

# Patients' needs and experiences of telerehabilitation after total hip and knee arthroplasty: A qualitative systematic review and meta-synthesis

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## Abstract

**Background:** The number of patients undergoing joint replacement procedures is continuously increasing. Tele-equipment is progressively being employed for postrehabilitation of total hip and knee replacements. Gaining a comprehensive understanding of the experiences and requirements of patients undergoing total hip and knee arthroplasty who participate in telerehabilitation can contribute to the enhancement of telerehabilitation programs and the overall rehabilitation and care provided to this specific population.

**Objective:** To explore the needs and experiences of total hip and knee arthroplasty patients with telerehabilitation.

**Design:** Systematic review and qualitative synthesis.

**Methods:** Electronic databases PubMed, Web of Science, The Cochrane Library, Embase, CINAHL, Scopus, ProQuest, CNKI, Wanfang Data, VIP, and SinoMed were systematically searched for information on the needs and experiences of telerehabilitation for patients with total hip arthroplasty and total knee arthroplasty in qualitative studies. The search period was from the creation of the database to March 2024. Literature quality was assessed using the 2016 edition of the Australian Joanna Briggs Institute Centre for Evidence-Based Health Care Quality Assessment Criteria for Qualitative Research. A pooled integration approach was used to integrate the findings inductively.

**Results:** A total of 11 studies were included and 4 themes were identified: the desire to communicate and the need to acquire knowledge; accessible, high-quality rehabilitation services; positive psychological experiences; the dilemmas of participating in telerehabilitation.

**Conclusions:** This study's findings emphasize that the practical needs and challenges of total hip and knee arthroplasty patients' participation in telerehabilitation should be continuously focused on, and the advantages of telerehabilitation should be continuously strengthened to guarantee the continuity of patients' postoperative rehabilitation and to promote their postoperative recovery.

## Keywords

Total hip arthroplasty, total knee arthroplasty, telerehabilitation, need, experience, meta-synthesis

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Registration: The study protocol had been registered in PROSPERO (International prospective register of systematic reviews). The registration number is CRD42023454346.

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## Introduction

Arthroplasty serves as an effective therapeutic approach for managing end-stage joint pathology and restoring joint functionality, thereby offering noteworthy pain relief and ameliorating the physical function and overall quality of life for patients.<sup>1,2</sup> Both total hip arthroplasty (THA) and total knee arthroplasty (TKA) have exhibited remarkable success rates and cost-effectiveness as joint replacement procedures.<sup>3,4</sup> In recent years, there has been a progressive increase in the number of patients undergoing THA and TKA, which is attributed to the global population aging and advancements in artificial joint replacement technology.<sup>5,6</sup>

Rehabilitation plays a crucial role in the recovery process following arthroplasty. Correct and comprehensive rehabilitation training can significantly improve joint mobility, enhance the strength of leg muscles, and empower patients to regain independence and actively engage in community life.<sup>7,8</sup> Postoperative rehabilitation for patients undergoing TKA and THA primarily consists of face-to-face rehabilitation and home-based rehabilitation. Face-to-face rehabilitation allows healthcare professionals to closely supervise and guide the patient's rehabilitation training, enabling real-time assessment of the rehabilitation progress. However, this approach may strain the rehabilitation resources of hospitals, increase the treatment workload of healthcare professionals, lead to higher out-of-pocket expenses for patients, and pose challenges for patients in accessing healthcare services.<sup>9</sup> Conversely, an increasing number of patients are opting for home-based rehabilitation, which provides a relaxed and comfortable environment. Nonetheless, home rehabilitation requires patients and their families to assume greater responsibility for postoperative rehabilitation.<sup>10</sup> Studies have indicated that home-based rehabilitation often falls short of achieving optimal outcomes due to the lack of professional guidance and supervision by healthcare professionals, as well as challenges related to patient compliance.<sup>11</sup>

With the advent and widespread use of the internet and mobile devices, teleservices have become increasingly prevalent in postoperative rehabilitation for THA and TKA.<sup>12,13</sup> Telerehabilitation refers to a remote rehabilitation approach that utilizes technologies such as videoconferencing, the internet, cell phones, or mobile devices to deliver rehabilitation-related information and healthcare services to patients.<sup>14,15</sup> Through telerehabilitation, healthcare professionals can offer postoperative rehabilitation support to patients in the comfort of their own homes by demonstrating exercises, providing reminders, and delivering follow-up information.<sup>16</sup> The emergence of telerehabilitation presents a viable solution to address various challenges associated with the limitations of traditional postoperative rehabilitation approaches.<sup>16,17</sup> Previous studies have indicated that teleapplication-based rehabilitation yields similar outcomes in terms of pain relief, improvement in physical function,

joint range of motion, and health-related quality of life when compared to face-to-face rehabilitation.<sup>18,19</sup>

Despite the increasing evidence supporting the effectiveness of telerehabilitation for postoperative rehabilitation following THA and TKA, there are still notable shortcomings. The demographic undergoing THA or TKA primarily comprises middle-aged and elderly individuals with limited familiarity with information technology, leading to challenges in the utilization of telerehabilitation programs.<sup>20</sup> Furthermore, the implementation of telerehabilitation procedures is hindered by network limitations and equipment constraints. Studies have revealed that certain existing telerehabilitation programs were not developed with patient involvement in the design and development phases, lacking a comprehensive consideration of patient needs.<sup>21</sup> Therefore, it is imperative to gain a thorough understanding of the requirements and experiences of patients undergoing TKA and THA in postoperative rehabilitation through telerehabilitation. This understanding will facilitate the enhancement and development of telerehabilitation programs. The objective of this study is to amalgamate qualitative research on the needs and experiences of telerehabilitation for patients undergoing THA and TKA, aiming to offer insights for clinical practice and the management of patient telerehabilitation.

## Methods

### Study design

Meta-synthesis is the most cited approach to synthesizing findings from qualitative studies in health service research.<sup>22</sup> The rationale for conducting a meta-synthesis is that its approach provides an overarching umbrella term to synthesize findings from different qualitative methods, it is often used for qualitative evidence synthesis and interpretation.<sup>23</sup> The meta-synthesis research methodology aligns with the objectives of this study as it enables a comprehensive analysis of multiple studies, synthesizing qualitative data to enhance understanding of the telerehabilitation needs and experiences among postoperative patients with THA and TKA.

This systematic review was undertaken following the reporting guideline, Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ).<sup>24</sup> The study protocol had been registered in PROSPERO (International prospective register of systematic reviews). The registration number is CRD42023454346.

### Search strategy

Electronic databases PubMed, Web of Science, The Cochrane Library, Embase, CINAHL, Scopus, ProQuest, CNKI, Wanfang Data, VIP, and SinoMed were systematically searched for information on the needs and experiences of telerehabilitation for patients with THA and TKA in qualitative

studies. The search period was from the establishment of the database to March 2024. The search strategy used a combination of subject terms and free words. Three groups of keywords were combined in the search strategy: (1) total knee arthroplasty/total hip arthroplasty; (2) telerehabilitation/telemedicine; and (3) qualitative research. Supplemental file 1 provides specific search strategies for each database. Additionally, the reference list of included studies was manually searched to identify relevant literature in line with the inclusion criteria of the aforementioned search strategy.

### Study selection

The search results were imported into and managed by NoteExpress software to remove duplicate records and complete the process of study selection. The selection process and results were reported in a flow diagram following PRISMA guidelines for reporting systematic reviews (Figure 1). Studies were included if they: (1) included THA and/or TKA participants or joint replacement related healthcare professionals; (2) reported needs and experiences of telerehabilitation for THA and/or TKA participants; (3) used qualitative research designs, qualitative data collection, and analysis; and (4) were published in English or Chinese. Studies were excluded if: (1) they were duplicates of published literature and (2) their qualitative data cannot be extracted.

### Quality appraisal

Two researchers (WZ and YW) trained in evidence-based medicine courses independently evaluated the study using the 2016 edition of the Australian JBI (Joanna Briggs Institute) evidence-based healthcare center qualitative research quality evaluation criteria.<sup>25</sup> In the case of disagreement, two individuals discussed the study until reaching a consensus or asked a third party to decide whether to include it. A total of 10 items were evaluated, each of which was rated as “yes,” “no,” or “unclear.” The quality of the study was categorized into three grades: A, B, and C. A grade of A indicates that the study meets the above standards and has the lowest possibility of bias. Partially meeting the above quality standards results in a grade of B, with a moderate possibility of bias, and the study is graded C if it does not meet the above quality standards at all and has the highest possibility of bias. Literature with a quality rating of A and B was finally included.

### Data extraction and analysis

Data extraction from the included studies was independently conducted by two researchers (WZ and YW). In case of disagreements, a third researcher was involved to resolve them through discussion. Key descriptive characteristics of the included studies were extracted using a pre-designed table, which included information such as authors,

publication year, country, research question, subject characteristics, setting, data analysis methods, and main findings.

The results were synthesized using the thematic synthesis method developed by Thomas and Harden,<sup>26</sup> which involved three stages. In the first stage, the researcher carefully read and analyzed the meaning of each research result. They then summarized and coded the results and findings line-by-line based on their meaning and content. In the second stage, descriptive topics were created to group similar results by comparing similarities and differences in the codes. Finally, in the third stage, the descriptive topics were thoroughly analyzed and examined, leading to the identification of new concepts and interpretations. The entire process was carried out by two researchers (WZZ and YW) who completed all the phases.

## Results

### Search results

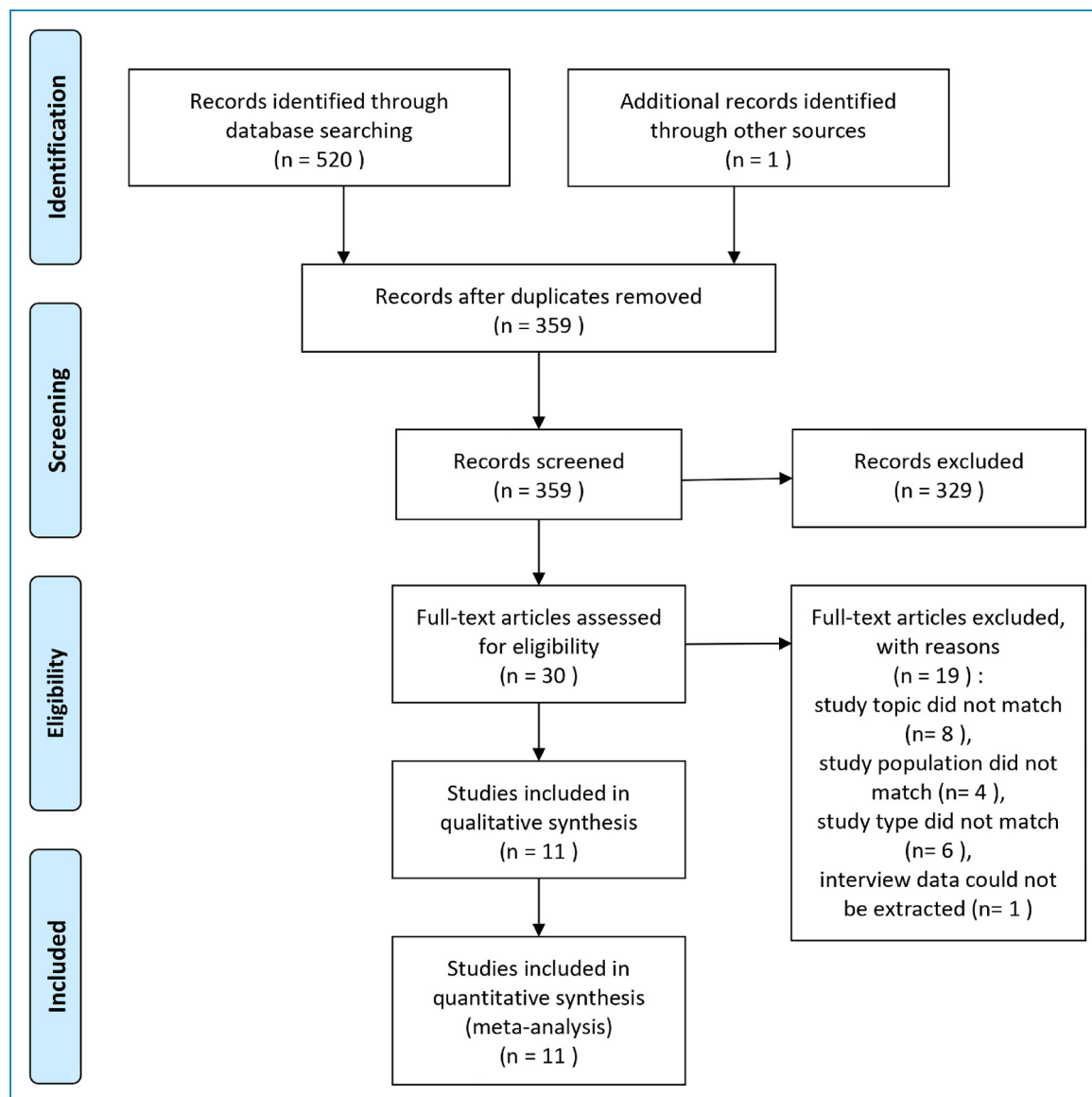
A total of 520 articles were retrieved through the database search, with 359 remaining after removing duplicates. After reviewing the titles and abstracts of the 359 articles, 329 were excluded. Then 30 full-text articles were read and 19 were excluded. Finally, 11 studies<sup>27–37</sup> met the final inclusion-exclusion criteria. A flowchart outlining the selection of eligible studies is shown in Figure 1.

### Quality appraisal

All 11 included studies were deemed to be of good quality. Four studies provided a comprehensive description of all quality assessment components and were rated as grade A, while the remaining 7 studies were evaluated at grade B. Among these, only four studies failed to describe the researcher’s situation adequately<sup>28,29,31,36</sup> and seven studies lacked a thorough explanation of the relationship between the researcher and the participants.<sup>28,29,31–33,36,37</sup> Additionally, the philosophical basis and methodological description of one study were unclear,<sup>29</sup> and another study did not articulate specific ethical information.<sup>36</sup> The complete details of the JBI quality appraisal for the 11 included studies are presented in Table 1.

### Study characteristics

Eleven studies were included from seven different countries: China, the United States, Canada, the United Kingdom, Australia, Germany, and Finland. All studies were published between 2013 and 2023. The total number of participants included in these studies was 201, consisting of TKA or THA patients, nurses, doctors, physiotherapists, and anesthesiologists. Among these studies, four conducted telerehabilitation using mobile apps,<sup>27,30,33,37</sup> two utilized telerehabilitation programs or platforms,<sup>28,31</sup> one employed ehealth programs,<sup>32</sup>



**Figure 1.** Flow diagram for study selection. According to preferred reporting items for systematic reviews and meta-analyses (PRISMA).

one implemented a virtual clinic intervention,<sup>29</sup> one used phone calls and webcams for telerehabilitation,<sup>36</sup> and two did not specify a telerehabilitation pathway.<sup>34,35</sup> Various qualitative research methods were employed, including qualitative descriptive studies, qualitative embedded single case studies, mixed-methods studies, participatory design, and qualitative exploratory studies. All studies conducted semi-structured interviews, with two studies also conducting focus group discussions.<sup>31,35</sup> Table 2 provides a detailed overview of the characteristics of the 11 included studies.

### Main findings of the meta-synthesis

The 11 included studies were read iteratively, relevant qualitative data were extracted and coded, and qualitative

data with similar meanings and themes were grouped into the same category, and a total of 10 categories were summarized and categorized. These categories were further synthesized and summarized to identify four overarching themes: (1) the desire to communicate and the need to acquire knowledge; (2) accessible, high-quality rehabilitation services; (3) positive psychological experiences; and (4) the dilemmas of participating in telerehabilitation (see Figure 2 for details).

**Theme 1: The desire to communicate and the need to acquire knowledge.** This theme centers around delineating the telerehabilitation requirements of patients undergoing THA and TKA. It mainly includes the patient's desire for doctor-patient communication and the need to access

**Table 1** JBI quality assessment results of the included primary studies.

Study	1	2	3	4	5	6	7	8	9	10	Grade
Wang et al. <sup>27</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	A
Kairy et al. <sup>28</sup>	Y	Y	Y	Y	Y	N	N	Y	Y	Y	B
Parkes et al. <sup>29</sup>	U	Y	Y	Y	Y	N	N	Y	Y	Y	B
Wang et al. <sup>30</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	A
Naeemabadi et al. <sup>31</sup>	Y	Y	Y	Y	Y	N	N	Y	Y	Y	B
Saunders et al. <sup>32</sup>	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	B
Fischer et al. <sup>33</sup>	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	B
Jansson et al. <sup>34</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	A
Van et al. <sup>35</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	A
Zhang et al. <sup>36</sup>	Y	Y	Y	Y	Y	N	N	Y	U	Y	B
Joshi et al. <sup>37</sup>	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	B

1. Is there congruity between the stated philosophical perspective and the research methodology?
  2. Is there congruity between the research methodology and the research question or objectives?
  3. Is there congruity between the research methodology and the methods used to collect data?
  4. Is there congruity between the research methodology and the representation and analysis of data?
  5. Is there congruity between the research methodology and the interpretation of results?
  6. Is there a statement locating the research culturally or theoretically?
  7. Is the influence of the researcher on the research, and vice versa, addressed?
  8. Are participants, and their voices, adequately represented?
  9. Is the research ethical according to current criteria or, for recent studies, is there evidence of ethical approval by an appropriate body?
  10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?
- N: no; U: unclear; Y: yes.

specialized knowledge. This theme was discussed in three of the included studies.<sup>27,31,34</sup>

**Expect to communicate with healthcare professionals.** Patients encountered challenges in accessing their healthcare provider during traditional rehabilitation, leading to difficulties in recalling all the necessary rehabilitation information. Furthermore, there were instances where patients experienced uncertainty due to conflicting information received: “I’ve received different kinds of information, so now I’m in doubt.”<sup>31</sup> Patients expressed an expectation

for telerehabilitation systems to facilitate seamless patient–physician communication, ensuring continuous access to healthcare professionals for inquiries: “We should be able to ask healthcare professionals questions about rehabilitation via the app...”<sup>27</sup> Moreover, patients sought active involvement of healthcare professionals in the postoperative rehabilitation process, desiring guidance on exercises: “If I could use the mobile app program, I would like to upload my exercise videos on the app and ask the healthcare professionals to review whether I am doing well.”<sup>27,31</sup>

**The desire for specialized knowledge.** Patients exhibited a keen interest in acquiring rehabilitation knowledge via telerehabilitation, recognizing its value: “... If the patients could open the app and watch the learning materials directly, it would be helpful.”<sup>27</sup> For instance, patients expressed a desire to learn relaxation techniques postsurgery, strategies for maintaining emotional wellbeing, effective pain management approaches, and traditional Chinese medicine-based rehabilitation techniques.<sup>27</sup> Concurrently, patients conveyed a preference for telerehabilitation to provide comprehensive instructions on postoperative rehabilitation methods and explicit guidelines regarding postoperative precautions: “... If there are some activities we mustn’t do, I hope to be informed clearly by a ‘Don’t list’ on the app.”<sup>27</sup> Patients aspired for telerehabilitation services to enhance their accessibility to and proficiency in such expertise, emphasizing the importance of supportive care and aid to aid adherence: “There is a need for a service that supports the patient during the whole care journey and helps the patient remember what is required.”<sup>34</sup>

**Theme 2: Accessible, high-quality rehabilitation services.** This theme elucidates the facilitation of more convenient and improved rehabilitation services for patients undergoing THA and TKA through telerehabilitation. Telerehabilitation offers enhanced accessibility to healthcare services, ensuring regular monitoring, timely rehabilitation reminders, and effective knowledge dissemination. This theme was discussed in seven of the included studies.<sup>27,28,30–32,34,35</sup>

**More convenient healthcare experience.** Telerehabilitation allows patients to experience the convenience of healthcare, which is available to them from the comfort of their own homes through the telerehabilitation program: “I did not need to go somewhere, like the rehabilitation center, to learn how to conduct rehabilitation exercises. Traffic and parking issues always give me headaches. I just stayed at my home, watching the app and practicing rehabilitation exercises with the support of the mobile app program.”<sup>30</sup> This greatly reduces the patient’s visit time and travel expenses. The patient can view the follow-up schedule at any time via the app: “... The follow-up schedule after

Table 2 Characteristics of the included studies.

Study	Country	Study design	Participants	Sample	Telerehabilitation type	Aims or purpose of the study	Main themes
Wang <i>et al.</i> <sup>27</sup>	China	Qualitative descriptive research; semistructured interviews	TKA and THA patients	N = 20	Mobile applications	To understand the specific needs of postoperative THA or TKA patients for rehabilitation services via mobile apps	4 Themes: assisting rehabilitation self-management; facilitating peer support; facilitating contact with healthcare professionals; supporting emotional wellbeing
Kairy <i>et al.</i> <sup>28</sup>	Canada	Qualitative embedded single case study; semistructured interviews	TKA patients	N = 5	Telerehabilitation platform	To explore patients' perceptions of receiving telerehabilitation services after TKA	6 Themes: improved access to services; strong therapeutic relationship with the therapist; telerehabilitation complements in-person visits; telerehabilitation provides individualized exercise programs; perceived ease of use of telerehabilitation equipment; a sense of ongoing support
Parke <i>et al.</i> <sup>29</sup>	United Kingdom	Mixed research; semistructured interviews	TKA and THA patients	N = 8	Virtual clinic	To assess the acceptability of a newly introduced virtual clinical follow-up pathway for hip and knee replacements	7 Themes: patient understanding and expectations; patient confidence; patient voice; managing deterioration of the condition, patient benefit; patient satisfaction using technology and navigating the website
Wang <i>et al.</i> <sup>30</sup>	China	Qualitative descriptive research; semistructured interviews	TKA and THA patients	N = 25	Mobile applications	To explore the experiences of patients undergoing mobile app-based rehabilitation after THA or TKA	5 Themes: improved access to healthcare; encouraged postoperative recovery; established supportive relationships; facilitated learning, and future directions

(continued)

Table 2 Continued.

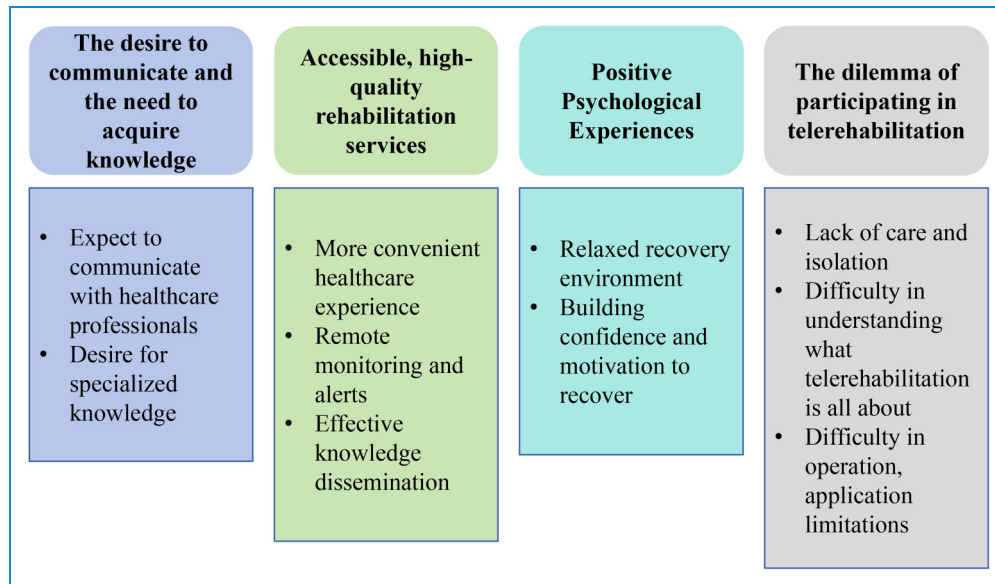
Study	Country	Study design	Participants	Sample	Telerehabilitation type	Aims or purpose of the study	Main themes
Naeemabadi et al. <sup>31</sup>	Australian	Participatory design; semistructured interviews; focus groups	TKA patients	N = 12	Telerehabilitation program	Design and development of a telerehabilitation program to address the need for a self-training rehabilitation program for postoperative TKA patients	4 Themes: communication; information; training; motivation
Saunders et al. <sup>32</sup>	Australian	Qualitative descriptive research; semistructured interviews	THA patients	N = 9	eHealth program	To explore the patient experience, perceived benefits, and recommendations of a teletherapy program for THA preoperative and postoperative education	3 Themes: supported surgical journey; motivated recovery; functionality
Fischer et al. <sup>33</sup>	German	Qualitative descriptive research; semistructured interviews	TKA patients	N = 8	Mobile applications	To investigate the use of a mobile application to remotely monitor and assess the health status of TKA patients at hospital discharge and to follow their recovery process	4 Themes: value of reports; feedback reports; graphical displays; text-based reports
Jansson et al. <sup>34</sup>	Suomi	Qualitative exploratory study; semistructured interviews	Surgeons, anesthesiologists, nurses, and physical therapists at joint replacement centers	N = 20 (surgeon = 4, anesthesiologist = 2, nurse = 10, physiotherapist = 4)	N/A	To understand the telemedicine needs of medical professionals for joint replacement patients during elective primary rapid hip replacement and knee replacement procedures	9 Themes: eligibility criteria; referrals; meeting the Health Care Guarantee; patient flow; postdischarge care; patient counseling; communication; transparency of the journey; and receiving feedback
Van et al. <sup>35</sup>	Australian	Qualitative descriptive	TKA patients, surgeons,	N = 34 (patients = 11, surgeons =	N/A	To investigate communications and	2 Themes: the patient total knee replacement journey;

(continued)

Table 2 Continued.

Study	Country	Study design	Participants	Sample	Telerehabilitation type	Aims or purpose of the study	Main themes
		research; semistructured interviews; focus groups	physiotherapists, general practitioners	12, physiotherapists = 3, general practitioners = 8)		interactions between patients and care teams in the delivery of TKA to identify opportunities for digital technology to add value to TKA healthcare service by enhancing the cocreation of value	information and communication flow
Zhang <i>et al.</i> <sup>36</sup>	China	Qualitative descriptive research; semistructured interviews	THA patients	N = 32	Telephone and online video	To explore the rehabilitation needs of hip replacement patients within 3 months of discharge from hospital and to provide a basis for developing a program of telephone follow up combined with online video that meets patient needs	4 Themes: desire to listen to pain complaints and provide relief; need for guidance in rehabilitation training; expectation to meet the need for disease knowledge; desire to attend to emotional needs
Joshi <i>et al.</i> <sup>37</sup>	United States	Exploratory, descriptive qualitative methodology; semistructured interviews	TKA and THA patients	N = 22	Mobile applications	To evaluate the feasibility and potential acceptance of a mobile application for resident-initiated home assessment	7 Themes: perceived level of comfort using technology; existing technology ownership; technology features used by patients; likelihood of use of a mobile home assessment tool; timing of use of mobile home assessment tool; perceived usefulness of a mobile home assessment tool; preferred tool features; preferred tool content and formats





**Figure 2.** Overview of themes and categories.

surgery could be provided on the app so that I could check whenever I want.”<sup>27</sup> In addition, therapists can see more patients, and patients have easier access to healthcare: “It allows patients to access health services more easily and therapists to see more patients.”<sup>28</sup>

**Remote monitoring and alerts.** Healthcare professionals can utilize apps to remotely remind patients of important tasks.<sup>27</sup> For instance, they can provide regular reminders for patients to review relevant video material, inquire about daily exercise routines, and initiate postoperative rehabilitation promptly.<sup>32</sup> As one participant explains, “The healthcare professionals sent messages every Monday to remind me to continue exercising, even during the holiday. With these reminders, I did better at keeping going with the practice of rehabilitation exercises.”<sup>30</sup> The telerehabilitation app can also monitor the intensity of the patient’s pain at any time,<sup>34</sup> and patients can provide timely feedback on their telerehabilitation experience so that healthcare professionals can make changes to their healthcare plans: “Via the app, patients could give instant feedback on their experience of using the mobile app program, such as is this app easy to use? What can be improved? The healthcare professionals could make timely modifications in the program according to patients’ feedback.”<sup>27</sup> The telerehabilitation program allows healthcare professionals to monitor whether the patient is on time for rehabilitation training and checks whether the rehabilitation exercises are up to standard, and give feedback on the patient’s rehabilitation training accordingly.<sup>31</sup>

**Effective knowledge dissemination.** Telerehabilitation produces good knowledge transfer. Patients can understand

complex rehabilitation exercises more easily and the video instructions are more detailed: “... The app could provide demonstration videos to show us how to properly conduct rehabilitation exercises, from the front, back, and side of the instructor.”<sup>27</sup> Some patients found it motivating to watch videos for rehabilitation.<sup>35</sup> At the same time, the telerehabilitation system provides more comprehensive professional information: “... I had read the instructional pamphlet provided by the ward nurse, but I preferred to use the app as the information provided via the app was more comprehensive...”<sup>30</sup> In addition, the rehabilitation content provided by the telerehabilitation app is more structured,<sup>31</sup> which can increase the patient’s interest in reading and learning and improve the quality of the patient’s rehabilitation: “I read everything I can and I think everything that was included was helpful...”<sup>32</sup> Patients can also access the content they care about on telerehabilitation apps to learn more about it and thus better their rehabilitation.<sup>32</sup>

**Theme 3: Positive psychological experiences.** This theme elucidates the favorable psychological encounters encountered by patients undergoing THA and TKA as they engage in telerehabilitation. In the context of telerehabilitation, patients report a diminished sense of stress and enjoy a more serene rehabilitative milieu. Furthermore, telerehabilitation contributes to the cultivation of patients’ self-assurance and bolstering of their motivation toward recuperation. This theme was discussed in five of the included studies.<sup>27,28,30–32</sup>

**Relaxed recovery environment.** Telerehabilitation gave patients a more relaxed rehabilitation environment. Patients

felt that rehabilitation was less stressful because the therapist was not with them: "... the fact that she (the physiotherapist) was not with me in the house, I was less stressed."<sup>28</sup> Patients liked the flexibility of telerehabilitation: "I just read the educational materials whenever and wherever I wanted and got knowledge about my recovery. I like this kind of flexibility."<sup>30</sup> Telerehabilitation also did not put additional pressure on the patient to rehabilitate,<sup>28</sup> the patient did not feel monitored,<sup>31</sup> and the rehabilitation training was available at any time and the rehabilitation environment was more free: "The advantage is that you can train at home and whenever you want."<sup>31</sup>

#### *Building confidence and motivation to recover.*

Telerehabilitation programs can provide examples of successful rehabilitation of other patients as a way to increase patient confidence: "Successful cases in postoperative rehabilitation could be provided on the mobile app. By seeing these examples, I would be more confident to continue in rehabilitation, coz I suppose if they could do it I could do it."<sup>27</sup> Patients reported more confidence in their rehabilitation activities when they saw patients with the same surgical experience undergoing rehabilitation.<sup>30</sup> The specific training goals provided by telerehabilitation can continuously motivate patients to adhere to the daily rehabilitation program<sup>27,32</sup> so that the patient's rehabilitation is normalized and keeps advancing in the right direction: "... it was positive regardless. We say well we're heading in, in the right direction... to recuperate."<sup>28</sup>

#### *Theme 4: The dilemma of participating in telerehabilitation.*

This theme explores the obstacles encountered by patients undergoing THA and TKA in their engagement with telerehabilitation. Patients expressed feelings of inadequate support and a sense of isolation during their participation in telerehabilitation. Additionally, some patients experienced difficulties comprehending the intricacies of telerehabilitation and viewed the remote system as challenging to navigate, often perceiving limitations in its functionality. This theme was discussed in nine of the included studies.<sup>27–33,36,37</sup>

*Lack of care and isolation.* Patients reported that health-care professionals did not take an active role in caring for them during the telerehabilitation process, "The nurse did not take an active role in caring for me on the phone, and I did not have the opportunity to talk about my distress."<sup>36</sup> Telerehabilitation made patients feel more isolated: "It is a lonelier form of training than team training."<sup>31</sup> Patients felt that they lacked sufficient hospital support: "I don't think there is much support you get from the hospital from that angle."<sup>31</sup> Some patients even felt that they were not really cared for.<sup>29</sup> In addition, patients felt that the rehabilitation therapist did not carefully supervise the patient's rehabilitation exercises during the

telerehabilitation sessions<sup>32</sup> and that the instructions did not last long: "Instead of him (the physiotherapist) watching me for 10–15 min, I had already done a few minutes."<sup>28</sup>

*Difficulty in understanding what telerehabilitation is all about.* Patients have difficulty understanding the medical terminology involved when using a telerehabilitation program: "Sometimes medical jargon is used in the instructions and I can't understand them."<sup>27</sup> The technical aspects of it were so specialized that they could not be understood and felt helpless: "... the technicalities involved were difficult to understand unless I had some medical knowledge."<sup>29</sup> Patients felt that the telerehabilitation program was more suited to younger patients and that those with experience in using it might be more likely to understand what was involved: "The idea is good, but maybe more suitable for patients, which are 30 years younger—they might understand it better."<sup>33</sup> In addition, some patients felt that remote instruction over the phone made it difficult for them to understand the specific rehabilitation modalities, "the phone follow up didn't talk about how to train at all, and I still didn't understand some of the movements without video demonstrations."<sup>36</sup>

*Difficulty in operation, application limitations.* Patients perceived the telerehabilitation program as complex to operate and sometimes had to ask for help: "... but I have to ask for help if a complicated operation such as uploading a document is required."<sup>27</sup> Patients are more likely to accept remote systems that are easy to operate, "I am more likely to use it if it is easy."<sup>37</sup> Because most of the patients receiving THA and TKA were middle-aged or older, with less knowledge of information technology,<sup>29</sup> only a small percentage of them could master the procedures: "Some of them are fantastic and do it but they're a minority."<sup>29</sup> The vast majority of patients are unfamiliar with the technology and need clear instructions on how to use it.<sup>27,30</sup> In addition, telerehabilitation programs can be malfunctioning and can consume patients' patience, making it difficult to use telerehabilitation programs properly when there is no internet access or the equipment is malfunctioning, affecting the patient's rehabilitation program.<sup>27</sup>

## Discussion

This meta-synthesis aims to synthesize qualitative research on the needs and experiences of patients undergoing TKA and THA with telerehabilitation to inform the clinical practice and management of telerehabilitation. The results of this study showed that the needs and experiences of patients undergoing TKA and THA participating in telerehabilitation were categorized into four themes: the desire for communication and the need to acquire knowledge, accessible and high-quality rehabilitation services, positive

psychological experiences, and the dilemma of participating in telerehabilitation. From the integrated results of the study, doctor–patient communication and access to specialized knowledge were the main needs of patients for telerehabilitation; moreover, although telerehabilitation brings many advantages for patients' postoperative rehabilitation, there are still some challenges for patients to participate in telerehabilitation at present.

The study findings indicate that patients who undergo THA and TKA often experience a lack of communication with healthcare professionals within the traditional rehabilitation model. Due to this deficiency, these patients express a strong desire to enhance communication opportunities with healthcare professionals through telerehabilitation programs, alongside a keen interest in acquiring relevant professional knowledge. It is important to address this communication gap, as the absence of effective communication and access to professional knowledge among patients undergoing postoperative THA and TKA can result in reduced confidence in the rehabilitation process, ultimately impacting its effectiveness.<sup>38</sup> By strengthening the lines of communication between patients and healthcare professionals, the latter can gain a comprehensive understanding of patients' concerns throughout the rehabilitation journey. This enables healthcare professionals to provide tailored rehabilitation guidance and subsequently enhances patient satisfaction with their treatment.<sup>39</sup> Therefore, it is imperative for healthcare professionals to actively engage in communication with patients, catering to their specific needs in remote rehabilitation. By patiently addressing patients' queries in the context of remote rehabilitation, healthcare professionals can foster a positive mindset among patients, ensuring their willingness to embrace subsequent phases of the rehabilitation process. At the same time, the increase in doctor–patient communication may further increase the number of people participating in telerehabilitation, which is conducive to long-term adherence to rehabilitation treatment and improved patient compliance.<sup>40</sup>

The integrated findings of this study demonstrate the numerous benefits offered by telerehabilitation for patients undergoing THA and TKA. Telerehabilitation provides patients with enhanced convenience in accessing medical services and a more comfortable rehabilitation environment. This aligns with the conclusions drawn by Ozden *et al.*,<sup>41</sup> suggesting that telerehabilitation may offer enhanced efficacy in enhancing physical function and providing more convenient healthcare to patients as opposed to traditional rehabilitation methods. Moreover, telerehabilitation enables healthcare professionals to closely monitor patients' rehabilitation progress, provide timely reminders for training sessions, and facilitate effective knowledge transfer, thereby bolstering patients' confidence in the rehabilitation process. Similarly, Hoogland *et al.*<sup>42</sup> found that patient compliance with telerehabilitation programs is

notably higher, resulting in increased confidence, motivation, and improved rehabilitation outcomes. However, a separate study<sup>43</sup> highlighted the persistent challenges of ensuring long-term sustainability in THA and TKA rehabilitation, as patients often discontinue subsequent rehabilitation due to time constraints and difficulties in traveling to treatment sites. Such factors have a detrimental effect on physical recovery. In contrast, telerehabilitation offers a flexible and personalized solution, allowing patients to engage in rehabilitation training at their convenience, irrespective of time, and travel distance limitations.<sup>44</sup> This versatility renders telerehabilitation a promising alternative for patients seeking effective and accessible rehabilitation therapy.

However, the findings of this study reveal that patients undergoing THA and TKA experienced psychological challenges characterized by a sense of neglect and loneliness during their participation in telerehabilitation. While previous research<sup>19</sup> has demonstrated that home-based telerehabilitation can yield equivalent outcomes compared to traditional face-to-face rehabilitation, the absence of personal interaction throughout the day can prevent patients from experiencing a sense of being cared for. For example, telerehabilitation based on verbal communication over the phone does not cater for the inner needs of the patient due to the short duration of the call, and the patient does not have time to talk about their own feelings.<sup>36</sup> As patients' expectations regarding telerehabilitation continue to rise, various dissatisfactory experiences will inevitably arise.<sup>45</sup> Therefore, healthcare professionals must actively address patients' psychological wellbeing within the context of telerehabilitation, including regular follow ups, comprehensive understanding, and empathetic care to meet their psychological needs. Moreover, subjects undergoing arthroplasty encounter diverse challenges during their participation in telerehabilitation, which impedes its practical implementation. The specialized nature of telerehabilitation content and technology renders it difficult for patients to comprehend. Additionally, as most arthroplasty patients are middle-aged or elderly individuals with limited knowledge of information technology, operating the telerehabilitation system becomes a daunting task for them. Previous studies<sup>46,47</sup> have also identified issues regarding the acceptability and usability of telerehabilitation, further hindering its widespread adoption.

Healthcare professionals play a crucial role as direct providers and supervisors of telerehabilitation services. To further enhance the effectiveness of these services, it is imperative to augment their training in telerehabilitation, improve guidance and management about patient issues, and mitigate obstacles hindering patient engagement.<sup>48</sup> Research findings<sup>49</sup> indicate that encouraging active patient participation in telerehabilitation and soliciting their feedback can facilitate shared decision making in rehabilitation treatment, resulting in a patient-centered

telerehabilitation model. This, in turn, fosters the advancement and design of diverse teleprograms and portals, thereby promoting the practical implementation of telerehabilitation. Despite being a promising form of rehabilitation, the promotion and widespread application of telerehabilitation remain limited. It is recommended that healthcare professionals and relevant technicians address the challenges faced by patients participating in telerehabilitation by intensifying skill training and application program development. By doing so, the practical utilization of telerehabilitation can be expanded, ensuring that a greater number of patients can benefit from this emerging approach.

### Limitations

This study also has some limitations. Firstly, the studies included in this analysis were conducted across six distinct geographical regions, with inherent disparities in economic and technological advancements. These variations might influence the user experience within the telerehabilitation system. Furthermore, divergences in patients' cultural backgrounds, physical conditions, and approaches to telerehabilitation could potentially impact the interpretation of integration outcomes. It is important to note that the countries encompassed in this study predominantly represent developed and high-income regions, thus limiting the applicability of the findings to low-income and less-developed areas.

### Relevance to clinical practice

The findings of this study yield crucial insights for healthcare professionals regarding the requirements and encounters of patients undergoing TKA and THA within the context of telerehabilitation. It is imperative for healthcare professionals to recognize the rehabilitation needs specific to patients undergoing TKA and THA. Additionally, it is worth noting that certain healthcare professionals may face challenges in effectively communicating with their patients, potentially leading to insufficient care, feelings of isolation, and difficulties comprehending the telerehabilitation content. Healthcare professionals should prioritize understanding patients' needs and providing support for their telerehabilitation programs. Furthermore, the study's findings highlight the advantages and positive experiences associated with telerehabilitation, which healthcare professionals can leverage to further enhance postoperative rehabilitation outcomes for patients.

### Implications for further research

Based on the study results, this research provides valuable insights into the challenges and limitations faced by patients undergoing THA and TKA when participating in telerehabilitation. These findings offer healthcare professionals a

deeper understanding of the factors influencing patient difficulties during the telerehabilitation process. Furthermore, while telerehabilitation offers patients a convenient rehabilitation environment, it may also engender feelings of loneliness and lack of support. Therefore, it is essential to explore more accessible and highly supportive telerehabilitation programs in the future. Importantly, attention should be given to addressing the specific needs of patients engaging in the telerehabilitation process. Future research should focus on developing personalized rehabilitation programs tailored to the telerehabilitation requirements of patients undergoing THA and TKA.

### Conclusions

This study integrated the genuine needs and experiences of patients undergoing THA and TKA when engaging in telerehabilitation. The exploration encompassed four key aspects. Patients express demand for telerehabilitation concerning effective communication and access to specialized knowledge. Additionally, telerehabilitation provides patients with more convenient, high-quality rehabilitation services and fosters positive psychological experiences. However, patients encounter various challenges during their participation in telerehabilitation. To ensure the continuity of postoperative rehabilitation and facilitate patient recovery, it is advisable to address the specific needs and obstacles faced by patients undergoing THA and TKA in telerehabilitation. Emphasis should be placed on enhancing the strengths of telerehabilitation and bolstering healthcare personnel training while optimizing program design. These efforts will minimize barriers to patient engagement in telerehabilitation and accelerate the practical implementation of this approach.

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