-op QIs - 10 acute care QIs - 8 post-acute care QIs - 2 across continuum QIs All 16 QIs addressing pre-op TKR care from Round 1 were included in the final set of recommendations. Of the 16 pre-op TKR care QIs, 13 focused on screening/assessment and 3 focused on interventions. The QIs focused on pre-op TKR care addressed:

[7] Ricoeur P. Interpretation Theory: Discourse and the Surplus of Meaning. Texas: Texas Christian University Press; 1976.

	A total of three online rounds were used. During Rounds 1 and 3 participants rated each QI for importance and validity on a 1-9 Likert scale, during Round 2 participants took part in an online anonymous moderated discussion forum. Data were analysed using descriptive statistics. The final set of QIs included all QIs with a median rating of ≥7 for importance and validity and no disagreement in Round 3.	**background not provided)** N=1 **Patient who had undergone THR and TKR** N=1 (Patient who had undergone THR: N=1 – the results include this participant) Gender: 53% (for the 15 participants who completed the study)	- Education (including education topics, providers, delivery modes and tailoring) - Exercise (including exercise types, schedule intensity and tailoring) - Lifestyle intervention (weight management program)

ADL activities of daily living, *AUDIT* Alcohol Use Disorders Identification Test, *AUDIT-C* Alcohol Use Disorders Identification Test Consumption, *CBT* cognitive behavioural therapy, *CFIR* Consolidated Framework for Implementation Research, *COM-B* Capability, Opportunity and Motivation to perform a particular Behaviour, *ERAS* Enhanced Recovery After Surgery, *GP* General Practitioner, *HADS* Hospital Anxiety and Depression Scale, *KOPEI* Knee Osteoarthritis Patient Education Intervention, *KOPEQ* Knee Osteoarthritis Patient Education Questionnaire, *NHS* National Health Service, *OA* osteoarthritis, *post-op* post-operative, *pre-op* pre-operative, *QI* quality indicator, *RCT* randomised controlled trial, *SD* standard deviation, *THR* total hip replacement, *TKR* total knee replacement, *UCLA* University of California Los Angeles, *UK* United Kingdom, *USA* United States of America

[a] For studies with mixed populations, details of the participants and findings are only provided for participants who met the review eligibility criteria unless otherwise indicated. Where appropriate, details of participants who did not meet the review eligibility criteria are provided in brackets.

[b] N indicates the number of participants who consented to participate. When reported in the primary source, age and BMI are presented as mean ± standard deviation in years and kg/m² respectively and gender/sex is presented as the percentage of females. Gender/sex is specified as either gender or sex if clearly reported in the primary source.

[c] Finding is from a study with a mixed population and is not supported with evidence specifically for participants who met the review eligibility criteria.

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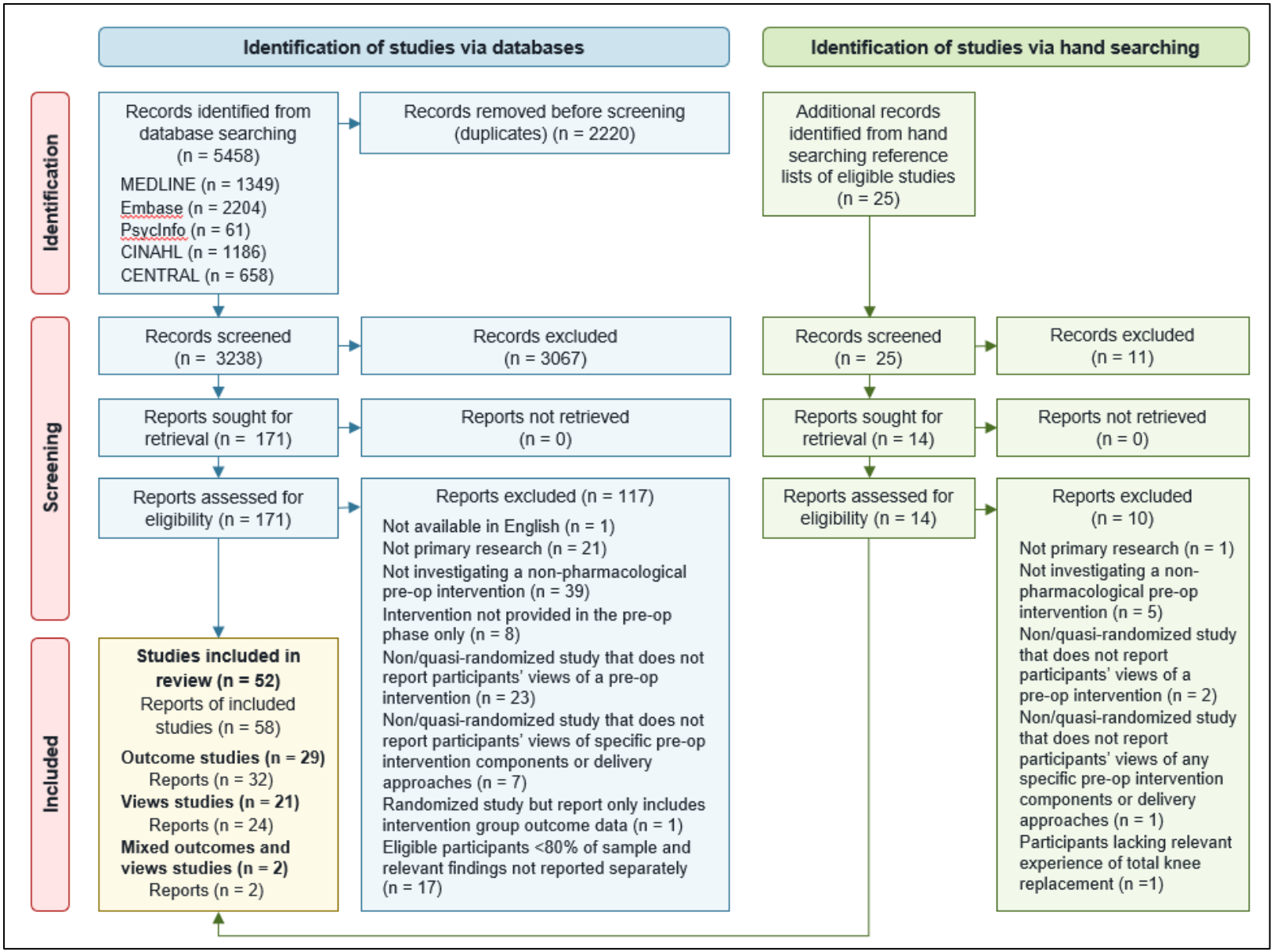
Identification of studies via databases
Identification of studies via hand searching
Identification
Records identified from database searching (n = 5458)
MEDLINE (n = 1349)
Embase (n = 2204)
PsycInfo (n = 61)
CINAHL (n = 1186)
CENTRAL (n = 658)
Records removed before screening (duplicates) (n = 2220)
Additional records identified from hand searching reference lists of eligible studies (n = 25)
Screening
Records screened (n = 3238)
Records excluded (n = 3067)
Records screened (n = 25)
Records excluded (n = 11)
Reports sought for retrieval (n = 171)
Reports not retrieved (n = 0)
Reports sought for retrieval (n = 14)
Reports not retrieved (n = 0)
Reports assessed for eligibility (n = 171)
Reports excluded (n = 117)
Not available in English (n = 1)
Not primary research (n = 21)
Not investigating a non-pharmacological pre-op intervention (n = 39)
Intervention not provided in the pre-op phase only (n = 8)
Non/quasi-randomized study that does not report participants' views of a pre-op intervention (n = 23)
Non/quasi-randomized study that does not report participants' views of specific pre-op intervention components or delivery approaches (n = 7)
Randomized study but report only includes intervention group outcome data (n = 1)
Eligible participants <80% of sample and relevant findings not reported separately (n = 17)
Reports assessed for eligibility (n = 14)
Reports excluded (n = 10)
Not primary research (n = 1)
Not investigating a non-pharmacological pre-op intervention (n = 5)
Non/quasi-randomized study that does not report participants' views of a pre-op intervention (n = 2)
Non/quasi-randomized study that does not report participants' views of any specific pre-op intervention components or delivery approaches (n = 1)
Participants lacking relevant experience of total knee replacement (n =1)
Included
Studies included in review (n = 52)
Reports of included studies (n = 58)
Outcome studies (n = 29)
Reports (n = 32)
Views studies (n = 21)
Reports (n = 24)
Mixed outcomes and views studies (n = 2)
Reports (n = 2)