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ORIGINAL RESEARCH ARTICLE

Primary care rehabilitation after Knee Replacement – a cross sectional study

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ABSTRACT

Background: Rehabilitation after Knee Replacement (KR) surgery often entails an extensive rehabilitation in primary care but evidence-based high-quality guidelines are lacking. There is also a knowledge gap regarding current rehabilitation modalities applied in primary care in Sweden. This study aimed to (I) describe rehabilitation in primary care after KR and (II) explore physiotherapists' perceptions of patients' challenges during the rehabilitation.
Methods: A cross-sectional, web-based survey was conducted among Swedish physiotherapists working in primary care. Questions were categorical or open-ended and related to current rehabilitation practices, treatment modalities, and physiotherapists' perceptions of patients' challenges in rehabilitation after KR. Data were described descriptively and open-ended answers were analyzed with quantitative and qualitative content analysis.
Results: In total, 202 physiotherapists answered the survey. Rehabilitation focused on home exercises with recurrent physiotherapy visits. Common treatment modalities were knee range of motion exercises, strength training, and stationary cycling. Key rehabilitation challenges included the following categories: *Patients are unprepared*, *Challenging to find the optimal load*, and *Restoring function and trust in the knee*.
Conclusion: Rehabilitation after KR in Swedish primary care seems to be in line with previously recommended international treatment modalities. According to the physiotherapists in this study, some of the key challenges that patients faced were not being prepared for the severe pain regaining function and trust in the knee, balancing load/recovery, and resuming physically demanding activities.

Keywords: Knee Replacement, Rehabilitation, Primary Care, Physiotherapy

What's already known about this topic?

- *Although rehabilitation in primary care after KR is common, lengthy, and challenging for patients, there is no knowledge of current rehabilitation modalities used by physiotherapists in Sweden.*

What does the study add?

- *Swedish primary care physiotherapists seem to apply previously, internationally recommended active treatment modalities in KR rehabilitation. Key challenges for the patients were severe pain, knee swelling, balancing load/recovery, and resuming physically demanding activities.*

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Introduction

The first-line core treatment for Knee Osteoarthritis (OA) includes education, structured exercise, and, when necessary, weight loss (1,2). If first-line treatment is insufficient, KR can be a suitable option for managing end-stage OA (2). KR is one of the most common orthopedic procedures, and its prevalence is expected to rise as the number of individuals

with knee OA continues to grow (3). Standard treatment for end-stage OA is a total KR while unicompartmental KR is used less frequently (4).

In Sweden, a fast-track perioperative protocol is applied for elective KR which has resulted in shorter hospital stays (5). In contrast to the short hospital stays, the rehabilitation after KR is often experienced as long and challenging according to qualitative studies (6,7). Rehabilitation after KR seems to require more physiotherapy resources compared to Hip Replacement (HR) (8,9). Although most knee range of motion (ROM) is regained within the first three months after surgery, quadriceps strength imbalances between the operated and non-operated leg can persist for a year or longer after the surgery (10,11). Rehabilitation following KR typically includes strength training and ROM exercises, although these recommendations are based on limited and unclear evidence (12). In fact, a recent systematic review highlighted the lack of evidence regarding effective rehabilitation after KR (13). In Sweden, 20,622 primary elective KR were reported during 2023, and the prevalence of individuals with at least one KR is 1.5% per 100,000 Swedish residents, according to the Swedish Arthroplasty Register (14). Patients undergoing KR in 2023 had a mean age of 69.4 years, 55.4% were women and 37% had a Body Mass Index ≤30.

Given the high prevalence of KR and possible existing regional differences in care management, a national interprofessional working group was appointed within Sweden's national system for knowledge-based healthcare management in 2023 to develop a person-centered and cohesive clinical pathway/guideline for patients undergoing KR (15). The guideline should incorporate the clinical pathway including surgery, peri-operative, post-operative care, and rehabilitation, and be based on reliable international guidelines, systematic reviews, or individual studies (16). The working group included orthopedic surgeons, an anesthesiologist, nurses, an occupational therapist, physiotherapists, a general practitioner, and a patient representative.

In developing the clinical pathway/guideline for KR, it was noted that the existing international clinical guidelines and recommendations are mostly focused on the surgical procedure and peri-operative care and not the post-operative rehabilitation (17). There are some clinical practice guidelines that provide general recommendations for KR, however, these are either not evidence-based or supported by limited or unclear evidence (12). A scoping review by Krysa et al. (12) provided some recommendations regarding rehabilitation after KR, but it is unclear if these treatment modalities are applied by physiotherapists in primary care in Sweden. This knowledge gap, including patients' referral from orthopedic clinics to primary care, is important to address when developing a clinical pathway/guideline. Furthermore, understanding physiotherapists' perceptions of the challenges patients face during rehabilitation after KR is also essential to explore, especially in light of previous research highlighting the patients' difficulties and the mismatch between patients' rehabilitation results and expectations (6,7).

Therefore, the aims of this study were (I) to describe rehabilitation in Swedish primary care after KR and (II) physiotherapists' experiences of patients' challenges during the rehabilitation.

Methods

Design and setting

A cross-sectional web-based survey study was conducted within physiotherapy practice in primary care. Swedish primary care is characterized by a decentralized healthcare system with variations across different regions. These regional differences impact accessibility and quality of care, as each region is responsible for organizing and financing its healthcare services (18). Primary care in Sweden is primarily financed through taxes and thus, healthcare is available to all residents at a relatively low out-of-pocket cost (19). Physiotherapy is an integral part of primary care in Sweden, where physiotherapists work at health care centers or operate their own private practices. Patients can access physiotherapy either through referral or by directly contacting a physiotherapist of their choice (20). According to healthcare data from Region Skåne in southern Sweden, most KR patients undergo rehabilitation in primary care and attend a median of 15 visits (interquartile range: 9–23).

Data collection and participants

An online, public survey was created to identify current rehabilitation practices, treatment modalities, and recommendations for patients after all types of KR. The survey aimed to reach physiotherapists working in primary healthcare who treated patients after KR. They were requested to provide responses in line with local guidelines (if existing) or established best practices in their geographic area. The online survey was published in November 2023 and was open until January 2024. A link to the survey was distributed through the Swedish Physiotherapy Association, social media, and by connections with physiotherapists working in different regions.

Survey development

A survey tool, Sunet Survey was used to construct the digital questionnaire and manage the responses. The survey was constructed in connection with the development of the national care pathway for patients undergoing KR. Three of the authors (EÖ, ML, CS) were part of the working group for the care pathway and were responsible for constructing and distributing the survey. They are all physiotherapists with clinical experience in primary care (EÖ) and orthopedic clinics conducting KRs (ML, CS). A patient representative in the working group also contributed feedback in this process. A pilot version of the survey was tested by five physiotherapists in primary care and minor language adjustments were made after their feedback. No personal information about the respondents was collected, only the type of workplace was requested (i.e., private primary care, own establishment, regional primary care, municipal primary care).

The questions in the survey were related to rehabilitation in primary health care including referral from orthopedic clinics

after surgery, rehabilitation modalities, and recommendations regarding walking. One question focused on patients' challenges during the rehabilitation. The questions were categorical (binary or multiple-choice) or open-ended. The open-ended questions allowed the respondents to provide elaborative responses regarding their perceptions of important considerations in different phases of the rehabilitation. The survey questions related to this study are included in Appendix I.

Data analysis

EÖ and TS had the major responsibility for the analysis with contributions from the other co-authors. The distribution of the categorical questions regarding referral to primary care after KR, rehabilitation modalities and recommendations concerning walking were synthesized in Microsoft Excel, calculated and descriptively presented. Open-ended responses regarding *treatment and walking* were summarized in the text.

The free-text answers responding to the perceived challenges for the patients were pragmatically analyzed with manifest quantitative and qualitative content analysis (21,22). All free text that responded to the specific aim were seen as a unit of analysis. The responses were read several times by EÖ and TS. Each response could entail several challenges, for example, knee swelling *and* pain. The identified challenges were seen as meaning units. During the analysis, the meaning units were repeatedly compared and thereafter grouped in similar subcategories and summarized in actual numbers of responses per subcategory using Microsoft Excel and the software program N'Vivo (23). The subcategories were grouped in categories based on their content. Data was reorganized several times before reaching the results. The results were presented in text with representative quotes from respondents' free-text answers. The number represents the ID of the respondent.

Ethics

Ethical approval was not required for this study as no personal data was collected.

Results

The survey was responded to by 202 physiotherapists in 14 (of 21) Swedish regions. Fifty-six percent worked in the three largest regions in Sweden (Stockholm, Västra Götaland, and Skåne). The physiotherapists worked in regional primary care (58%), private primary care (38%), private practice (3%), or other (1%).

Referral to primary care

The first contact between the patient and the primary care physiotherapist after the surgery can be established in different ways according to the respondents. Patients can be referred from the orthopedic clinic, make an appointment themselves, and in some cases, they already have an established contact with the physiotherapist prior to surgery. In cases where patients contact the physiotherapist themselves, most respondents (72%) preferred that the first appointment after KR would be scheduled before the surgery. Regarding timing for the first post-operative visit, *2–3 weeks* was the most common response (57%), followed by *within a week (36%).*

Rehabilitation modalities

Treatment was most frequently (73%) delivered as home exercises combined with recurring physiotherapist visits. Group sessions and digital solutions were only reported to be used by a few physiotherapists (7%). Almost all respondents reported using a combination of active knee range ROM, strength training, and stationary cycling in KR rehabilitation (Fig. 1).

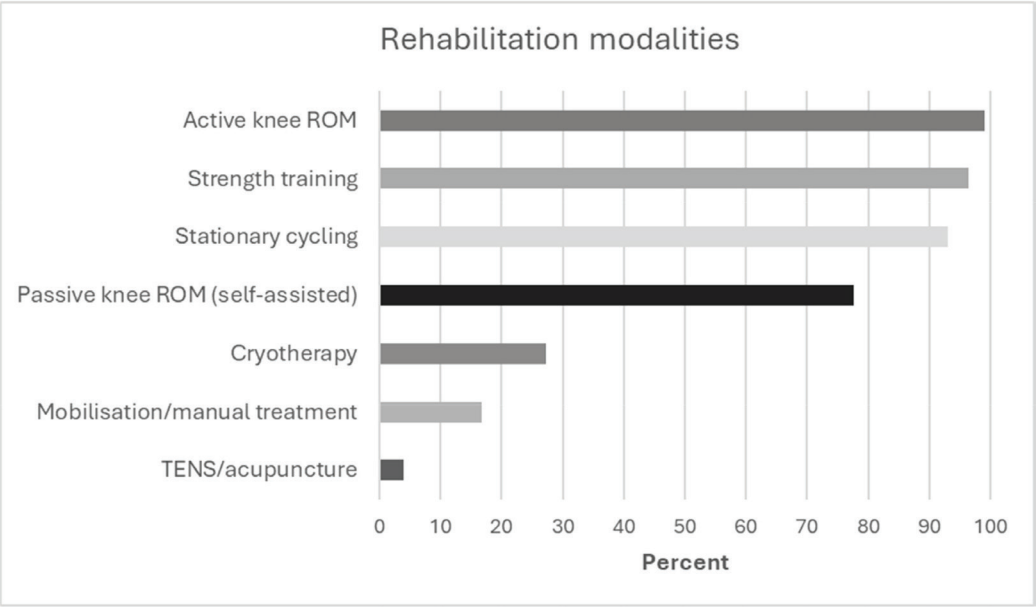

FIGURE 1 - Reported use of treatment modalities in primary care rehabilitation after KR surgery.

Regaining knee ROM was emphasized in the early post-operative phase of the rehabilitation. The respondents often recommended the patients to use a stationary bike or a peanut/bobath ball as equipment in partially unloaded exercises to increase knee flexion.

> Range of motion is prioritized during the initial period. Load to the point of pain and inform the patient that pain and swelling are common during the first few months and that this is normal. Resp. 21

Mobility exercises were combined with progressive strength training with an initial focus on the unloaded contraction of m. quadriceps proceeding to functional exercises involving other muscle groups such as the hip abductors and extensors. The respondents frequently recommended functional exercises such as rising from a chair and stair climbing.

Recommendations concerning walking

Sixty-one percent reported having a general recommendation for walking aids. The respondents were mostly in agreement regarding the type of walking aids and the duration of the period with walking aids. Two crutches were recommended unless the patient required a walker or other walking aid. Using crutches was recommended for at least 4–6 weeks or for as long as the patient walked with a limp.

Recommendations on walking distance were individual to a high extent, and most respondents emphasized that the walking time/distance should be limited during the first weeks after KR. Knee pain and joint swelling were frequently mentioned factors that should guide the walking time/distance. Some respondents were less restrictive and recommended as much loading as possible and 20–30 minutes of daily walking in the first weeks after the surgery.

> Listen to the body. Stay inside during week one and walk as little distance as possible the first 2 weeks after surgery. Then individually tailored recommendations. Resp. 97

> I usually recommend a daily walk of 20 minutes the first time (after surgery). Then increase when 5–6 weeks have passed depending on the patient's conditions. Resp. 153

Closely monitoring the patient, guiding them in balancing activity/load with recovery, and providing support during the challenging period following the surgery was seen as important.

Challenges during the rehabilitation

184 respondents (91%) answered an open-ended question related to patients' difficulties during the rehabilitation. Three main categories were identified, each with four to five subcategories. The main categories, subcategories, and the number of comments are presented in Table I.

TABLE 1 - Physical therapists' perception of patients' challenges during the rehabilitation

Main categories	Subcategories	Counted comments (n)
Patients are unprepared	Lengthy rehabilitation	16
	To endure the first tough weeks	9
	Misconceived expectations	9
	Handling life-long limitations	5
Challenging to find the optimal load	Manage pain and swelling	42
	Adherence to exercise	27
	Activity balance	13
	Setbacks with too much loading	9
Restore function and trust in the knee	Regain knee range of motion	61
	Walk without limping	34
	Resume physically demanding work and activities	27
	Kinesiophobia	8
	Trusting the knee	6

Patients are unprepared

The respondents wrote that patients could be surprised by the often severe pain during the first post-operative period. Furthermore, the patients were not always aware that the rehabilitation might be very lengthy. Sometimes, patients had expected to be able to return to work or activities more quickly. One respondent answered that many patients might be surprised that they don't recover as quickly as they had expected. Pre-operative information about the rehabilitation period was mentioned as extremely important.

> Patients often do not adequately absorb the information from the orthopedic surgeon regarding time, pain, and the rehabilitation process. Patients are often surprised that they experience such significant pain after the surgery. Resp. 57

The rehabilitation after the surgery often continues for a long period. The duration of the period with recurring follow-up visits differs according to the respondents, but a common period seems to be between three to six months with a transition to self-care only. It can take up to a year or more for full recovery after KR, even though considerable improvements often occur within the first few months.

> Some people are surprised that it takes so long before it feels ok, that it takes time before it feels like "my knee" and not my "operated knee", which can take one year and sometimes longer than that. Resp. 68

Challenging to find the optimal load

Finding the appropriate balance between load and recovery was mentioned as difficult for the patients by approximately half of the respondents. This seemed to be especially important during the first post-operative period. Too much load led to increased knee swelling and pain. Knee ROM and pain were often driven by swelling, which could worsen if the patient overloaded the knee. The respondents emphasized the importance of guiding patients to find the optimal load to manage knee swelling effectively. Identifying the optimal load and not exceeding it was something that the respondents often discussed with their patients. Several respondents noted that younger patients were often eager to return to work and daily activities, leading them to discontinue the use of walking aids or place excessive strain on the knee prematurely.

> For younger patients: Eager to start with heavier loads, they may need to be slowed down as they often experience increased swelling and pain with too rapid progression. Resp. 121

The physiotherapists experienced that an increase in pain after loading could cause a setback for many patients and that the setback might have a negative impact on their motivation and mental health. An important aspect that the respondents wrote was that they offered support to the patients and helped them find the appropriate balance between load and recovery. Another challenge that the respondents acknowledged was patients' limited motivation and low adherence to exercise. Patients who had a low adherence to the rehabilitation protocol may risk a worse outcome after the surgery. Continuation and consistency in the rehabilitation were recommended to improve adherence.

> The motivation to exercise as much as required after knee arthroplasty is not an easy rehabilitation process that happens on its own; much depends on the patient. Resp. 121

Restore function and trust in the knee

Regaining knee ROM was seen as a priority during the early phase of the rehabilitation, and it was also mentioned as a common struggle that the patients had, especially in knee extension. The respondents considered it important that the patients push the knee to full ROM. Many patients had difficulties with regaining quadriceps strength and a symmetrical gait pattern. The respondents stated that this was probably because the patients had been limping for quite a while before the surgery and this was difficult to change.

> The most difficult part for some is finding an 'optimal' walking pattern after the surgery, i.e., avoiding the limping gait they had before the surgery. Resp. 68

Some patients have difficulties trusting their knee and understanding that the pain they are experiencing does not mean that there is something wrong with the KR. Kinesiophobia may be an obstacle for some patients, especially in the early post-operative period when the pain is worse. The respondents also reported that the patients might have a fear of doing something that might "destroy" the KR and force them to have a revision surgery.

Discussion

This study explores rehabilitation in primary care following KR surgery. The most reported treatment modalities included a combination of active ROM exercises and strength training. Passive treatments like therapist-guided mobilization and acupuncture were less frequently utilized. The physiotherapists identified several key challenges for the patients during the rehabilitation process, with the difficulties of regaining ROM and managing pain and swelling in the knee being the most reported.

Since patients are typically discharged from the hospital shortly after surgery, early support from a physiotherapist may be crucial. Most physiotherapists in our study expressed a preference for scheduling the first post-operative session prior to surgery, to avoid delays in rehabilitation. If patients booked their appointment only after the surgery, they risked facing a long wait for an appointment and, in some cases, they did not prioritize physiotherapy due to post-surgery pain. This opinion echoes findings from a Japanese study, where patients who booked appointments after surgery had to wait several weeks for their first physiotherapy session, a delay that was deemed suboptimal (24).

The treatment modalities suggested in this study mainly align with the results in a scoping review of clinical practice recommendations for post-operative joint replacement rehabilitation (12). That review recommended early joint mobilization and physiotherapy, while treatments like continuous passive motion and transcutaneous electrical nerve stimulation therapy (TENS) lacked sufficient evidence to support or oppose their use. In the review by Krysa et al., *physiotherapy* encompassed several modalities such as strength training, exercise, ROM exercise, manual therapy, aquatic exercise, balance and mobility training. In our study, few respondents reported that they used manual therapy and, given the responses in free-text, it was mainly used as an add-on if the initial active ROM exercise did not have the desired effect on knee mobility.

According to the respondents, there are many challenges facing KR patients. A lack of preparedness for the struggles during the rehabilitation was identified as a factor that negatively impacted the recovery process. The respondents expressed that many patients were unaware of the initial pain and swelling and that it may take a long time to regain

knee function. This lack of awareness can lead to frustration and may negatively impact their adherence to rehabilitation protocols according to the respondents. This finding is consistent with earlier studies showing that patient expectations significantly influence rehabilitation outcomes (13,14). Preoperative education about the rehabilitation process, emphasizing that the first weeks after surgery may be difficult and that the recovery might take a long time, could play a crucial role in managing expectations and improving overall satisfaction and outcomes for the patients. Future studies may consider exploring the effects of pre-operative information on post-surgery outcomes such as pain, health-related quality of life, and psychological distress. Finding the balance between loading the knee and recovery appears to be a common struggle for patients, particularly in the early stages of rehabilitation. The respondents in our study emphasized that patients tend to either overdo physical activity or remain too cautious, both of which can hinder recovery. The respondents were fairly consistent in their recommendations that the patients should limit their walking distances and use walking aids early in the rehabilitation to prevent overload and knee swelling. The ability to walk without limitation was identified in a systematic review as one of the most important aspects of recovery for patients after a KR (25). Regaining symmetrical walking without limping was also expressed as important by the respondents in our study but it was also acknowledged as a major challenge for the patients. Other important recovery aspects identified in the previously mentioned systematic review were pain reduction, returning to activities of daily living, recreational activity, and knee ROM (25). Several of these factors that were considered important in the recovery process were also identified as challenges in our study.

Low adherence to recommendations and exercises among the patients may lead to a worse outcome of rehabilitation according to the respondents. This is not unique to this group of patients and is especially common in home-based exercise (26,27). The respondents emphasized that the exercises needed to be repeated several times per day, especially in the early phase of rehabilitation to regain knee ROM and reduce swelling. Previous research has identified self-motivation as one of the predicting factors of adherence, which was also reported in our study (27). A strong therapeutic alliance between the patient and physiotherapist as well as continuous support from physiotherapist were highlighted as important for adherence in our study and have been previously described as factors that may enhance adherence to exercise (24). Patients who are well-informed and understand the importance of doing the exercises might have more successful outcomes (28). Of the patient difficulties reported, regaining knee ROM was the most mentioned factor. Regaining knee ROM early was repeatedly emphasized as important by the respondents. There is reason to place emphasis on this, as previous studies have shown an association between early (six-weeks) post-operative knee ROM and self-reported satisfaction with knee ROM (29). The maximum gain of knee ROM is achieved within twelve weeks post-operatively according to an observational study (10). Thus, to make the most of the possibilities for improvement within this time, an early post-operative physiotherapy contact is recommended.

Regaining muscle strength, walking without limping, and returning to physically demanding work and activities were, according to the respondents, challenges that the patients were faced with later in the rehabilitation process. The respondents expressed that the patients often had difficulties in regaining a normal gait pattern because they had been limping for a long time before the KR. These results are in line with the results from a recent systematic review and meta-analysis reporting that lower speed, stride length, cadence, and longer stance phase on the non-operated leg were detected in patients at least six months after KR (30). Difficulties in regaining quadriceps strength are common and may be an important reason for functional impairment and the long-term alterations in gait (11,31) which was also expressed by the respondents in our study. Although the recommended period of sick leave after KR for patients with physically demanding work in Sweden is up to six months on a full-time basis, followed by partial sick leave (32), the respondents expressed that many patients found it difficult to return to physically demanding work or activities that required sufficient muscle strength. This result is in line with the results from a Swedish registry study reporting that long sick leave is common after KR and that 12–17% were still sick-listed one year after the surgery (33). Individuals at risk of long-term sick leave should be identified at an early phase to facilitate appropriate intervention at an early stage. A recent study has suggested that the *Work, Osteoarthritis, or Joint Replacement questionnaire* score at three-month follow-up could be used to predict the ability to return to work-related activities (34).

Strengths and limitations

One strength of this study is the combination of closed- and open-ended questions which allows the respondents to fully reflect their views. There were a geographical spread of the respondents and most Swedish regions were represented. The use of an anonymous digital survey might have reduced the influence of social desirability bias since the respondents could feel secure that they wouldn't be identified (35). There are also weaknf responses were low. Siesses in this study that should be mentioned. Considering the (probably) several thousand physiotherapists working in primary care in Sweden, the number of responses was low. Since this was a public survey, we were not able to determine the response rate. However, the consistency in the responses suggests that the outcome would likely have remained unchanged, even with additional responses. Self-selection bias might have influenced the results since the respondents were not targeted but had a choice to use the link to the survey.

There is a risk that the questions did not cover all relevant and important aspects of KR rehabilitation such as patient education and self-management. Furthermore, despite that the alternatives for rehabilitation modalities were based on the authors' and patient representative's experiences, we might have omitted important modalities. We also did not specify our definition of different treatment modalities in the survey. Strength training especially may encompass

different definitions among physiotherapists which may lead to misclassification of treatment modalities. Lastly, this study focuses on physiotherapists' perceptions of patients' challenges after KR surgery, and future studies in the same project will reveal if this agrees with the patients' experiences.

Conclusion

Physiotherapists in primary care in Sweden prioritized knee ROM, strength training, and stationary cycling in rehabilitation after KR. These treatment modalities were mainly in line with those recommended in previous research. Handling pain and knee swelling, regaining function and trust in the knee, balancing load/recovery, and resuming physically demanding activities and work were among the challenges that patients faced during rehabilitation according to the physiotherapists. Sufficient pre-operative information, effective pain management, adherence to exercise, and accepting the situation were seen as important factors to overcome the challenges.

Disclosures

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