



Review

Changing the narrative for exercise-based prehabilitation: Evidence-informed and shared decision making when discussing the need for a total knee arthroplasty with patients



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ABSTRACT

Objective: To examine a novel application of exercise-based prehabilitation in severe knee osteoarthritis—termed “pre-evaluation exercise”—focused on supporting surgical decision-making and adherence to clinical guidelines, rather than attempting to enhance post-operative recovery.

Design: This narrative review discusses the usage of exercise in the clinical decision process for total knee arthroplasty (TKA). It synthesizes data from studies on exercise-based prehabilitation, covering patient selection, implementation, and its effects on surgical choices. Emphasis is placed on multi-disciplinary coordination within an Enhanced Recovery After Surgery (ERAS) framework.

Results: Evidence suggests that pre-evaluation exercise can improve symptom management and may lead to delayed or reduced surgical intervention. This approach shows significant potential in reducing the rate of TKA surgeries among patients with severe knee osteoarthritis by improving physical conditioning, addressing symptom variability, and enhancing informed, patient-centered surgical decisions.

Conclusions: Pre-evaluation exercise in knee osteoarthritis is a viable strategy that complements existing ERAS initiatives by facilitating guideline-conformant surgical decision-making. Incorporating this into pre-surgical care pathways can foster improved patient-related outcomes and healthcare resource optimization.

1. Training your body for surgery

The statement “Training your body for surgery may improve recovery” [1] is based on a narrative or rationale, which can be summarized as “better in—better out” [2,3]. The narrative is often used to argue the importance of exercise-based prehabilitation in total knee arthroplasty (TKA) [4]—especially in patients with low functional status prior to surgery [2]. We refer to “exercise-based prehabilitation” as an exercise modality of a multi-modal surgical prehabilitation effort that can contain other modalities, such as information about the surgical procedure and counseling on smoking and alcohol. The objective of this narrative review is to examine a novel application of exercise-based prehabilitation in

severe knee osteoarthritis termed “pre-evaluation exercise”. “Pre-evaluation exercise” includes an exercise and education re-evaluation process focused on supporting surgical decision-making and adherence to clinical guidelines, rather than attempting to enhance post-operative recovery.

2. Methodological approach

We chose a state-of-the-art narrative review-design to qualify a discussion of a novel concept, which we refer to as “pre-evaluation exercise”, and to be able to contrast against the more established and well-known terms “exercise-based prehabilitation” or “pre-operative exercise”. The search terms used for the PICO(T) elements were based on a

Abbreviations: ERAS, Enhanced Recovery After Surgery; OA, Osteoarthritis; TKA, Total knee arthroplasty.

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previous search strategy of ours, used for an ongoing systematic review [5], supplemented with a search for post-operative function outcomes related to the effects of pre-operative exercise on postoperative recovery. Our overall approach to literature selection was to filter on article type and generally use level 1a-evidence from systematic reviews of RCTs, if possible, and supplement with RCTs where we could not find systematic reviews. Further, the selection of included literature in the review included subjective judgement of relevance.

3. Exercise-based prehabilitation in TKA

Prehabilitation is an important part of multimodal care in many Enhanced Recovery After Surgery (ERAS) programs [6–9]—including (TKA) [10]. The aim of prehabilitation is to improve the physical capacity of a patient prior to a surgery, so that she can better withstand the negative consequences of surgery—thereby enhancing postoperative recovery [2,9,11,12]. In TKA, exercise-based prehabilitation is thought to enhance post-operative recovery after TKA because pre-operative function status generally relates to post-operative function outcomes [13–15]. The line of reasoning is that if function status before surgery is increased by exercise-based prehabilitation (typically by knee-focused resistance exercise), post-operative function outcomes will also improve, and recovery is enhanced. Such reasoning, however, assumes causality based on association. Just because two variables are associated, it cannot be inferred that an exposure-induced change in one variable will be associated with a change in the other. To this point, it has been very difficult across systematic reviews to consistently show clinically-relevant superiority of exercise-based prehabilitation over randomized no-exercise comparators on post-operative muscle strength and function outcomes after TKA [16–28]. If this is also the case when exercise-based prehabilitation is applied in frail and at-risk TKA subpopulations, remains to be investigated at larger scale [29]. The surgical trauma—and large effect of spontaneous recovery [30]—seems to determine the recovery trajectory to a great extent after a TKA, with no or little added clinical benefit from exposures with small(er) effects, such as exercise-based prehabilitation [17]. It is therefore relevant to ask if patients should spend time on exercise-based prehabilitation at all? We are convinced that they should!

4. Narrative-change from “exercise-based prehabilitation” to improve post-operative outcomes to “pre-evaluation exercise” to enhance surgical decision making

It is still relevant to spend time on prehabilitation exercise in severe knee osteoarthritis when a TKA is considered, but for different reasons than currently argued. We are proposing to change the narrative of exercise-based prehabilitation in TKA from something that is solely meant to enhance postoperative recovery to something that is meant to inform surgical decision making. The goal is to identify the right patients for surgery at the right time, which is ERAS at its finest [6–9]. When we suggest a narrative change, is not meant to indicate that we believe exercise is not important in severe knee osteoarthritis—we do! Over the continuum of knee osteoarthritis severity, exercise is important to potentially reduce knee symptoms, but also to improve cardiometabolic health. The traditional knee-focused exercise-approach unfortunately does not seem to improve cardiometabolic health to an extent that is considered clinically relevant [31]. By educating patients with severe knee osteoarthritis about the importance of being physically active—and not only concentrating on prescribing knee-focused exercise—we can play an important role in “Making Every Contact (with the health care system) Count” [32] and potentially also impact cardiometabolic health.

5. Importance of exercise in severe knee osteoarthritis

In patients with severe knee osteoarthritis, it seems exercise can reduce symptoms and postpone surgery in around 50–70 % [33–37] (Table 1).

Some of this effect may be explained by non-exercise specific factors [38–40], such as attention from health care professionals [41] or fluctuations in symptoms over time [42]. It does seem that patients with osteoarthritis seek health care contact when their symptoms are worse [43, 44], making it possible that their symptoms will fluctuate to the better without any treatment. No matter the mechanisms underlying the effect, similar clinical improvements and proportion of patients postponing surgery have been seen after a weight loss of around 7.5 % [45–47].

We recently published our findings from the QUADX-1 trial [37]. The trial was designed to firstly investigate the efficacy of three different dosages of one home-based, knee-extensor resistance exercise on knee-extensor strength in patients eligible for knee replacement, and secondly, the influence of exercise on symptoms, physical function, and decision on surgery. We used a simple model of coordinated non-surgical (exercise) and surgical care of patients, in which the knee arthroplasty specialists functioned as gate keepers for treatment coordination. The overall goal of this model of care was to enhance surgical decision making. The trial participants were patients referred to a knee arthroplasty specialist at our institution because they were considered candidates for a TKA. After an initial consultation with the knee arthroplasty specialist and blinded assessment of outcomes, they were referred to their local municipal rehabilitation center for instruction in seated knee-extensions to be performed in different dosages at home without supervision (2 control visits with the treating physical therapist after 4 and 8 weeks of exercise). After 12 weeks of exercise, the patients were seen by the same knee arthroplasty specialist and outcomes were assessed blinded again. We found the exercise dose unrelated to strength gains, function improvements, and symptom changes. We also found that 68 % of the patients decided not to have surgery after the pre-evaluation exercise and follow-up conversation with the knee arthroplasty specialist. Specifically, they were asked: “Based on your knee symptoms in the last week would you say that you need knee surgery?” As stated above, the finding that so many patients felt they did not need surgery after such a simple regimen of pre-evaluation exercise may to some extent be related to non-exercise specific mechanisms [38–40]. This finding is in line with that reported by other authors after exercise interventions in moderate-to-severe knee OA [33–37] (Table 1).

6. Coordinated care in severe knee osteoarthritis by means of “pre-evaluation exercise”

While the findings that exercise may reduce symptoms and postpone surgery in a substantial number of patients with severe knee osteoarthritis are encouraging, clinical implementation at-scale is complex. Non-surgical and surgical care of patients with severe knee osteoarthritis typically belong to different health care sectors (primary and secondary care), so who “owns” the responsibility of coordinating the two? There are certainly indications that ownership of treatment coordination as well as understanding and belief among different stakeholders is causing suboptimal care [48–53]. Examples of suboptimal care [54] and beliefs among practitioners and patients in severe knee osteoarthritis include; general practitioners' lack of referral to non-surgical care before referring patients to an orthopedic surgeon [44,55,56], the belief among patients that surgery is the only effective care option [57–59], orthopedic surgeons' skepticism towards the effectiveness of exercise in patients with severe knee osteoarthritis [60,61], and patients' reluctance to take active part in the care of their condition, e.g. refusing to try exercise therapy [44,59,62,63].

Based on the literature reviewed above, coordinated exercise-based prehabilitation may play an important role for improving surgical decision making in severe knee osteoarthritis. Such a role implies that any “pre-operative” exercise in severe knee osteoarthritis—where a TKA is considered—is not referred to as “pre-operative” because surgery may not necessarily be needed and performed. It is more a “pre-evaluation” process that includes exercise—thus, the name “pre-evaluation exercise”. The indication for surgery is evaluated before a period of exercise and re-

Table 1

Recent studies on surgical status in patients with knee OA undergoing non-surgical interventions.

Study	Design	Population	Intervention	Time frame	Surgical status
Dabare et al., 2017 [35].	International prospective cohort, N = 167 (knee OA).	Knee OA fulfilling the American College of Rheumatology criteria.	Education, exercise, and dietetic intervention.	3-6 months + indefinitely until symptom worsening.	67 % without TKA at 6 years.
Dell'Isola et al., 2021 [36].	Observational, register-based, N = 20,649 (knee OA).	Clinical or radiographic-based diagnosis of knee OA.	Education, exercise, and physical activity.	6 weeks + advice to continue.	80 % unwilling to have surgery at 3 months. 70 % unwilling to have surgery at 12 months.
Gwynne-Jones et al., 2020 [34].	Observational cohort, N = 186 (knee OA).	Knee OA diagnosed by own GP.	Education, exercise, occupational therapy, dietitian advice or orthoses if indicated.	6 sessions.	56 % without TKA at 7 years.
Husted et al., 2022 [37].	RCT, N = 140.	Knee OA and eligible for TKA.	Exercise.	12 weeks.	68 % without TKA at 3 months. 57 % without TKA at 2 years (unpublished).
Skou et al., 2018 [33].	Two-year follow-up from two RCTs, N = 2x100.	Knee OA (N = 100, RCT1) and knee OA eligible for TKA (N = 100, RCT2).	Both RCTs: Education, exercise, insoles, and dietary advice and/or pain medication if indicated.	Both RCTs: 12 weeks.	86 % without TKA at 2 years (RCT1). 68 % without TKA at 2 years (RCT2).

OA, osteoarthritis; GP, general practitioner; RCT, randomized controlled trial. The non-pharmacological trial arm is displayed for RCT designs.

evaluated after a period of exercise, based on symptom changes and patient feedback. Such a treatment re-evaluation process is no different from that of other non-surgical treatment modalities in knee osteoarthritis, such as weight loss and education, where time is needed before effects and symptom fluctuations are measurable. In a shared decision-making process concerning the need for surgery, changes in symptoms (or lack thereof) after exercise, weight loss, and education regarding the benefits of physical activity may help inform the decision [11,64–67]—especially since the medical indication for knee replacement is not clear-cut [68,69].

7. Conclusions

Based on the literature reviewed, there is a clinical use case for pre-evaluation exercise in severe knee osteoarthritis. A clinical use case where the focus is more on enhancing surgical decision making and guideline adherence than on enhancing post-operative recovery. To stand a chance of successful implementation, the organization of the care pathway should be as simple and pragmatic as possible. As a minimum, the care pathway should include the main components (1) pre-exercise assessment of surgical status, (2) education; around 12 weeks of exercise with two sessions/week (knee-focused) plus encouragement to be physically active according to WHO guidelines; and dietary advice (if indicated) and then (3) re-assessment of surgical status. How many discipline areas (types of health care professionals) should be involved, we believe should be pragmatic and reflect what is possible in the local clinical context. Such a care pathway could be part of an ambitious ERAS framework for TKA and help support surgical decision-making. Adding encouragement to be physically active to knee-focused exercise meant to treat cardinal knee OA symptoms could help target cardiometabolic health. We believe the clinical scenario above is achievable. It is not costly, and challenges are mainly related to a change of workflow, tradition, and beliefs. We need visionary stakeholders to make that happen. Together we can create better collaborative healthcare and treatment coordination for patients with severe knee osteoarthritis who are considered candidates for a TKA.

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Consent for publication

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Availability of data and material

N.a.

Authors' contributions

Conception of the review: TB, RSH and KT, Design and methodology: All authors, Project administration: TB and RSH, Data acquisition: RSH and TB, Analysis and interpretation of the data: All authors, Statistical expertise: N.a., Drafting of the manuscript: RSH and TB, Critical revision of the manuscript for important intellectual content: All authors, All authors read and approved the final manuscript, Guarantor(s): TB (thomas.quaade.bandholm@regionh.dk) and KT take responsibility for the integrity of the work as a whole.

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Declaration of competing interest

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