

## Original Article

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# Consequences for preoperative pain and function when postponing elective knee and hip arthroplasty

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**ABSTRACT**

**INTRODUCTION.** The coronavirus outbreak causes postponement of elective surgery. We evaluated how pain, function and general health were impacted by postponing elective knee and hip arthroplasty in patients with knee and hip osteoarthritis with no known surgery rescheduling date due to the coronavirus outbreak.

**METHODS.** This study included 194 patients from a Danish public hospital with postponed elective primary knee or hip arthroplasty due to the lockdown. Patients responded to questionnaires when their surgery was cancelled and before surgery. Changes in pain and function were evaluated with the Oxford Knee and Hip Scores (OKS, OHS) and their general health with the EuroQoL 5-dimension scale (EQ5D). Additionally, we asked about the patients' concerns and whether they felt improved, unchanged or deteriorated during the waiting period.

**RESULTS.** Complete data were obtained for 110 (57%) patients, 59 and 51 awaiting knee or hip arthroplasty (median age 71 years, 62% were female), respectively. Arthroplasty was postponed for a median (range) 98 (63-161) days. A total of 34% were concerned that the postponement would lead to a poorer outcome. Mean OKS and OHS differences were 0 (95% confidence interval (CI): -1-1) and -1 (95% CI: -2-0) from surgery cancellation to re-scheduled surgery. The mean EQ5D index difference was 0.0 (95% CI: 0.0-0.1) for both groups. A total of 75 (68%) patients felt an important deterioration of their condition.

**CONCLUSIONS.** Pre-operatively, patients worried about experiencing an altered treatment outcome due to postponed surgery and felt that their condition had deteriorated during the waiting period although this was not reflected in patient-reported outcome measures.

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**TRIAL REGISTRATION.** not relevant.

In Denmark, the coronavirus (COVID-19) outbreak led the government to impose a nationwide lockdown in March 2020. Consequently, patients with knee and hip osteoarthritis (OA) had their planned elective knee or hip arthroplasty postponed for an unspecified time period [1]. Although delaying elective surgery was a rational move to slow the spreading of COVID-19, reserve inpatient capacity and limit the use of protective equipment for COVID-19 infections, it was, however, not without consequences [2]. Postponing elective surgeries had a major impact on the logistics of the healthcare system which is now struggling to re-establish pre-COVID-19 waiting list standards. Guidelines have been suggested to ensure the safe resumption of elective knee and hip arthroplasty in parallel with the ongoing pandemic, highlighting that patients' and healthcare workers' well-being is the most important consideration [3, 4]. Elective arthroplasty was re-initiated in June 2020 and while waiting lists slowly decrease, uncertainty remains as to whether the treatment effect will be the same or if the postponed surgery

has led to deterioration in pain and functional capacity.

A recent study found that the COVID-19 lockdown led to a deterioration in self-reported pain and physical function in patients with hip and knee OA awaiting surgery [5]. In contrast, a less than six-month waiting list period showed no impact on level of pain and functional limitations before surgery [6]. However, patients have reported concerns about having their surgery delayed due to the COVID-19 outbreak [7, 8]. Therefore, we evaluated how pain, function and general health were impacted by postponed elective knee and hip arthroplasty in patients with knee and hip OA with no known surgery rescheduling date due to the COVID-19 outbreak.

## METHODS

This prospective cohort study recruited patients with knee or hip OA who had their elective primary knee or hip arthroplasty at a public hospital in Denmark postponed due to the COVID-19 outbreak. Patients responded to a postal questionnaire at the time their surgery was cancelled due to the lockdown initiated in Denmark on 13 March 2020. A pre-surgery follow-up questionnaire was distributed to patients who had re-scheduled their surgery between 2 June 2020 and 1 December 2020.

To evaluate functional limitations and general health, we used a number of patient-reported outcome measures that have sufficient validity characteristics for use in this patient population [9-12]. Degree of pain and functional limitations were measured with the Oxford Knee and Hip Scores (OKS, OHS) for knee and hip OA, respectively [9]. The side-specific aggregate pain level during the past week was measured with a 10 cm visual analogue scale (VAS) [10]. The Forgotten Joint Score (FJS) was used to measure the degree of joint awareness in daily life activities [11]. To enable evaluation of change over time, we used an adapted preoperative version in accordance with Hamilton et al. [13]. Patients' general health was measured with the EuroQol 5-dimension scale (EQ5D) [12]. At lockdown, we additionally asked whether patients were concerned about achieving poorer treatment outcomes due to having their surgery postponed. At the re-scheduled surgery, we additionally asked whether patients had symptoms of or had tested positive for COVID-19 and if they had been hospitalised during the postponement period. Finally, using a transition anchor question, we asked patients whether they experienced overall changes in symptoms during the period they had awaited surgery. Response options were provided on a seven-point scale ranging from *better, an important improvement* to *worse, an important deterioration* [14].

## Statistics

Patient characteristics were reported as mean and 95% confidence interval (CI) or median and range or interquartile range for continuous variables, and number (proportion) for categorical variables. The primary outcomes were change in pain and functional limitations (OKS, OHS); the secondary outcomes were change in pain (VAS), joint awareness (FJS) and self-reported general health (EQ5D) from the time of postponed to re-scheduled surgery for the knee and hip arthroplasty groups.

To compare the outcome scores, a paired sample t test or the Wilcoxon signed-rank test was used. A drop-out analysis was performed to compare baseline characteristics for patients with complete data and patients answering the questionnaire at surgery cancellation only ([https://ugeskriftet.dk/files/a06210509\\_-\\_supplementary.pdf](https://ugeskriftet.dk/files/a06210509_-_supplementary.pdf)).

We investigated the time dependency of OKS and OHS effect estimates using univariate linear regression models to test the hypothesis that a change in OKS and OHS would depend on the number of postponed surgery days.

The Pareto Classification of Health Change was used to classify the transition in general health state measured with the EQ5D in the postponement period [15]. The classification included being "better", "worse", "unchanged" or "mixed".

We evaluated the proportion of patients feeling that their knee or hip problems had improved, were unchanged or had deteriorated based on their response to the transition anchor question. To investigate the impact of patients' perceived changes in their overall joint problem on OKS and OHS scores, subgroup analyses were performed stratified by those being importantly deteriorated and not importantly deteriorated. For all analyses, R version 3.6.1 was used [16].

## Ethics

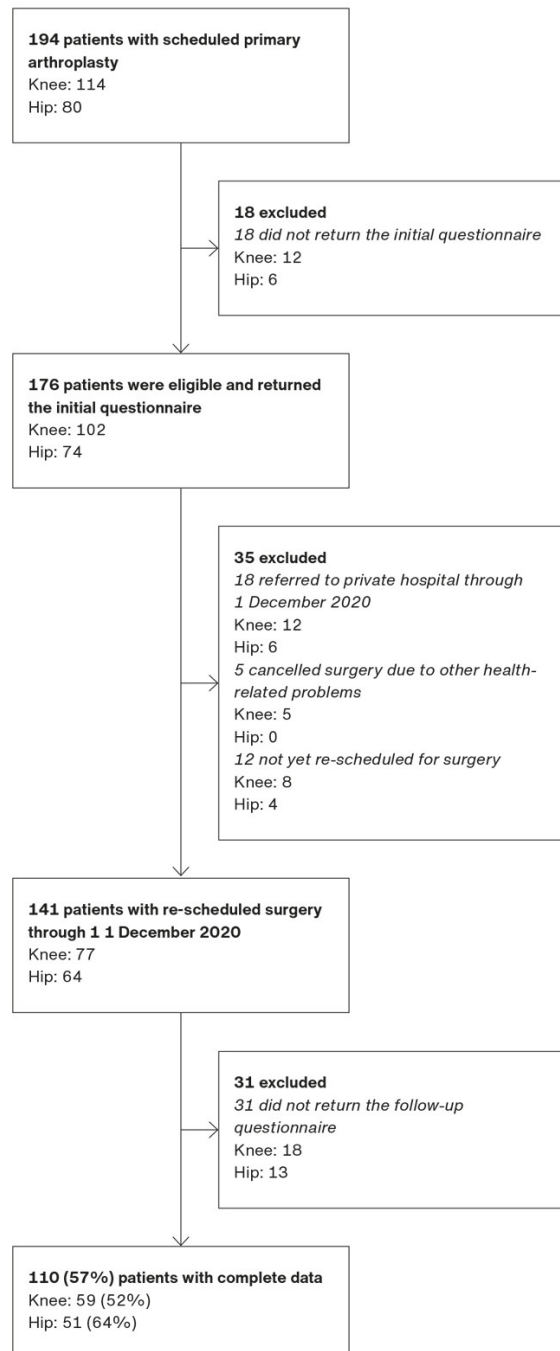
This study was conducted in accordance with the Helsinki Declaration. In Denmark, approval from the national ethics committee is not required for questionnaire-based studies. Approval was acquired from the institutional review board. All included patients consented to participate.

*Trial registration:* not relevant.

## RESULTS

Out of 194 patients with postponed knee or hip arthroplasty, 176 returned the initial questionnaire, and 110 (57%) provided complete follow-up data in the course of the study period (**Figure 1**). The 59 patients with a postponed knee arthroplasty and complete data had a median age of 70 years and 58% were female. The 51 patients with a postponed hip arthroplasty and complete data had a median age of 72 years and 67% were female (**Table 1**). Patients with complete data and patients answering the questionnaire at surgery cancellation only were not statistically different in terms of age, sex, OKS, and OHS ([median age 70 vs 69 and 72 vs 70], [% female 58 vs 51 and 67 vs 74], [median OKS 19 vs 19], and [median OHS 18 vs 16]). Patients with complete data had postponed their knee arthroplasty for a median (range) of 111 (29-244) days and their hip arthroplasty for 83 (35-216) days.

**FIGURE 1** Flow chart.



**TABLE 1** Demographics for patients who had their surgery postponed due to the COVID-19 pandemic.

	Knee arthroplasty (n = 59)	Hip arthroplasty (n = 51)
Age, yrs, median (2.5-97.5 quantiles)	70 (62-75)	72 (61-76)
Sex, female, % (n)	58 (34)	67 (34)
BMI, kg/m <sup>2</sup> , median (2.5-97.5 quantiles)	30 (26-35)	27 (24-31)
OKS, median (2.5-97.5 quantiles)	19 (13-23)	-
OHS, median (2.5-97.5 quantiles)	-	18 (12-22)
FJS, median (2.5-97.5 quantiles)	8 (2-14)	7 (0-14)
EQ5D index, median (2.5-97.5 quantiles)	0.66 (0.34-0.72)	0.59 (0.32-0.66)
EQ5D VAS, median (2.5-97.5 quantiles)	55 (38-70)	45 (21-70)
Pain VAS, median (2.5-97.5 quantiles)	72 (62-82)	78 (71-82)
<i>ASA classification, % (n)</i>		
1	5 (3)	10 (5)
2	80 (47)	61 (31)
3	15 (9)	29 (15)
<i>Kellgren &amp; Lawrence classification<sup>a</sup>, % (n)</i>		
2	2 (1)	-
3	42 (25)	-
4	56 (33)	-
<i>Tönnis classification<sup>a</sup>, % (n)<sup>b</sup></i>		
2	-	20 (10)
3	-	78 (40)

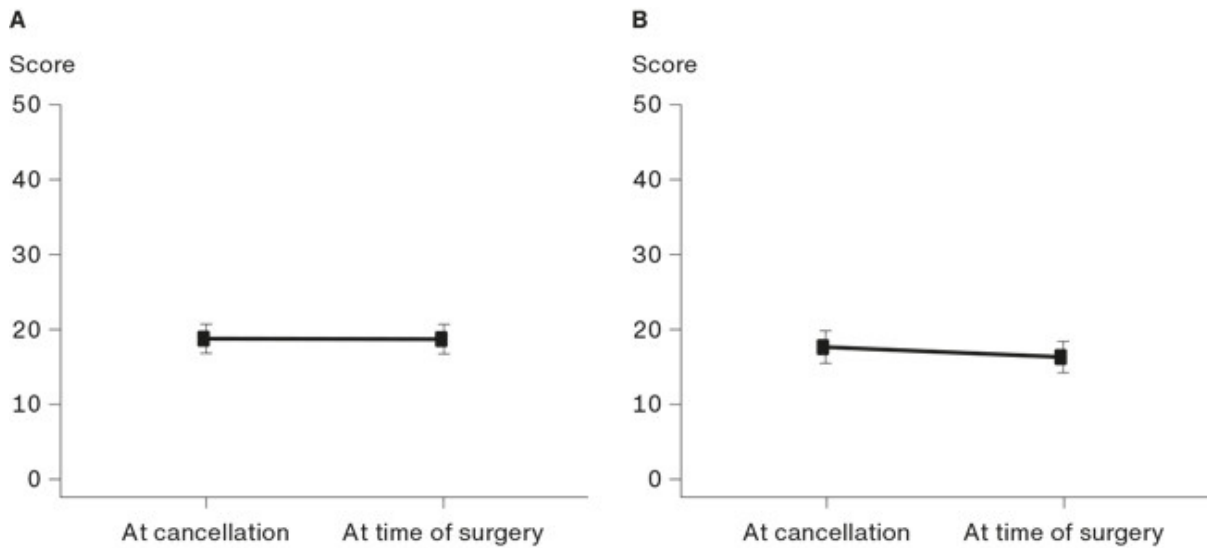
ASA = American Society of Anesthesiologists; EQ5D = EuroQol 5-Dimension; FJS = Forgotten Joint Score; OHS = Oxford Hip Score; OKS = Oxford Knee Score; VAS = visual analogue scale.

a) For bilateral surgery, the side with the highest score was used.

b) 1 missing.

Mean difference in OKS and OHS were 0 (95% CI: -1-1) and -1 (95% CI: -2-0) (**Figure 2**). Linear regression analyses showed no significant association between length of postponement and change in OKS or OHS (effect estimates 0.0 [p = 0.9] and 0.0 [p = 0.5], respectively).

**FIGURE 2** The mean difference of Oxford Knee Score (A) and Oxford Hip Score (B) from time of surgery cancellation to time of re-scheduled surgery.



Mean differences in FJS were -2 (95% CI: -5-1) and 1 (95% CI: -2-3), and for pain VAS -1 (95% CI: -5-3) and -1 (95% CI: -7-5) for the knee and hip arthroplasty groups, respectively. For the EQ5D Index, the corresponding differences were 0.0 (95% CI: 0.0-0.1) and 0.0 (95% CI: 0.0-0.1), for EQ5D VAS -2 (95% CI: -8-4) and 0 (95% CI: -7-6).

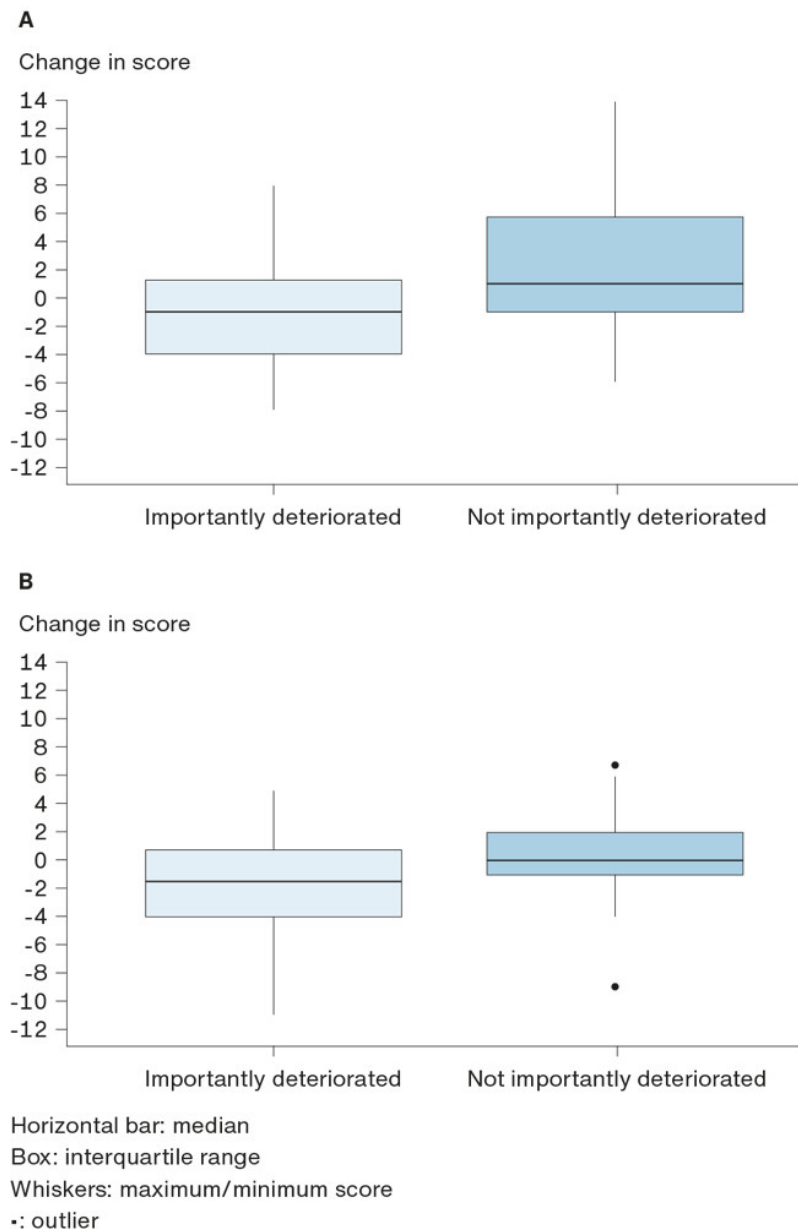
At lockdown, 34% of the patients with postponed arthroplasty were concerned that postponement would result in a poorer treatment outcome, 47% were not concerned and 19% were unsure.

Using the Pareto Classification of Health Change, the health profile was considered “better” for 22% and 24%, “worse” for 36% and 35%, “unchanged” for 29% and 33%, and “mixed” for 13% and 8% for patients who awaited knee and hip arthroplasty, respectively.

For patients awaiting knee and hip arthroplasty, 63% and 75% perceived important deterioration in their symptoms, whereas none and 2% perceived important improvements in their symptoms, respectively.

Subgroup analyses showed that the OKS and OHS scores deteriorated more for patients who perceived having deteriorated to an important degree than for patients who did not feel that they had deteriorated to an important degree (Figure 3).

**FIGURE 3** Box plot for the Oxford Knee Score (A) and Oxford Hip Score (B) stratified by those being importantly deteriorated and not importantly deteriorated from time of surgery cancellation to time of re-scheduled surgery.



For patients awaiting knee and hip arthroplasty, 8% and 6% reported symptoms of coronavirus and 8% and 4% tested positive for COVID-19. No patients were hospitalised due to COVID-19, but 3% and 8% were hospitalised for other reasons.

## DISCUSSION

This prospective cohort study found that postponing elective knee and hip arthroplasty due to the COVID-19 outbreak had no detrimental effects on pain, function or general health in patients with knee or hip OA. However, when asked about their perceived change in knee or hip problems in the period awaiting surgery, 75

(68%) perceived an important deterioration in their symptoms.

We found that, from the time of COVID-19 shut-down to the new date of surgery, the average OKS was unchanged for those awaiting knee arthroplasty. However, for those awaiting hip arthroplasty, a statistically significantly decreased OHS of one point was observed. Although minimal important change cut-off values for deterioration in OHS have not been established, an average one-point deterioration may not be clinically relevant. We were unable to directly compare our OKS and OHS scores with previous studies. However, in contrast to this study, a recent study found that the lockdown led to a statistically significant deterioration in self-reported pain and physical function in patients with hip and knee OA awaiting surgery [5]. The difference in findings may be due to usage of phone interviews rather than self-completed questionnaires, to a difference in timeframe between follow-up responses, a smaller number of patients enrolled, a lower percentage of females included, and that patients awaiting hip arthroplasty were on average more than ten years younger than respondents in the present study [5].

Patients remained stable from COVID-19 lockdown to the new date of surgery in terms of their average degree of pain and functional limitations measured with the OHS and OKS. However, when asked about their perceived change during the waiting period, we found that most patients (68%) perceived their symptom levels to have deteriorated. These findings may reflect that patients worry about their situation, especially considering that 34% expressed concerns that postponing surgery would lead to a poorer treatment outcome. In parallel, other studies have found that patients were anxious due to the uncertainty about when the surgery could be re-scheduled [7, 8]. In these studies, the proportion of patients who were eager to have their surgery immediately re-scheduled conflictingly varied between 55% and 90%. This variation may reflect the differences in study populations and hospital settings. However, the fact that our study similarly reported concerned patients suggests that re-scheduling surgery is an important consideration.

Limitations of this study include that data were collected at a single public hospital, limiting the generalisability of the results. However, the representativeness of our study population in a Danish context is supported by several facts; including that the hospital uptake area covered both rural and urban geographical areas and that patient characteristics were in line with those from the nationwide Danish Knee and Hip Arthroplasty Registers [17, 18]. Additionally, the OKS and OHS scores derived from this study are lower than reported in a previous study of Danish patients before undergoing knee or hip arthroplasty [19].

At lockdown, patients may have scored themselves as having more problems as a result of having their surgery postponed, which in turn may reflect concerns about when they would be able to have their surgery re-scheduled. Finally, selection bias may have occurred as the patients included in the patient-reported outcome measure comparison comprised only 57% of the total proportion who had their surgery postponed. Patients were excluded either because they did not reply to the initial questionnaire ( $n = 18$ ), because they were referred to a private hospital setting ( $n = 18$ ) or because surgery was postponed due to other health-related problems ( $n = 5$ ). Finally, some were still awaiting surgery at the time of analyses ( $n = 12$ ). In total, 31 patients did not return the follow-up questionnaire. It is possible that the patients replying to the questionnaires were those who perceived the greatest urgency to have their surgery re-scheduled quickly. Furthermore, the 18 patients referred to private hospitals may potentially have had more severe symptoms that urged them to skip the waiting period by opting for referral to private hospital care.

Additionally, we do not know whether the 12 patients who had not yet been operated may experience additional deterioration of symptoms since they have been postponed for a longer time period. However this group only constitutes 6% of the total population. Patients providing complete data and patients only providing data at their initial surgery cancellation were not statistically different why we consider the results to be generalisable.



## CONCLUSIONS

On average, the COVID-19 shut-down did not impact pre-operative pain, function or general health status in patients with knee or hip OA during the period when their surgery was postponed. However, almost seven out of ten patients perceived that they had deteriorated to an important degree. These findings can support clinicians in understanding how patients may experience indefinite postponement of elective hip and knee surgery during the corona pandemic. Furthermore, patients may feel reassured by learning that, on average, no deterioration in symptoms was associated with postponing.

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**References** can be found with the article at [ugeskriftet.dk/dmj](https://ugeskriftet.dk/dmj)

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