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Factors Associated With Patients' Willingness to Consider Joint Surgery After Completion of a Digital Osteoarthritis Treatment Program: A Prospective Cohort Study

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Objective. To examine patient willingness and a possible shift in willingness for surgery and to investigate factors associated with this shift, following participation in the digital nonsurgical osteoarthritis (OA) treatment program Joint Academy.

Methods. A total of 458 individuals (mean ± SD age 62 ± 5.6 years, 67% women) with diagnosed hip or knee OA were evaluated after 6 weeks in the Joint Academy program, comprising education and exercise as well as asynchronous chat with a physical therapist. Data describing joint pain, health-related quality of life (the EuroQol 5-domain [EQ-5D] questionnaire in 3 levels), walking difficulties, the 30-second chair stand test, and willingness to consider surgery were collected at baseline and at 6 weeks.

Results. At follow-up, 31% of those participants willing to consider surgery at baseline no longer considered surgery. Of those participants who were unwilling to consider surgery at baseline, 6% reconsidered and decided in favor of surgery at follow-up. Less pain and a higher EQ-5D score at 6 weeks were associated with the change from being willing to unwilling to consider surgery at follow-up (odds ratio [OR] 0.67–1.64; $P < 0.05$). Worse pain, a lower EQ-5D score, and having walking difficulties at 6 weeks, and a lower pain and EQ-5D score improvement were associated with the change from being unwilling to willing to consider surgery at 6 weeks (OR 0.51–4.30; $P < 0.005$).

Conclusion. Evidence-based nonsurgical OA treatment, at least delivered in a digital format, may reduce the need for surgery and should therefore be offered as the first-line treatment option to patients with hip and knee OA. The results also support the idea that such treatment programs have the potential to improve selection of patients for total joint replacement.

INTRODUCTION

Total joint replacement (TJR) of the knee and/or hip is a common treatment for end-stage osteoarthritis (OA) and >1.2 million hip and knee TJRs are performed annually in the US alone, with an estimated total financial burden of 20 billion dollars (1). While the number of TJRs is expected to gradually rise with the increasing aging population (2), some studies propose that this procedure may not be effective for all patients (3), and in some cases TJR will even increase hospitalization and health care costs (4). Previous studies have shown that between 25% and 34% of all hip and knee TJRs may be inappropriate (5,6), and nearly one-fifth of patients undergoing TJR are not satisfied with the outcome (7).

According to international guidelines, first-line treatment in hip and knee OA should be based on education and exercise, as well as weight loss if needed (8). To implement those guidelines, different self-management programs, including education and either optional (9) or compulsory (10,11) exercises aiming at improved strength and neuromuscular control, have been developed in Sweden (Better Management of Patients with OsteoArthritis [BOA]) in 2008 (9) and in Denmark (Good Life with Osteoarthritis in Denmark) (10,11) in 2013, and a similar program, the stepped-care approach, is offered in the Netherlands (12). Findings from these programs show significant improvements in pain level, physical function, and quality of life as well a decrease in medication intake and sick leave in patients with hip and knee OA that may last for up to 2 years after completion of the program (10,13). Most importantly, findings also indicate that education and exercise may delay or reduce the need for hip and knee replacements in these patients (14–17). Despite these

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SIGNIFICANCE & INNOVATIONS

- Willingness to consider surgery is the most prominent indicator for referral to total joint replacement (TJR) in patients with hip and knee osteoarthritis (OA).
- Willingness for surgery may not necessarily indicate future beneficial outcomes of surgery.
- After 6 weeks in a nonsurgical digital OA treatment program, 31% of those willing to consider surgery at baseline had reconsidered. Of those who were unwilling to consider surgery at baseline, 6% reconsidered and decided in favor of surgery at 6 weeks. The shift in attitude, in either direction, was highly dependent on the success of the treatment program in reducing the OA symptoms.
- A structured and evidence-based nonsurgical OA treatment program may reduce the need for TJR and should be offered as the first-line treatment option to patients with hip and knee OA**.** The patients' willingness for TJR before completing nonsurgical OA treatment may be a poor indicator for surgery.

findings, many patients do not receive adequate information on treatment options, and surgery is often offered before nonsurgical treatments have been adequately used (9,18,19).

Identifying the most appropriate patients as candidates for TJR is not a straightforward process, as the opinions regarding indications for TJR seem to differ among physicians (20,21). In addition, findings from a systematic review highlight the fact that patients' willingness to undergo surgery has been shown to be the most prominent indicator for referral to TJR in individuals with hip and knee OA (22). This fact may be problematic, since the willingness to consider TJR is influenced by factors such as sociodemographic status and expectations of surgery (22) and may not necessarily indicate future beneficial outcomes of surgery. In a study by Hawker et al (23), more severe OA symptoms and impaired walking ability were reported to be associated with the patients' willingness to consider TJR in an elderly population with symptomatic hip or knee OA in Canada. However, whether and how patients' willingness to consider surgery may change after completing structured evidence-based nonsurgical OA treatment is unclear. Such knowledge may further improve the identification of patients eligible for TJR. Thus, the aim of this study was to investigate any possible shift in willingness to consider surgery and to investigate factors associated with this shift, following completion of a digital treatment program for hip and knee OA, including education and exercise as well as asynchronous chat with a physical therapist.

SUBJECTS AND METHODS

Intervention. This study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines for observational studies (24). The intervention consisted of a digital, nonsurgical OA treatment program (called Joint Academy), detailed in a previous publication (25). Briefly, the first 6 weeks of the program comprise 8 video lectures about OA, physical activity, and self-management in OA as well as different levels of exercises aimed at improving strength and neuromuscular control, based on each individual's progression in the program. The participants are also able to chat asynchronously with a physical therapist throughout the duration of the program. Joint Academy is a digital version of the Swedish evidence-based face-to-face BOA self-management treatment program (9), and Joint Academy has previously been found to reduce pain and improve function and quality of life in patients with hip and knee OA (16,25).

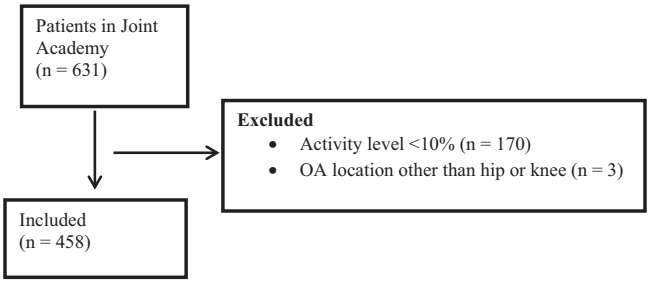

Figure 1. Flow chart of the inclusion process. OA = osteoarthritis.

Table 1. Baseline characteristics of included participants (n = 458)*

Characteristic	Values
Women, %	67.8
Age, years	62 ± 5.6
Body mass index, kg/m^2	26.9 ± 4.9
Working situation, %	
Working	46.6
Retired	45.5
Unemployed	3.3
Sick-leave	4.2
OA medication last 6 months, %	49.9
Previous surgery to other joint, %	13.3
Pain location knee, %	58.2
Pain baseline	5.6 ± 2.2
Walking difficulties at baseline, %	84.5
30CST baseline median (quartiles)†	10 (8–12)
EQ-5D baseline score	0.64 ± 0.2
Fear of physical activity at baseline, %	23.6
Consider surgery at baseline, %	23.2
Compliance level in percentage	78.2 ± 17.3

* Values are the mean ± SD unless indicated otherwise. OA = osteoarthritis; 30CST = 30-second chair stand test; EQ-5D = EuroQol 5-domain questionnaire.
† Non-normally distributed data.

Participants. Of 631 participants who completed the Joint Academy program (16,25), register data from 458 patients (mean ± SD age 62 ± 5.6 years, 67% women) between November 2015 and January 2018 were used in this study. Inclusion criteria were hip or knee OA diagnosed by an orthopedic surgeon and/or a physiotherapist involved in the Joint Academy program; completion of the patients' first 6-weeks in the treatment program for OA; and reporting at least 1 of the following factors at baseline and at 6 weeks: pain, health-related quality of life, and physical function. Exclusion criteria were reporting another joint than hip or knee as the primary OA location and a level of program compliance of <10%. This level of compliance has been used in previous studies on the effect of Joint Academy (16,25) and was defined as the proportion of completed videos, exercises, and questionnaires offered in the program. A flow chart of the inclusion process is shown in Figure 1. Participant characteristics are shown in Table 1. The study was approved by the Regional Ethics Review Board in Lund, Sweden (Dnr 2017/651; Dnr 2017/980), and all patients gave their informed consent at registration.

Data collection. The following demographic data were collected at baseline registration: age, sex, body mass index (BMI), employment status, primary OA location (hip or knee), previous surgery on any joint, and intake of OA medications during the last 6 months. Prior to starting the program (at baseline) and at follow-up (at 6 weeks), the participants were asked whether they had any walking difficulties, whether they had any fear of physical activity, and whether they were willing to consider surgery due to OA-related symptoms (yes/no). In addition, they were asked to fill out a questionnaire on health-related quality of life, the EuroQol 5-domain (EQ-5D) questionnaire in 3 levels. The EQ-5D includes questions about mobility, self-

Table 2. Differences in baseline demographics, pain, and function between those participants who considered surgery at baseline and those who did not (n = 458)*

Factor	Willing	Unwilling	*P*
Sex			
Women	60 (19.4)	250 (80.6)	0.005†
Men	46 (31.1)	102 (68.9)	–
Age, mean ± SD years	61 ± 9.5	62 ± 9.6	0.154‡
Body mass index, mean ± SD kg/m^2	28 ± 5.7	26.5 ± 4.7	0.007§
Working situation (n = 423)			
Working	48 (22.4)	166 (77.6)	0.642¶
Retired	43 (20.6)	166 (79.4)	–
OA medication last 6 months			
Yes	65 (28.5)	173 (71.5)	0.007†
No	41 (17.8)	189 (82.2)	–
Previous surgery			
Yes	22 (36.1)	39 (63.9)	0.005†
No	84 (21.2)	313 (78.9)	–
Pain location			
Hip	43 (22.5)	148 (77.5)	0.787¶
Knee	63 (23.6)	204 (76.4)	–
Pain at baseline, mean ± SD	6.8 ± 1.8	5.2 ± 2.1	<0.001§
EQ-5D score, mean ± SD	0.54 ± 0.19	0.68 ± 0.12	<0.001§
Baseline walking difficulties			
Yes	102 (26.4)	205 (73.6)	<0.001†
No	4 (5.6)	67 (94.4)	–
Baseline 30CST, median (quartiles)#	10.0 (8–11)	10.0 (8–12)	0.02**
Fear of physical activity at baseline	32 (29.4)	77 (70.6)	0.078¶

* Values are the number (%) unless indicated otherwise. OA = osteoarthritis; EQ-5D = EuroQol 5-domain questionnaire; 30CST = 30-second chair stand test.
† Statistically significant by the chi-square test.
‡ Independent *t*-test.
§ Statistically significant by independent *t*-test.
¶ Chi-square test.
# Non-normally distributed data (n = 447).
** Statistically significant by Wilcoxon signed rank test for non-normally distributed data.

care, usual activities, pain/discomfort, and anxiety/depression. A higher EQ-5D score indicates better health-related quality of life (26,27). Participants were also asked to rate their current pain on an 11-point numerical rating scale (NRS; where 0 = no pain and 10 = the worst possible pain) (28). Physical function was assessed using the 30-second chair stand test (30CST) (29), in which the number of repetitions of sitting to standing from a chair during a period of 30 seconds was recorded (self-reported).

Statistical analysis. All statistics were calculated using SPSS software, version 24. Data were explored for normality using visual inspection of histograms and interpretation of skewedness and kurtosis. All data met the assumptions of normality except physical function. To assess the proportion of cross overs from considering surgery at baseline to not considering surgery after completion of the program, and the reverse, cross tabulation and the chi-square test were used. Cross tabulation and the chi-square test were also used when the data were dichotomous, and Student's *t*-test (normally distributed data) and Wilcoxon's signed rank test (non-normally distributed data) were used for continuous data, to assess differences in demographics, pain, and function between those participants who were willing to consider surgery and those participants who were not. At 6 weeks, the cohort was divided into 2 groups, 1 group that had been willing to consider surgery at baseline (n = 104) and 1 group that had been unwilling to consider surgery at baseline (n = 348). Due to multicollinearity between pain, physical function, and walking ability, separate logistic regressions adjusted for age, sex, BMI, and previous surgery were performed to evaluate associations between each independent variable (pain, EQ-5D score, fear of physical activity, walking difficulties, and 30CST) and the dependent variable of willingness to consider surgery, in the 2 groups at 6 weeks. In the group of patients who were willing to consider surgery at baseline, unwillingness to consider surgery at 6 weeks was given the value 1, and in the group of patients who were unwilling to consider surgery at baseline, willingness to consider surgery at 6 weeks was given the value 1 in the regression analyses. For the purpose of regression, the EQ-5D score (0–1) was multiplied by 10. *P* values less than or equal to 0.05 were considered statistically significant. Due to the exploratory design of the study, no adjustments for multiple comparisons were made (30).

Table 3. Differences in pain and function at 6 weeks from baseline willingness to consider surgery*

	Willing at baseline (n = 104)			Unwilling at baseline (n = 348)		
Factor	Willing at 6 weeks (n = 72)	Reconsidered at 6 weeks (n = 32)	*P*	Unwilling at 6 weeks (n = 327)	Reconsidered at 6 weeks (n = 21)	*P*
Pain at 6 weeks	5.8 ± 1.9	4.1 ± 2.4	<0.001†	3.6 ± 2.2	5.5 ± 2.2	0.001†
Change in pain, baseline to 6 weeks	–1.3 ± 1.9	–2 ± 3.6	0.330‡	–1.5 ± 2.2	–0.5 ± 2.0	0.043†
EQ-5D at 6 weeks	0.55 ± 0.18	0.69 ± 0.18	0.001†	0.72 ± 0.12	0.56 ± 0.16	<0.001†
Change in EQ-5D, baseline to 6 weeks	0.05 ± 0.15	0.06 ± 0.12	0.806‡	0.04 ± 0.13	–0.04 ± 0.13	0.011†
Walking difficulties at 6 weeks, %						
Yes	73.3	26.6	0.031§	90.9	9.1	0.009§
No	46.7	53.3	–	97.9	2.1	–
Fear of physical activity at 6 weeks, %						
Yes	80.0	20	0.341¶	95.7	4.3	0.687¶
No	67.8	32.2	–	93.5	6.5	–
30CST at 6 weeks, median (quartiles)#	11 (9–15)	12 (10–15)	0.289**	12 (10–16)	12 (9–15)	0.18**
Change in 30CST, baseline to 6 weeks	1.9 ± 4.5	2.2 ± 3.5	0.755‡	2.2 ± 4.2	2.74 ± 4.9	0.602‡

* Values are the mean ± SD unless indicated otherwise. EQ-5D = EuroQol 5-domain questionnaire; 30CST = 30-second chair stand test.
† Statistically significant by independent *t*-test.
‡ Independent *t*-test.
§ Statistically significant by the chi-square test.
¶ Chi-square test.
# Non-normally distributed data.
** Wilcoxon signed rank test for non-normally distributed data.

RESULTS

After 6 weeks in the nonsurgical digital OA treatment program, 32 of 104 participants (31%) of those who were willing to consider surgery at baseline no longer considered surgery. Of those who were unwilling to consider surgery at baseline, 21 of the 348 participants (6%) reconsidered and decided in favor of surgery after 6 weeks ($P < 0.001$).

Differences between those participants who were willing to consider surgery at baseline and those who were not. Male participants, participants taking any OA-related medication during the last 6 months, those who had had previous surgery, and participants reporting walking difficulties at baseline were more likely to be willing to consider surgery at baseline ($P < 0.05$). Participants who considered surgery at baseline also had a higher BMI, greater pain, a lower EQ-5D score, and worse physical function at baseline compared to those participants who were unwilling to consider surgery ($P < 0.05$). No differences in age, working situation, pain location, or fear of physical activity were observed (Table 2).

Factors associated with the shift from being willing to consider surgery at baseline to no longer considering surgery after completion of the program. Of participants who said they had considered surgery at baseline, those who reconsidered after completion of the program were less likely to have walking difficulties at 6 weeks and had less pain and a higher EQ-5D score at 6 weeks than those who still considered having surgery after completion of the program ($P < 0.005$) (Table 3). After adjusting for age, sex, BMI, and previous surgery, the only variables associated with the shift from willingness to consider surgery to no longer considering surgery at 6 weeks were less pain at 6 weeks (odds ratio [OR] 0.67) and a higher EQ-5D score (OR 1.64). In other words, for every step-increase in NRS pain, the likelihood of having reconsidered after the program decreased by 33%, and for every 0.1 step increase in the EQ-5D score, the likelihood of having reconsidered increased by 64% (Table 4 and Supplementary Table 1, available on the *Arthritis Care & Research* web site at http://onlinelibrary.wiley.com/doi/10.1002/acr.23772/abstract).

Factors associated with the shift from being unwilling to consider surgery at baseline to willingness to consider surgery after completion of the program. Of participants who said they were unwilling to consider surgery at baseline, those who reconsidered were more likely to have walking difficulties, a lower EQ-5D score at 6 weeks, and greater pain at 6 weeks. They had also experienced smaller improvements in pain and the EQ-5D score compared to those who still did not consider surgery (Table 3). The adjusted regression models showed that worse pain at 6 weeks (OR 1.63), a lower EQ-5D score at 6 weeks (OR 0.51), less pain improvement (OR 1.30), a smaller EQ-5D score improvement (OR 0.63), and having walking difficulties at 6 weeks (OR 4.30) were independently associated with the shift from being unwilling at baseline to being willing to consider surgery at 6 weeks (Table 4 and Supplementary Table 1, available on the *Arthritis Care & Research* web site at http://onlinelibrary.wiley.com/doi/10.1002/acr.23772/abstract).

DISCUSSION

In this first study to our knowledge investigating factors associated with the shift in willingness to consider surgery after participation in a digital nonsurgical treatment program for OA, nearly one-third of the participants changed their attitude and no longer considered surgery after completion of the program. Less pain and a better health-related quality of life after completion of the program were independently associated with the participants' shift from being willing to unwilling to consider surgery at 6 weeks. Worse pain, health-related quality of life, and walking ability, and less improvement in pain and health-related quality of life after completing the program were independently associated with the participants' shift from being unwilling to willing to consider surgery at 6 weeks.

Table 4. Factors associated with the shift in willingness to consider surgery after completion of the program, adjusted for age, sex, and body mass index*

Independent variable	Adjusted OR (95% CI)	*P*†
Shift from willing to unwilling		
Pain at 6 weeks (n = 104)	0.67 (0.53–0.85)	<0.001
EQ-5D score at 6 weeks (n = 103)	1.64 (1.17–2.30)	0.004
Shift from unwilling to willing		
Pain at 6 weeks (n = 347)	1.63 (1.27–2.08)	<0.001
Pain change (n = 347)	1.30 (1.07–1.48)	0.009
Walking difficulties at 6 weeks (n = 347)	4.30 (1.24–14.94)	0.022
EQ-5D score at 6 weeks (n = 343)	0.51 (0.39–0.67)	<0.001
EQ-5D score change (n = 343)	0.63 (0.44–0.88)	0.007

* The dependent variable is willingness to consider surgery after completion of the program (at 6 weeks). Number of participants who shifted from willing to unwilling: n = 32; number of participants who shifted from unwilling to willing: n = 21. OR = odds ratio; 95% CI = 95% confidence interval. For the purpose of regression the EuroQol 5-domain questionnaire (EQ-5D) score was multiplied by 10.
† All *P* values are statistically significant.

Consistent with previous research, worse OA symptoms were associated with a willingness to consider surgery before entering the treatment program (23), whereas age and work situation seem to have little importance. We also found men to be more willing to consider surgery at baseline than women. This finding is in contrast, however, with a recent review that showed men and women to be equally willing to consider surgery due to OA-related symptoms, but that women were less likely than men to be referred to surgery, despite OA severity (22). Post hoc analyses revealed no differences in OA symptoms between men and women, but a higher proportion of the men (22% versus 9%) in this cohort had undergone a previous TJR in another joint. Given that previous surgery was associated with willingness to have surgery, experiences and expectations of surgery may be one explanation for the fact that a higher proportion of the men compared to women considered surgery in this study.

As shown in previous research (23) and the baseline data in the current study, the severity of OA symptoms may influence willingness to consider surgery. However, whether completing a nonsurgical treatment program aimed at reducing OA symptoms may alter the attitude toward surgery in either direction has not been previously clarified. In the current study, 31% of those participants who considered surgery as a treatment option before entering the online OA treatment program reconsidered and no longer considered surgery as an option after completion of the program. This result is in line with previous studies that showed a reduction in surgery interest of between 24% and 67% after participants were enrolled in structured nonsurgical treatment programs including education and exercise (14,16,17). Furthermore, in another study, only 26% of patients eligible for TJR actually underwent surgery after being enrolled in a nonsurgical treatment option (15). This is the first study to investigate whether completing a nonsurgical treatment program may be associated with crossing over from being unwilling to consider surgery at baseline to being willing to consider surgery after the program. In the current study, approximately 6% of the participants shifted in this direction. The adjusted result from this study indicates that patients who experienced reduced pain and better health-related quality of life after completing the program more often changed their mind and no longer considered surgery. On the other hand, some of the patients who did not consider surgery at baseline and then experienced small improvements in pain level and health-related quality of life, and who still had walking difficulties after the program, also reconsidered and changed their preference in favor for TJR. For example, the improvements in pain in the group who were willing to consider surgery at baseline but reconsidered after completion of the program correspond to a clinically significant change (–2 points on an NRS) (31), whereas the participants who still considered surgery or were unwilling at baseline but reconsidered after completion of the program did not reach clinically significant changes. That is, the individual patient's willingness to consider surgery after the program is highly dependent on the success of the treatment program in reducing their OA symptoms.

In TJR, identifying the patients for whom surgery will be beneficial is a crucial matter. Today, approximately 20% of the patients who undergo TJR for hip or knee OA are not satisfied with the result, which, to some extent, may be attributed to presurgery expectations (7). Studies also showed that the willingness to consider surgery is highly dependent on factors not related to OA symptoms, such as social network, socioeconomic status, and expectations of surgery (32). The result from this study indicates that a significant number of patients will change their attitude toward surgery, in either direction, after completing a treatment program including education and exercise. Thus, offering nonsurgical treatment to patients with hip and knee OA before they make any decision regarding TJR is essential. In this study, approximately one-third of the participants no longer considered surgery after the program. This number also corresponds to the proportion of performed hip and knee TJRs that may be deemed inappropriate each year (6). In other words, in the US alone, unnecessary surgery costing approximately $8.3 billion is performed annually (1). Furthermore, some patients (6%) changed their attitude in the opposite direction. Given this fact, a structured nonsurgical treatment program, when delivered in a digital format online, may reduce the need for TJR and the financial burden of inappropriate surgeries, and in addition assist in selecting those for whom surgery will be beneficial and therefore may also increase the postsurgery satisfaction rate.

Some limitations of this study should be recognized. First, similar to previous studies on the effect of the Joint Academy program (16,25), to increase study power, the lowest level of compliance with the program to be eligible for this study was set at 10%. This setting is a relatively low compliance level, and thus the results in this study may be underestimated, compared to what might have been the case if a higher compliance level in the program had been used. However, since the mean level of compliance in the program was 78%, the compliance level did not likely have an effect on the result. Second, we combined patients with hip and knee OA into 1 group in the analyses. Patients with hip and knee OA are suggested to constitute 2 populations with different expectations of surgery and different surgical outcomes (33), and separate analyses may thus be warranted. However, post hoc analyses revealed no difference in baseline pain and function or willingness to consider surgery between those participants with hip and knee OA (33). Thus the location of OA, i.e., the hip or knee joint, did not likely affect the results in this study.

Third, due to the choice of an observational study design, we do not know whether the results of the digital management program are generalizable to patients receiving no treatment or those undergoing face-to-face programs, such as BOA (9) or Good Life with Osteoarthritis in Denmark (10). Future results from ongoing studies may give further insight into these questions (34). Nevertheless, nonsurgical OA management programs including

education and exercise are evidence-based, and data indicate that this digital program encouraging patients to carry out daily treatment may be at least as effective in reducing OA symptoms as face-to-face treatment (16), and also add long-term effects (35). Therefore, the present results are likely to apply for all types of nonsurgical OA treatments that include education and exercise, regardless of how they are delivered. Fourth, willingness to consider TJR was only evaluated after 6 weeks in the program, and future studies on the long-term willingness for TJR after participation in such OA treatment program are thus warranted. However, Skou et al (15) showed that 75% of patients appointed for knee TJR reconsidered after completion of a nonsurgical treatment program. At follow-up 1 year later, those patients still did not find a knee replacement necessary, indicating long-term effects.

Finally, individual decision-making on important health care aspects such as TJR is complex and cannot solely be explained by the factors investigated in this study. Qualitative studies have highlighted factors such as ability to cope with pain, expectations of surgery, the patient-doctor relationship, and personal views on eligibility criteria for TJR to be important factors when experiencing hip and knee OA and considering TJR (22,33). None of these factors were evaluated in this study. Furthermore, the decision-making process can be divided into 2 stages, the deliberation stage, when the patients consider their options, gather information and review the advantages and disadvantages of these options, and the decision-making stage, where the actual decision is determined (36). In a recent review, Barlow et al (33) discuss the fact that future research is needed to investigate the likelihood of patients to go back to the deliberation stage if their OA symptoms decrease. The result from this study provides evidence that points in that direction. However, studies that include satisfaction after TJR as well as qualitative studies that include patients who have already completed a structured nonsurgical treatment program are warranted, to improve our understanding of the individual factors that are involved in TJR decision-making after nonsurgical treatment, and to further improve the identification of patients who should be referred to TJR.

Structured nonsurgical OA treatment, when delivered in a digital format online, may reduce the number of patients interested in having surgery and can possibly delay or reduce the need for surgical joint replacement. The result showing that one-third of the patients who were willing to consider surgery before entering the online OA treatment program reconsidered after completion supports the idea that exercise and education should be offered as the first-line treatment option for patients with hip and knee OA. A patient's willingness to have TJR before nonsurgical OA treatment may therefore be a poor indicator for surgery. Less improvement in pain, walking ability, and health-related quality of life after completion of the program may cause the patients to change their attitude in favor of surgery. Taken together, these results show that a patient's attitude for and against surgery may shift after program completion. This result suggests that participation in a structured evidence-based nonsurgical OA treatment program has the potential to improve selection of patients for TJR.

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AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be submitted for publication. Dr. Cronström had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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