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## Economics

## The Effect of the COVID-19 Pandemic on Electively Scheduled Hip and Knee Arthroplasty Patients in the United States



Timothy S. Brown, MD <sup>a,\*</sup>, Nicholas A. Bedard, MD <sup>a</sup>, Edward O. Rojas, BS <sup>a</sup>, Christopher A. Anthony, MD <sup>b</sup>, Ran Schwarzkopf, MD <sup>c</sup>, C. Lowry Barnes, MD <sup>d</sup>, Jeffrey B. Stambough, MD <sup>d</sup>, Simon C. Mears, MD <sup>d</sup>, Paul K. Edwards, MD <sup>d</sup>, Sumon Nandi, MD, MBA <sup>e</sup>, Hernan A. Prieto, MD <sup>f</sup>, Javad Parvizi, MD, FRCS <sup>g</sup>, AAHKS Research Committee

<sup>a</sup> Department of Orthopedics and Rehabilitation, University of Iowa Hospitals and Clinics, Iowa City, IA

<sup>b</sup> Department of Orthopedics, Washington University, St. Louis, MO

<sup>c</sup> Division of Orthopedics, Adult Joint Reconstruction, NYU Langone, New York, NY

<sup>d</sup> Department of Orthopaedic Surgery, University of Arkansas for Medical Sciences, Little Rock, AR

<sup>e</sup> Department of Orthopaedics, University of Maryland School of Medicine, Baltimore, MD

<sup>f</sup> Department of Orthopedics and Rehabilitation, University of Florida College of Medicine, Gainesville, FL

<sup>g</sup> Rothman Orthopaedic Institute, Thomas Jefferson University, Philadelphia, PA

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## ABSTRACT

**Background:** In response to the COVID-19 pandemic, hospitals in the United States were recommended to stop performing elective procedures. This stoppage has led to the cancellation of a large number of hip and knee arthroplasties. The effect of this on patients' physical mental and economic health is unknown. **Methods:** A survey was developed by the AAHKS Research Committee to assess pain, anxiety, physical function, and economic ability of patients to undergo a delayed operation. Six institutions conducted the survey to 360 patients who had to have elective hip and knee arthroplasty cancelled between March and July of 2020.

**Results:** Patients were most anxious about the uncertainty of when their operation could be rescheduled. Although 85% of patients understood and agreed with the public health measures to curb infections, almost 90% of patients plan to reschedule as soon as possible. Age and geographic region of the patients affected their anxiety. Younger patients were more likely to have financial concerns and concerns about job security. Patients in the Northeast were more concerned about catching COVID-19 during a future hospitalization. **Conclusions:** Patients suffering from the pain of hip and knee arthritis continue to struggle with pain from their end-stage disease. They have anxiety about the COVID-19 pandemic. Few patients feel they will be limited financially and 90% want to have surgery as soon as possible. Age and physical location of the patients affect their causes for anxiety around their future surgery.

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The 2020 global pandemic caused by the novel coronavirus SARS-CoV-2 (COVID-19) [1] has had drastic effects across world economies and healthcare systems [2,3]. With the rapid spread

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\* Reprint requests: Timothy S. Brown, MD, Department of Orthopedics and Rehabilitation, University of Iowa Hospitals and Clinics, Iowa City, IA 52242.

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across the globe, many regions were overwhelmed with patients requiring respiratory support [4–6]. Public health interventions in China provided guidance for other regions in the world on how to face a looming worldwide crisis [7]. After the first identified infection in the United States (US) in late January 2020 and subsequent evidence of community spread, state governments began drastically limiting businesses and issuing stay-at-home orders. Hospitals began limiting elective surgical procedures following national health guidelines in an effort to (1) slow the spread of the disease, (2) protect patients and staff from asymptomatic or undiagnosed carriers, (3) conserve personal protective equipment, and (4) reserve inpatient capacity for the COVID-19 infections [8,9].

**Table 1**  
Participating Sites.

Institution	Region	Surgeons (n)	Surveys (n)
University of Arkansas for Medical Sciences	Midwest	2	53
University of Florida	South	5	52
University of Iowa Hospitals and Clinics	Midwest	4	58
University of Maryland	Northeast	5	9
Hospital for Joint Diseases, New York University	Northeast	21	43
Rothman Institute	Northeast	45	144
		82	359

One survey was completed from a seventh institution and was counted in the frequency but not in the analysis

With the World Health Organization declaration of a global pandemic on March 11, 2020, elective cases in the US, including hip and knee arthroplasty, began to be postponed indefinitely or canceled outright. The US Surgeon General recommended stopping elective surgery on March 14, 2020.

Hip and knee arthroplasties are two of the most commonly performed elective procedures in the US, with approximately 1.5 million procedures performed annually [10,11]. Thousands of patients suffering from the daily pain of arthritis were affected and the true impact of the pandemic on these patients is unmeasured. The American Association of Hip and Knee Surgeons sought to understand the impact these postponements have had on our patient population. The anxiety induced by the pandemic is well documented among health care workers [12] but poorly

## COVID-19 Delayed Orthopedic Surgery

Record ID

When was your surgery originally planned?

- March  
 April  
 May  
 June or later

Was your planned surgery postponed or canceled by your surgeon/hospital or did you cancel the surgery?

- My surgeon postponed or canceled the operation  
 I chose to postpone or cancel the operation out of concern for COVID-19

3. Please rate each item with the following scale (severe anxiety, moderate anxiety, neutral, minimal anxiety, no anxiety).

Becoming infected with COVID-19?

- no anxiety  
 minimal anxiety  
 neutral  
 moderate anxiety  
 severe anxiety

Spreading COVID-19 to a family member, friend or colleague?

- no anxiety  
 minimal anxiety  
 neutral  
 moderate anxiety  
 severe anxiety

Finances

- no anxiety  
 minimal anxiety  
 neutral  
 moderate anxiety  
 severe anxiety

Job Security, FMLA or disability

- no anxiety  
 minimal anxiety  
 neutral  
 moderate anxiety  
 severe anxiety

Not knowing how long my joint replacement will be pushed back?

- no anxiety  
 minimal anxiety  
 neutral  
 moderate anxiety  
 severe anxiety

**Fig. 1.** Survey instrument that was distributed to patients electronically. COVID-19, coronavirus SARS-CoV-2. FMLA, Family and Medical Leave Act.

Has your knee or hip pain increased/decreased/stayed the same since the onset of the COVID-19 pandemic?	<input type="radio"/> increased <input type="radio"/> decreased <input type="radio"/> stayed the same
Knowing what you know about COVID-19, would you still have elected to move forward with your TKA/THA even if it would have put you at elevated risk for COVID-19 infection, hospitalization and possibly death?	<input type="radio"/> Yes <input type="radio"/> No
Do you believe that it is important to stop elective surgery/joint replacements in order to minimize the spread of COVID-19?	<input type="radio"/> Yes <input type="radio"/> No
Do you currently feel isolated or lonely?	<input type="radio"/> Yes <input type="radio"/> No
Do you have the help you need at home to assist you while struggling with your arthritis?	<input type="radio"/> Yes <input type="radio"/> No
Has your activity level increased, decreased, or stayed the same since your surgery was cancelled?	<input type="radio"/> increased <input type="radio"/> decreased <input type="radio"/> stayed the same
Once the COVID 19 pandemic is over:	<input type="radio"/> I will reschedule my surgery for a date in the near future <input type="radio"/> I will delay the surgery as I am worried about contracting COVID 19 in the hospital <input type="radio"/> I will delay the surgery because of financial difficulties <input type="radio"/> I will delay the surgery because I no longer have enough paid time off from work and need to increase available time off before I have surgery <input type="radio"/> I will delay surgery for other reasons (please explain below)
Other reasons for surgery delay:	_____

Fig. 1. (continued).

understood among patients. The aim of the present study was to identify hip and knee arthroplasty patients across many different institutions in the US who had their scheduled primary joint arthroplasty postponed or canceled because of the COVID-19 pandemic guidelines for elective surgery and assess their pain, anxiety, physical function, and economic ability to undergo a delayed operation once the threat of COVID-19 has subsided.

## Methods

We administered a novel questionnaire to our elective hip and knee patients affected by the COVID-19 pandemic. Participating centers were identified through the American Association of Hip and Knee Surgeons Research Committee and Research Consortium. Six centers participated in the study. These institutions represent both academic and private medical centers in varied regions throughout the US (Table 1). Each institution submitted and obtained local IRB approval or exemption for the study, and all sites signed a standardized data use and transfer agreement with the host institution (the University of Iowa).

Inclusion criteria for the study were patients scheduled for primary elective hip or knee arthroplasty in the Spring of 2020 who had their surgery postponed or canceled because of the COVID-19 pandemic. No protected health information was collected from

any patient. The survey (Figure 1) was distributed to patients electronically or over the telephone with REDCap (Research Electronic Data Capture, Nashville, TN) hosted at the University of Iowa. The survey contained questions regarding the prior planned operation, questions on a 5-point Likert scale [13] addressing anxiety around COVID-19 and the canceled operation, questions about the patients' disease state, and socioeconomic concerns. Data were collected from April 6 to April 15, 2020, before analysis. Surveys were considered complete and included in the study only if all questions were answered on the form.

Descriptive statistics were performed for the frequency of each survey question and reported as mean  $\pm$  standard deviation. For the 5 questions that addressed anxiety around COVID-19, responses from the Likert scale were analyzed as categorical responses and also turned to a continuous variable with mean presented (1 = no anxiety to 5 = severe anxiety). Univariate analyses were performed with age (younger than 65 years versus 65 years and older) and with US geographic region (Midwest, Northeast, and South). We used the chi-squared test to detect the relationship between age and region group for each of the categorical variables. The Wilcoxon rank sum test or Kruskal-Wallis test was used to compare the differences for continuous variables among these same groups. All statistical analyses were performed using SAS 9.4 (SAS Inc. Cary, NC) with significance level at  $P < .05$ .

**Table 2**  
Responses by Age <65 y vs 65 y or Older.

Question	Age <65 y 175 (49%) <sup>a</sup>	Age 65+ y 185 (51%)	P Value	OR (95% CI)
Region				
Midwest	61	50	.13	
Northeast	93	103		
South	20	32		
Joint				
Hip	72	86	.31	
Knee	103	99		
Surgery planned				
March	61	79	.30	
April	96	93		
May	17	11		
June	1	2		
Who canceled?				
Surgeon	158	150	<b>.013</b>	
Self	17	35		
Becoming infected				
1 – no anxiety	25	22	.79	
2 – minimal	50	56		
3 – neutral	28	23		
4 – moderate	51	61		
5 – severe	21	23		
Spreading infection				
1 – no anxiety	31	28	.82	
2 – minimal	47	51		
3 – neutral	11	13		
4 – moderate	50	61		
5 – severe	36	32		
Finances				
1 – no anxiety	43	100	<b>&lt;.0001</b>	
2 – minimal	44	36		
3 – neutral	24	21		
4 – moderate	48	22		
5 – severe	16	6		
Job security				
1 – no anxiety	73	144	<b>&lt;.0001</b>	
2 – minimal	33	16		
3 – neutral	29	17		
4 – moderate	30	6		
5 – severe	10	2		
Not knowing				
1 – no anxiety	21	32	<b>.0095</b>	
2 – minimal	21	33		
3 – neutral	19	17		
4 – moderate	63	76		
5 – severe	51	27		
Arthritis pain change?				
Increased	102	94	.26	
Decreased	4	8		
Stayed same	69	83		
Surgery in spite of COVID?				
Yes	71	40	<b>&lt;.0001</b>	2.5 (1.6-3.9)
No	104	145		
Agree with no elective OR?				
Yes	144	163	.12	
No	31	22		
Feeling isolated?				
No	41	33	.19	
Yes	134	152		
Have help at home?				
No	32	22	.09	
Yes	143	163		
Activity level changed?				
Increased	21	10	.08	
Decreased	85	94		
Stayed same	69	81		
Rescheduling?				
No delay	154	162	.08	
COVID fear	7	16		
Financial	4	1		
PTO	3	0		
Other	7	6		

COVID, novel coronavirus SARS-CoV-2. OR, operating rooms; PTO, paid time off. Values in bold represent  $P < .05$ .

<sup>a</sup> One survey was completed from a seventh institution and was counted in the frequency but not in the analysis.

**Table 3**  
Responses by US Region.

Question	Midwest 111 (31%)	Northeast 196 (55%) <sup>a</sup>	South 52 (14%)	P Value
Joint				
Hip	49	92	17	.18
Knee	62	104	35	
Surgery planned				
March	34	93	13	<b>&lt;.0001</b>
April	65	99	24	
May	12	1	15	
June	0	3	0	
Who canceled?				
Surgeon	108	160	39	<b>&lt;.0001</b>
Self	3	36	13	
Becoming infected				
1 – no anxiety	17	21	9	.06
2 – minimal	39	51	16	
3 – neutral	20	25	6	
4 – moderate	28	66	17	
5 – severe	7	33	4	
Spreading infection				
1 – no anxiety	15	30	13	<b>.043</b>
2 – minimal	40	48	10	
3 – neutral	6	12	6	
4 – moderate	35	66	10	
5 – severe	15	40	13	
Finances				
1 – no anxiety	54	66	22	.19
2 – minimal	19	47	14	
3 – neutral	13	27	5	
4 – moderate	19	45	6	
5 – severe	6	11	5	
Job security				
1 – no anxiety	69	110	37	.13
2 – minimal	13	27	9	
3 – neutral	13	31	2	
4 – moderate	12	23	1	
5 – severe	4	5	3	
Not knowing				
1 – no anxiety	23	23	7	.08
2 – minimal	18	29	7	
3 – neutral	9	21	6	
4 – moderate	47	77	15	
5 – severe	14	46	17	
Arthritis pain change?				
Increased	58	111	26	.91
Decreased	4	6	2	
Stayed same	49	79	24	
Surgery in spite of COVID?				
Yes	36	60	15	.89
No	75	136	37	
Agree with no elective OR?				
Yes	97	163	47	.34
No	14	33	5	
Feeling isolated?				
No	27	37	9	.44
Yes	84	159	43	
Have help at home?				
No	94	163	48	.26
Yes	17	33	4	
Activity level changed?				
Increased	15	11	4	.07
Decreased	45	106	28	
Stayed same	51	79	20	
Rescheduling?				
No delay	95	173	47	.92
COVID fear	7	12	4	
Financial	2	3	0	
PTO	1	2	0	
Other	6	6	1	

COVID, novel coronavirus SARS-CoV-2. Values in bold represent  $P < .05$ .<sup>a</sup> One survey was completed from a seventh institution and was counted in the frequency but not in the analysis.

## Results

Six centers distributed surveys, representing 82 hip and knee surgeons. Surveys were completed successfully by 360 patients. Mean age of the patients was 65 years (33–89 years), 208 (58%) were female, and 158 were scheduled for total hip arthroplasty (THA) (44%) and 202 for total knee arthroplasty (TKA) (56%). Patients were originally scheduled for March (39%), April (53%), and May (8%). Less than one percent of the patients who responded were originally scheduled for June or later. Most patients had their surgery postponed or canceled by the surgeon or hospital (308, 86%), whereas 14% of patients initiated the cancellation. Older patients were more likely to have initiated the cancellation of their operation than younger patients (18% vs 10%,  $P = .013$ ). The cancellation reason was significantly different in the Northeast and South, with 18% and 25% of cancellations initiated by the patient compared with 3% for Midwest ( $P < .0001$ ).

### Anxiety Around COVID-19

Overall, not knowing when the canceled joint arthroplasty will be rescheduled was rated as the highest source of anxiety ( $3.4 \pm 1.4$ ). Not knowing when the procedure will be rescheduled caused moderate or severe anxiety in 217 patients (60%). Becoming infected with COVID-19 ( $3.0 \pm 1.3$ ) and spreading infection to others ( $3.1 \pm 1.4$ ) were also high causes for anxiety. Patients were least concerned with finances ( $2.3 \pm 1.3$ ) and job security/disability ( $1.8 \pm 1.2$ ).

There were significant differences in the responses by both age and region (Tables 2 and 3). For the younger cohort, the questions about finances ( $2.7 \pm 1.3$  vs  $1.9 \pm 1.1$ ,  $P < .0001$ ) and job insecurity ( $2.3 \pm 1.3$  vs  $1.4 \pm 0.9$ ,  $P < .0001$ ) caused significantly more anxiety than in the older group. In the Northeast, patients had significantly higher anxiety around becoming infected with COVID-19 ( $3.2 \pm 1.3$  compared with  $2.7 \pm 1.2$  for Midwest and  $2.8 \pm 1.3$  for South,  $P = .004$ ).

### Arthritis Symptoms in Light of COVID-19

Most patients stated that their pain from hip/knee arthritis has increased since surgery cancellation (54%), and 30% stated that they would have proceeded with surgery in spite of the risks posed by COVID-19. Activity levels have decreased for 50% of the participants since cancellation. Although most patients have help at home assisting with activities of daily living, 15% of the respondents were without help at home and 21% of patients felt isolated or lonely as a result. There were no significant differences between age groups or regions.

### Public Health Measures and COVID-19

Patients varied in responses to further efforts to curb the spread of COVID-19. Most patients (85%) agreed with the decision to stop elective procedures in the face of ongoing pandemic. There were no differences in age or region for these responses.

### Patient Plans for Future Treatment

When asked about future plans for arthritis treatment, 316 patients (88%) stated they will reschedule surgery in the near future. Only 23 patients (6%) wished to delay further for fear of COVID-19, 5 patients (1%) wished to delay for financial reasons, 3 patients (1%) to accrue more paid time off. There were no differences in age or regional responses.

## Discussion

As of April 15, 2020, the global COVID-19 pandemic caused by the SARS-CoV-2 virus has caused 1.9 million infections and 123,010 deaths globally [14], with 579,005 confirmed cases and 22,252 deaths in the US [15]. Projections of critical care shortages throughout the US [16], and as a result, drastic public health measures designed to slow its spread [7,9] led to a dramatic shift in the practice of hip and knee arthroplasty surgeons in the US. The broad recommendation to postpone elective operations in the US during the pandemic has led to a large cohort of patients with end-stage hip and knee arthritis that can no longer receive their recommended surgical treatment. By some estimations, as many as 150,000 patients will have their elective hip/knee arthroplasty postponed per month while the elective moratorium lasts [10]. In this study, we aimed to focus on these patients and their responses to the anxiety caused by COVID-19, their daily disease burden from lower extremity arthritis, and their future focus for rescheduling the planned procedure.

We found that most patients had their operation postponed by their surgeon, although patients from regions harder hit by the pandemic were more likely to have canceled their own surgery (18% cancellation in Northeast urban areas compared with 3% for the rural Midwest). Older patients at higher risk if contracting COVID-19 were also more likely to cancel themselves compared with younger patients (18% vs 10%). Patient anxiety was most focused on the unknown timing for future scheduling across regions. Younger patients were significantly more concerned with finances and job security. Patients from the urban Northeast region were more concerned with becoming infected by the virus. The daily symptoms of arthritis were unchanged or exacerbated in most patients, and limitations at home were significant for 15%–20%. The drastic public health measures taken by state and federal government to slow the spread of COVID-19 were understood by the patients, but almost 90% of the respondents replied that they would like their surgery rescheduled in the near future.

The present study is limited by its small number of patient responses relative to the predicted number of canceled cases and the homogeneity of the participating sites. Continued work will occur over the next few months to distribute the survey more broadly and to further understand the effect the COVID-19 pandemic has had on our patients. With more patients, we hope to validate this initial study and perform more in-depth subgroup analyses. A second limitation includes the fact that survey administration was mixed between online completion and telephone review of the questions by a member of the surgeon's team. It is possible that the discrepancies in administration techniques could bias patient responses.

## Conclusion

The COVID-19 pandemic has had a dramatic effect on everyday life in the US and the rest of the world and has affected hip and knee surgeons, their practices, and most importantly our patients. From the present study, we conclude that patients clearly have anxiety related to the COVID-19 pandemic and continue to suffer from the effects of lower extremity arthritis while at home. Stark regional differences exist in the burden of COVID-19 in the US, and this is seen in our patient's responses. Patient age also plays a large role in the reaction to the pandemic, particularly in regard to financial and job security concerns. This pilot study will be expanded to include all regions of the country and larger numbers of patients in the ensuing weeks before arthroplasty surgeons resume the performance of elective joint arthroplasty surgery.

## References

- [1] Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020;382:727–33. <https://doi.org/10.1056/NEJMoa2001017>.
- [2] Gates B. Responding to Covid-19 - a once-in-a-Century pandemic? *N Engl J Med* 2020. <https://doi.org/10.1056/NEJMp2003762>. [E-pub ahead of print].
- [3] Fauci AS, Lane HC, Redfield RR. Covid-19 - navigating the uncharted. *N Engl J Med* 2020;382:1268–9. <https://doi.org/10.1056/NEJMe2002387>.
- [4] Grasselli G, Pesenti A, Cecconi M. Critical care utilization for the COVID-19 outbreak in lombardy, Italy: early experience and Forecast during an emergency response. *JAMA* 2020. <https://doi.org/10.1001/jama.2020.4031>. [E-pub ahead of print].
- [5] Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. China medical treatment expert group for C. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med* 2020. <https://doi.org/10.1056/NEJMoa2002032>. [E-pub ahead of print].
- [6] Song JY, Yun JG, Noh JY, Cheong HJ, Kim WJ. Covid-19 in South Korea - challenges of subclinical manifestations. *N Engl J Med* 2020. <https://doi.org/10.1056/NEJMc2001801>.
- [7] Pan A, Liu L, Wang C, Guo H, Hao X, Wang Q, et al. Association of public health interventions with the epidemiology of the COVID-19 outbreak in Wuhan, China. *JAMA* 2020. <https://doi.org/10.1001/jama.2020.6130>. [E-pub ahead of print].
- [8] Omer SB, Malani P, Del Rio C. The COVID-19 pandemic in the US: a clinical update. *JAMA* 2020. <https://doi.org/10.1001/jama.2020.5788>.
- [9] Gostin LO, Hodge Jr JG. US emergency legal responses to novel coronavirus: Balancing public health and Civil liberties. *JAMA* 2020. <https://doi.org/10.1001/jama.2020.2025>.
- [10] Kurtz SM, Ong KL, Lau E, Bozic KJ. Impact of the economic downturn on total joint replacement demand in the United States: updated projections to 2021. *J Bone Joint Surg Am* 2014;96:624–30. <https://doi.org/10.2106/JBJS.M.00285>.
- [11] Sloan M, Premkumar A, Sheth NP. Projected volume of primary total joint arthroplasty in the U.S., 2014 to 2030. *J Bone Joint Surg Am* 2018;100:1455–60. <https://doi.org/10.2106/JBJS.17.01617>.
- [12] Shanafelt T, Ripp J, Trockel M. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA* 2020. <https://doi.org/10.1001/jama.2020.5893>.
- [13] Likert R. A technique for the measurement of attitudes. *Arch Psychol* 1932;140:1–55.
- [14] WHO. Coronavirus Disease 2019 (COVID-19) Situation Report - 85. 2020. [https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200415-sitrep-86-covid-19.pdf?sfvrsn=c615ea20\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200415-sitrep-86-covid-19.pdf?sfvrsn=c615ea20_2) [accessed 15.05.20].
- [15] CDC. Coronavirus Disease 2019 (COVID-19): Cases in U.S. 2020. <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html> [accessed 15.05.20].
- [16] Moghadas SM, Shoukat A, Fitzpatrick MC, Wells CR, Sah P, Pandey A, et al. Projecting hospital utilization during the COVID-19 outbreaks in the United States. *Proc Natl Acad Sci U S A* 2020. <https://doi.org/10.1073/pnas.2004064117>.