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Survey of AAHKS International Members on the Impact of COVID-19 on Hip and Knee Arthroplasty Practices



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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) pandemic poses an important risk to global health.
Methods: This study surveyed 370 international orthopedic surgeons affiliated with the American Association of Hip and Knee Surgeons to help identify the global impact of the COVID-19 pandemic on patient care.

Results: A total of 99 surgeons (27% of those surveyed) completed the questionnaire representing 32 different countries. Except for surgeons in Japan, all respondents noted that their practice had been affected to some degree and 70% of the surgeons have canceled elective procedures. More than a third of the surgeons have had to close their practices altogether and the remaining open practices were estimated to be sustainable for 7 weeks on average given their current situation.

Conclusion: The COVID-19 pandemic has resulted in marked changes to the majority of international arthroplasty practices.

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In December 2019, coronavirus disease 2019 (COVID-19) broke out in Wuhan, Hubei Province, the People's Republic of China. Since that time, the disease has spread worldwide to an extent not seen in decades and poses an important global health threat [1]. It is now known that COVID-19 is a highly contagious disease caused by the SARS-CoV-2 virus which produces symptoms that are much more severe than the seasonal flu, with fatality rates around 1.4% [2]. The virus is transmitted person-to-person and healthcare professionals

may serve as a mechanism for hospital-associated transmission and outbreaks [3]. Healthcare providers are at risk of propagating this disease and this risk is not exclusive to those healthcare workers at the "front lines" of the pandemic (eg, emergency department, isolation wards). In one recent report, upward of 78% of healthcare workers infected were outside of these frontline areas, allowing infection to spread [4]. As such, measures to slow the spread of infection have been witnessed worldwide in targeting all departments within hospitals.

The need to slow the rate of transmission and accountability of proper stewardship of medical resources is of utmost importance. The acute spike in sick patients with COVID-19 in Italy and Spain, for example, showed that hospitals could quickly become depleted of necessary medical equipment to protect patients and staff. A similar situation has been seen in US-based hospitals where we have seen key shortages in ventilators, personal protective equipment (PPE), and blood products [5–7]. In response, early recommendations were made by the American College of Surgeons to

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delay elective surgical procedures in an effort to save PPE and minimize these shortages [8]. A large majority of US hospitals have since canceled elective surgeries for the immediate future. It is unclear whether similar strategies were taken by governments worldwide, as this would depend on the volume of COVID-19-infected cases in any specific country.

Total hip (THA) and knee arthroplasty (TKA) are some of the highest-volume procedures performed in hospitals on an elective basis [9]. Furthermore, there are certain procedures involving THA or TKA that may require more urgent treatment, such as those patients presenting with periprosthetic joint infections or fractures. Some of these patients could be COVID-19 infected and require a surgical intervention in an emergent or semi-urgent basis. Orthopedic surgeons worldwide are attempting to balance minimizing COVID-19 disease burden while still providing necessary care. To date, it is unknown how arthroplasty surgeons worldwide are altering their practice in the setting of COVID-19. The purpose of this survey is to determine the impact of COVID-19 on arthroplasty practices internationally.

Materials and Methods

A web-based survey was developed by the American Association of Hip and Knee Surgeons (AAHKS) and administered using SurveyMonkey (SurveyMonkey, San Mateo, CA), a survey platform for online data collection and analysis. The survey consisted of a series of questions related to the COVID-19 pandemic and its effects on joint arthroplasty practice. The survey was sent to all international AAHKS members on April 8, 2020, and closed 5 days later to allow for preparation and submission of this article to the journal supplement. A similar survey had also been sent to AAHKS members within the United States and Canada and those results were used to communicate the degree of practice disruptions to the federal government.

Three hundred seventy international members were sent the e-mail and 99 members (27%) completed the survey within the 5-day open window. Thirty-two different countries were represented in the responses and are listed in Table 1. The survey was translated to Chinese, Japanese, Italian, and German and additionally distributed to members of the hip and knee societies in these countries in order to garner more precise information from surgeons practicing in countries affected in one way or another by COVID-19. Two hundred sixty additional surgeons from the Japanese Society for Replacement Arthroplasty, the German Orthopedic Society, the Chinese Orthopaedic Association, and the Italian Hip Society responded to the translated survey.

The responses were anonymous and tabulated and reported in aggregate form. Descriptive statistics including mean, standard deviation, and median values were reported for all continuous variables. Percentiles and sample size were reported for categorical variables.

The survey questions are shown in Tables 2–4.

Results

Of the 370 active international AAHKS members sent the request, 99 respondents (27%) satisfactorily completed the survey. The survey responses are distributed through Tables 2–4. For simplicity, as the number of respondents was 99, percentages were omitted as the recorded responses roughly equal the percentage.

Respondents were greatly impacted by the effects of COVID-19 on their patient practice, with only 3 respondents from Japan indicating no changes to their arthroplasty practice at their respective hospitals. The majority of respondents stated that their practice has been affected, with 71 confirming their hospital had

Table 1
Responses by Country.

Country	Responses
Argentina	8
Australia	2
Brazil	3
Chile	8
China	2
Colombia	8
Ecuador	2
France	4
Germany	1
Greece	2
India	10
Indonesia	1
Iran	1
Ireland	3
Italy	8
Japan	8
Korea	1
Mexico	4
New Zealand	1
Pakistan	1
Panama	1
Philippines	1
Russia	1
South Africa	2
Spain	2
Taiwan	1
Turkey	2
United Kingdom	4
Ukraine	1
Uruguay	3
United States	1
Venezuela	1

stopped elective inpatient surgery altogether. Some noted that their hospitals canceled all types of surgeries in response to COVID-19 pandemic (14 responses from countries including Mexico, India, Italy, Chile, Uruguay, United Kingdom, Philippines, Spain, South Africa, and France). Many surgeons noted a shift in their focus to nonsurgical clinical care (19), or performing more administrative work (26). Ten respondents noted that they were providing more nonorthopedic patient care. Twenty-two respondents report that their respective hospitals have been unable to care for all COVID-19-infected patients and a large number have encountered disruptions in both supply and staffing needs. Because of the COVID-19 pandemic, an average of 81 cases were estimated to be deferred per respondent, with the maximum response of 2000 estimated cases.

The arthroplasty-related procedures still being performed at most hospitals were most commonly semi-urgent arthroplasty problems including periprosthetic fracture, massively failed total joint arthroplasty, and first-stage resection for prosthetic joint infection, demonstrating that semi-urgent procedures were still performed at many hospitals. Of the cases that were still performed, about half (48 responses) replied that there was some form of preoperative testing for COVID-19 infection. Most surgeons used an N-95 respirator to some capacity while operating (67), but to a lesser extent when rounding on the wards (41).

Surgeons were affected personally. There were 4 surgeons who tested positive for COVID-19 infection. Almost half (42) of the surgeons reported they were no longer working at all. Responders reported that the average number of weeks their practices could sustain the current economic pressures was approximately 7 weeks. Forty-four respondents replied that they have had to forego their salary and 22 have had to layoff or furlough employees. A large majority (82) of responders have not received any financial assistance from the government.

Table 2
Hospital-Related Questions.

Questions	# of Respondents
What specific effect has the continued COVID-19 pandemic had on your patients? (Mark all that apply)	
No changes at the hospital affecting TJA.	3
The hospital has stopped elective inpatient surgery.	71
The hospital has selectively restricted inpatient elective surgery.	20
Hospital-based elective outpatient surgery has been stopped.	41
Hospital-based elective outpatient surgery has been selectively restricted.	11
Patients with acute periprosthetic infections/fractures have surgery delayed.	4
Patients with semi-acute need for TJA revisions (loosening, dislocations) have surgery delayed.	29
All TJA patients are being tested for COVID-19.	6
TJA patients with positive screening questions/symptoms are being tested for COVID-19.	14
I am voluntarily deferring surgery.	33
Patients are canceling/delaying scheduled surgery.	58
The hospital is affected with staffing shortages due to the pandemic.	18
How has the COVID-19 pandemic affected your practice?	
No impact.	0
I am delaying primary TJA surgery due to the pandemic.	71
My clinic volume is reduced due to the pandemic.	69
My staff and I are spending time discussing the pandemic with patients.	26
My training or teaching (student/resident/fellow) is disrupted.	44
I am doing more nonsurgical orthopedic clinical care.	19
I am doing more administrative work.	26
I am doing more nonelective orthopedic surgery (trauma, tumor).	29
I am doing nonorthopedic patient care because of the pandemic.	10
How has the COVID-19 pandemic affected your hospital?	
The hospital is experiencing supply disruptions related to the pandemic.	64
The hospital is experiencing staff disruptions related to the pandemic.	41
The hospital will not be able to take care of all infected COVID-19 patients.	22
If you are deferring cases, please estimate the total number deferred	
Average 81 cases, range 4-2000	

COVID-19, coronavirus disease 2019; TJA, total joint arthroplasty.

Table 3
Direct Patient Care–Related Questions.

Questions	# of Respondents
Are you providing care through telemedicine?	
Zoom videoconference	40
FaceTime/Google Chat	18
Through my EHR	6
Doxy.me	1
Skype	10
Telephone (including apps, eg, WhatsApp)	72
What surgeries are still being performed at your site of care?	
No surgery is being performed	14
“Elective” primary TJA	12
First-stage explants for PJI	35
Second-stage reimplantations for PJI	14
Aseptic TJA revisions	8
Massively failed TJA (collapse, dislocation, component failure with imminent dislocation)	43
Periprosthetic fracture	83
If a patient undergoes urgent or semi-urgent surgical intervention: the following testing is completed	
No testing	32
Preoperative PCR testing is performed	36
Chest CT scan is performed	12
Does not apply	17
For patients undergoing general anesthetic, the hospital is following recommended guidelines of: other than anesthesia personnel no other personnel are allowed in the OR for 21 min after intubation and 21 min after extubation to prevent spread of virus	
Yes	42
No	27
Does not apply	30
During the orthopedic operative procedure, I use an N-95 respirator mask	
Only if known COVID-19-positive patient	35
All surgical procedures	32
I don't use an N-95 mask, I use a standard mask	31
During inpatient rounds on the wards, I use an N-95 respirator mask	
I use an N-95 respirator mask on when rounding on COVID-19-positive patients.	23
I use an N-95 mask during all rounding.	18
I don't use any mask when rounding.	5
I only use a standard mask when rounding.	53

EHR, electronic health record; COVID-19, coronavirus disease 2019; TJA, total joint arthroplasty; PJI, periprosthetic joint infection; PCR, polymerase chain reaction; CT, computed tomography; OR, operating room.

Table 4
Personal and Financial-Related Questions.

Questions	# of Respondents
What is the impact of the pandemic on you?	
I am effectively not working due to institutional or self-imposed deferral of elective surgery	42
I am not working due to personal illness, COVID-19 exposure, or post-travel quarantine	1
I am not doing my usual work, but I am now taking trauma call, or have increased my administrative role because of the pandemic	46
I consider myself in a high-risk group for COVID-19 (age greater than 60, underlying condition)	10
I have tested positive for COVID-19.	4
No confirmed cases of COVID-19 have occurred in my community or institution	17
Confirmed COVID-19 cases have occurred in my community or institution	35
How many weeks more can your practice sustain disruption due to the pandemic?	
Average 7.3 wk, range 2–30	
2 Responders were “unsure”	
Have you had to furlough/layoff employees?	
Yes	22
No	75
If yes, average number	2.9
Have you had to forego your compensation?	
Yes	44
No	55
Have you closed your practice?	
Yes	37
No	60
Are you seeking financial relief for your practice?	
Government assistance	8
Private assistance (bank loan, institutional support)	9
Not yet, but considering it	31
No	51
How has the COVID-19 pandemic affected you personally?	
I am concerned that my work poses a risk to my family.	21
I am under financial stress.	19
I am under mental/emotional stress.	8
I am adapting to the professional and personal challenges of the pandemic successfully.	49
The impact of the pandemic has been minimal.	2

COVID-19, coronavirus disease 2019.

Many surgeons have turned to digital platforms to aid in their direct patient care with 72 relying on telephone or video-based applications to communicate with patients. WhatsApp (WhatsApp, Menlo Park, CA) seems to be a preferred method of patient communication for responders.

In general, survey results from the international hip and knee arthroplasty societies from Japan, Germany, China, and Italy were similar to the results from AAHKS poll. There were some notable differences between societies. Japan had the highest number of respondents still performing arthroplasty cases, while Italy had the lowest. As expected, telemedicine was adopted by many societies, and most Italian surgeons are performing some form of telemedicine. We were surprised to see that very few surgeons across societies practice safe intubation/extubation guidelines and wear an N-95 respirator mask during operative procedures (Table 5).

Discussion

COVID-19 has progressed to a pandemic posing a substantial global health threat [1–4]. Global, regional, and local pressures have affected orthopedic surgeons worldwide. This survey of international AAHKS members is an attempt to characterize the

impacts of the COVID-19 pandemic on arthroplasty practices worldwide. Most notably, the majority of arthroplasty practices have been affected with all 99 surgeons responding that their practice has been affected to some degree and 71 having canceled elective procedures altogether. Semi-urgent procedures, such as those performed for periprosthetic fractures or infections, are still being performed. More than a third of responders noted that they have had to close their practices altogether and the remaining open practices were estimated to be sustainable for another 7 weeks on average.

The financial impact of COVID-19 on arthroplasty practices worldwide is unprecedented. The American Academy of Orthopaedic Surgeons and AAHKS have requested from the US government a number of provisions to support arthroplasty surgeons during this healthcare and economic crisis. These include flexibility with Health Insurance Portability and Accountability Act rulings for good faith actions to provide telehealth, a delay of the 2019 Merit-Based Incentive Payment System reporting deadline, Good Samaritan protections for COVID-19 volunteers, federal support for physician practices, suspension of any possible proposed Medicare cuts, and an allowance to expand physician-owned hospitals to treat Medicare patients (www.aaos.org website).

Table 5
Abbreviated Survey Results From International Societies.

Country/Society	# of Respondents	Hospital With Selective Restriction of Elective Surgeries	Shortages in Supplies	Providing Telemedicine	Hospital Still Performing Elective TJA	Follow Intubation Guidelines	Any Use of N-95 in OR	Average Time Practice Will Survive
COA	56	47 (84%)	49 (88%)	41 (73%)	48 (86%)	7 (13%)	5 (13%)	7 wk
JSRA	119	45 (38%)	77 (65%)	34 (29%)	85 (71%)	9 (8%)	26 (22%)	8 wk
Germany	21	14 (67%)	20 (95%)	12 (57%)	14 (67%)	0	14 (67%)	Unknown
SIA	64	32 (50%)	40 (63%)	59 (92%)	17 (27%)	9 (14%)	30 (47%)	5 wk

TJA, total joint arthroplasty; OR, operating room; COA, Chinese Orthopaedic Association; JSRA, Japanese Society for Replacement Arthroplasty; SIA, Italian Hip Society.

Key shortages in ventilators, PPE, and blood products have been observed throughout the United States [5–7]. As more local governments have issued “shelter in place” laws, blood donations have decreased only adding to the shortage. In an attempt to slow the depletion of these vital resources, many hospitals have canceled elective surgeries including THA and TKA. Our results suggest that this trend is occurring internationally as well, with 71 practices having canceled all elective procedures. Sixty-four international surgeons responded that their hospital is experiencing supply disruptions, 41% experiencing staff-related disruptions, and 22% will be unable to take care of all infected COVID-19 patients requiring hospitalization.

Anesthesia providers are at a particular risk, as every intubation and extubation poses an aerosol-producing chance to spread the infection [10]. Interestingly, less than half of the respondents claim that protocols have been implemented to decrease the risk of infection to hospital staff after intubation and extubation. Close to half of the respondents endorsed efforts to screen surgical patients for the SARS-CoV-2 virus in an attempt to improve overall safety for all providers. Ultimately, limiting surgical procedures decreases the amount of necessary PPE and as such there appears to be international pressure to decrease amount of elective procedures.

While only 4 respondents have tested positive for COVID-19, 10% of surgeons are currently performing nonorthopedic medical care and may be at further risk of contracting the virus. A survey of orthopedic surgeons in Wuhan, China, was recently published examining the effects of utilizing N-95 respirators on COVID-19 transmission [11]. The authors determined that the incidence of infection in orthopedic surgeons was up to 20.7% in the early stages of the outbreak with the main suspected site of infection occurring on the general wards (ie, not isolation wards). The use of N-95 respirators was found to have a protective effect against COVID-19. Thus, they recommend routine wear of the respirator at all times to prevent infection and spread both in the operating room (OR) and while rounding on the floor. In our study, it was found that 67 surgeons reported using an N-95 respirator to some capacity in the OR, with 32 wearing them in the OR for every surgical procedure. However, over half of responders (58) reported not using an N-95 mask during any inpatient rounding duties. Based on the data available from the Wuhan study, it would seem reasonable to recommend using an N-95 respirator mask at all times; limited access to N-95 respirators may have played a role in the reported numbers in our survey.

Perhaps the most alarming finding of our study was that more than one-third of international arthroplasty surgeons (37/99) have been forced to close their practice altogether. Twenty-two have had to layoff or furlough employees due to economic burdens, and the average time practices were estimated to remain open given their current economic scenario was 7.3 weeks. In the United States, elective procedures account for 48% of hospital costs and potentially an even larger percentage of revenues [12]. Additionally, 5 musculoskeletal procedures (hip arthroplasty, knee arthroplasty, laminectomy, spinal fusion, and lower extremity fracture care) account for 17% of those elective procedures. Without elective procedures continuing to provide revenue, the financial burden on hospital organizations will only increase. In the United States, President Donald Trump signed the bipartisan Coronavirus Aid, Relief, and Economic Security (CARES) Act on March 27, 2020. This \$2 trillion relief fund is aimed at aiding individuals, businesses, and state/local governments [13]. The CARES Act provides \$100 billion in relief funds to hospitals and healthcare providers, including \$30 billion in payment, not loans, that was immediately released to any healthcare provider who billed Medicare in 2019, based on a formula related to their fee-for-service charges [14]. Orthopedic practices with less than 500 employees are eligible for loan

programs through the Small Business Administration. The US Department of Health and Human Services has also announced relaxation of Health Insurance Portability and Accountability Act requirements and provided waivers for the use of telemedicine during the pandemic in order to ensure care for COVID-19 and non-COVID-19 patients is continued [15]. As gleaned from the survey, a number of international members are using some form of telemedicine to communicate with patients. Maintaining contact with our patients is of paramount importance during this crisis, as practices will need to be reinvigorated once the pandemic resolves.

In our study, 44 respondents have had their wages stopped to limit costs and support hospital funding. Additionally, 19 endorsed undergoing personal financial stress, but only 8 responded having received some financial support from their government. Fortunately, 9 respondents endorsed receiving some private financial help from either private loans or their own institution. The vast majority of surgeons (82) reported no financial aid at all. Members of the AAHKS international committee were contacted to discuss the availability of federal aid from their countries. Surgeons from the United Kingdom, Chile, Colombia, New Zealand, Italy, Japan, or France have not received any help from their federal governments. Several countries have had some actions toward decreasing taxes or debt relief, or assistance in the public sector, but the resources available are quite limited and usually are not available for surgeons in private practice. In the midst of this global pandemic, the full economic repercussions are unclear; however, surgeons receiving direct aid from international governments remains relatively uncommon at this time.

This study has several limitations mainly due to its survey design. First, it is possible that the population who chose to complete the survey represents a small subset of the orthopedic arthroplasty community and is not indicative of the larger group as a whole. However, given the large cohort of arthroplasty surgeons encompassed in the AAHKS, this may not be accurate. Another limitation is the overall response rate of 27%, which raises the potential for nonresponder bias. However, we extended the survey to include additional individuals from different arthroplasty societies and these results were found to be generally similar. Perhaps those who are continuing their practices did not have time to respond, falsely skewing the data collected.

Conclusion

This survey-based study of international members of the AAHKS demonstrates the global impacts of COVID-19. The COVID-19 pandemic has resulted in marked changes to the majority of international practices, with 71% of responders noting cancellation of elective procedures at their respective hospitals and 37% members reporting closure of their practice.

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