



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



ELSEVIER

Contents lists available at ScienceDirect

## The Journal of Arthroplasty

journal homepage: [www.arthroplastyjournal.org](http://www.arthroplastyjournal.org)

Primary Hip and Knee Arthroplasty

## Telemedicine Hip and Knee Arthroplasty Experience During COVID-19



Nancy M. Giunta, PAC, MHP<sup>\*</sup>, Phani S. Paladugu, MS, MA,  
David N. Bernstein, MD, MBA, MEI, Melvin C. Makhni, MD, MBA,  
Antonia F. Chen, MD, MBA

Brigham and Women's Hospital, Department of Orthopaedic Surgery, Harvard Medical School, Boston, MA

## ARTICLE INFO

## Article history:

Received 30 November 2021

Accepted 24 February 2022

Available online 4 March 2022

## Keywords:

telemedicine

COVID

adult reconstruction

total joint arthroplasty

satisfaction

## ABSTRACT

**Background:** Although telemedicine visits were essential and adopted by providers and patients alike, few studies have been conducted evaluating orthopedic patient perception of the care delivered during these visits. To our knowledge, no study has evaluated specific factors that affected patient satisfaction with telemedicine and the receptiveness to continue virtual visits post COVID-19 in total joint arthroplasty (TJA) patients. Thus, the purposes of our study are to determine the following: (1) patient satisfaction with using TJA telemedicine services, (2) whether patient characteristics might be associated with satisfaction, and (3) whether virtual clinic visits may be used post-COVID-19.

**Methods:** A prospective, cross-sectional survey study was completed by 126 TJA patients who participated in telemedicine visits with TJA surgeons from May 1, 2020 to August 31, 2020. The survey consisted of questions regarding demographics, satisfaction, and telemedicine experiences.

**Results:** One hundred one (80.2%) patients were satisfied with their telemedicine visit, with patients <80 years old ( $P = .008$ ) and those with a longer commute time ( $P = .01$ ) being more satisfied  $P = .01$ . There was a significant preference for in-person visits when meeting arthroplasty surgeons for the first time ( $P < .001$ ), but patients were equally amenable to follow-up telemedicine visits once there was an established relationship with the surgeon.

**Conclusion:** Younger patients, patients with longer commute distances, and patients who had established relationships with their provider expressed higher satisfaction with telemedicine arthroplasty visits. Although >80% of patients were satisfied with their telemedicine visit, an established patient-provider relationship may be integral to the success of an arthroplasty telemedicine practice.

© 2022 Elsevier Inc. All rights reserved.

The coronavirus (COVID-19) pandemic presented unprecedented challenges to patient care across all levels and specialties of medicine. For several months in 2020, most healthcare institutions across the country eliminated elective surgeries and minimized in-person patient visits to only urgent or emergency circumstances. The exponential rise in the use of telemedicine during this pandemic has been well described [1,2]. As regulators eased privacy regulations and payment policies were expanded, healthcare

providers across all specialties rapidly embraced the use of telemedicine services. As comfort with the technology has grown, providers have even become adept at performing virtual physical examinations for orthopedic conditions [3].

Although this unprecedented change was essential and adopted by providers and patients alike, few studies have been conducted evaluating orthopedic patient perception [4] of the care delivered during these visits and how the post-COVID-19 landscape might look relative to orthopedic telehealth. Studies have documented patient satisfaction with telehealth across several disciplines [5,6]. Other studies have evaluated patient satisfaction and cost savings within orthopedics [7–12]. These studies found consistently high levels of patient satisfaction with their virtual care and identified cost reductions for both patients and the healthcare system. From the system perspective, these studies established lower equipment, maintenance, and staffing costs, while patients benefited from

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to <https://doi.org/10.1016/j.arth.2022.02.106>.

<sup>\*</sup> Address correspondence to: Nancy M. Giunta, PAC, MHP, 75 Francis Street, Boston, MA 02115.

<https://doi.org/10.1016/j.arth.2022.02.106>

0883-5403/© 2022 Elsevier Inc. All rights reserved.

reduced travel costs and reduced combined travel and visit time. Chaudhry et al [13] performed a systematic review and meta-analysis of 133 published articles on the use of telemedicine in multiple subspecialties in orthopedics and determined that there was no statistically significant difference in the level of satisfaction for patients and surgeons, and no difference in patient-reported outcome measures for orthopedic patients who did or did not receive telemedicine. In addition, time savings were reported by patients who engaged in telemedicine when travel time was both included and excluded [13].

To our knowledge, however, no study has evaluated specific factors that affected patient satisfaction with telemedicine and the receptiveness to continue virtual visits post COVID-19 in the adult hip and knee arthroplasty population. Thus, the purposes of our study are the following: (1) to determine the level of patient satisfaction with the use of telemedicine services in hip and knee arthroplasty patients, (2) to determine whether any patient characteristics might be associated with the degree of satisfaction related to arthroplasty telemedicine visits, and (3) to establish whether virtual clinic visits might remain a tool in the post-COVID-19 world for new or follow-up arthroplasty patients.

## Methods

A prospective, cross-sectional survey study was conducted on adult patients (>18 years old) who participated in a telemedicine visit with a fellowship-trained arthroplasty surgeon at a single urban institution from May 1, 2020 to August 31, 2020. Telemedicine visits were defined as virtual visits utilizing either teleconferencing or a telephone call. During this time period, a total of 585 telemedicine visits were conducted either via an audio-video format or by telephone. These represented virtual new patient visits, virtual follow-up visits for established patients, and virtual follow-up visits for patients who had never met the surgeon in person. Our data did not stratify by category, but several individual patients had multiple virtual visits included in this total.

Following Institutional Review Board approval, consecutive total joint arthroplasty patients were invited to complete a 15-question telemedicine survey, a brief COVID-19 survey, a short demographic survey including age (date of birth), gender, and employment status, as well as questions drawn from the Generalized Anxiety Disorder-2 (GAD-2) and Patient Health Questionnaire-2 (PHQ-2). All survey questions are listed in the [Appendix](#). Surveys were either completed over the phone or through a secure messaging platform where patients completed an Health Insurance Portability and Accountability Act compliant Research Electronic Data Capture (REDCap) survey on a secure web platform for building and managing online databases and surveys. Responses were placed on Likert Scales, and free text was permitted for specific questions.

Questions regarding the telemedicine visit evaluated previous telemedicine experience, time preparing for in-person vs telemedicine visits (including preparing questions for the medical staff, interacting with administrative or office staff, downloading and troubleshooting software), travel time for in-person visits, visit options offered (telephone vs video) and individual preferences for the device used for the visit (laptop, computer desktop, tablet, smartphone, landline telephone, other), comfort with using technology for the visit, perception of the quality of care at in-person vs telemedicine visits, the patient experience in-person vs telemedicine, and preference for future first time and follow-up visits with an orthopedic surgeon (in-person vs telemedicine).

Patient satisfaction was ranked on a Likert scale as very satisfied, satisfied, uncertain, dissatisfied, and very dissatisfied. Satisfaction was defined as patients who responded that they were very satisfied or satisfied with their visit; likewise, dissatisfaction was

**Table 1**  
Demographics.

Characteristic	Number (n)	Percentage (%)
Age (y)		
40-49	8	6.4
50-59	22	17.5
60-69	41	32.5
70-79	49	38.9
80-89	6	4.8
Gender		
Male	43	34.0
Female	83	66.0
Employment		
Full-time employee	35	27.8
Part-time employee	12	9.5
Unemployed	6	4.8
Disabled	8	6.4
Recently unemployed	3	2.4
Other	62	49.2
Travel time		
<1 h	46	36.5
1-2 h	41	32.5
2-3 h	19	15.1
>3 h	14	11.1
No response or unable to categorize	6	4.8
Telemedicine experience		
First telemedicine visit	40	31.8
One previous visit	26	20.6
More than one previous visit	60	47.6
Devices used for telemedicine visit		
Smartphone	49	38.9
Laptop	37	29.4
Tablet	20	15.9
Desktop computer	8	6.4
Landline telephone	5	4.0
Other	4	3.2
No response	3	2.4
Ease of technology		
Easy	94	74.6
Difficult	28	22.2
Preparation time for in-person visit		
≤30 min	113	89.7
>30 min	5	4.0
No response	8	6.4
Preparation time for telemedicine visit		
≤30 min	114	90.5
>30 min	8	6.4
No response	4	3.2

defined as patients who responded that they were very dissatisfied or dissatisfied with their visit. Preference for future telemedicine vs in-person visits was assessed via a 1-10 rating scale. A response of 1-5 was considered positive for a telemedicine visit preference, while 6-10 was considered positive for an in-person visit preference.

Patients in the study population often came from outlying communities seeking care at a tertiary medical center. Respondents categorized the amount of time it took to travel round trip to their typical in-person visits and were placed within the following categories: ≤1 hour, >1-2 hours, >2-3 hours, and >3 hours.

The COVID-19 survey asked patients about their level of worry (using a scale of 1-10, where 10 was very worried and 1 was not worried at all) for contracting COVID-19, surviving COVID-19 if diagnosed, sitting in the medical waiting room with possible COVID-19 exposure, the financial impact of COVID-19 on their access to health care, and concern for frontline healthcare workers. This survey further questioned whether their orthopedic condition was still an important health priority during COVID-19 (on a scale of 1-10, where 1 was no longer a priority and 10 was very much a priority), whether they continued to go to healthcare appointments during COVID-19 (yes or no) and whether they canceled or postponed their orthopedic care during this time (yes or no).

**Table 2**  
Patient Health Questionnaire (PHQ-2) Survey Results.

PHQ-2 Question/Response	Number (n)
Over the past 2 weeks, how often have you been bothered by any of the following problems?	
Little interest or pleasure in doing things	
Not at all	95
Several days	20
More than half the days	4
Nearly every day	5
No response	2
Feeling down, depressed, or hopeless	
Not at all	97
Several days	24
More than half the days	1
Nearly every day	3
No response	1

### Statistical Analysis

Descriptive statistics were calculated and were reported by mean  $\pm$  standard deviation. Categorical variables were compared with chi-squared tests, while continuous variables were compared with Student's *t*-tests, Mann-Whitney *U*-test, and one-way analysis of variance. The Social Sciences Calculator from <https://www.socscistatistics.com> was utilized for computations. A *P* value  $<.05$  was considered statistically significant.

### Results

One hundred sixty-three (163) patients within a single institution's arthroplasty division responded to the survey. One hundred twenty-six (126) responses were complete with respect to the telemedicine satisfaction questions. There were 43 male respondents (34%) and 83 female (66%) respondents with a mean age of 66 years  $\pm 9.5$  (range 40–85). The distribution of patients was sorted into age brackets by decades, 40–49, 50–59, 60–69, 70–79, 80–89 years. All patient demographics are listed in Table 1, with PHQ-2 and GAD-2 results in Table 2 and 3, respectively.

For 40 (31.8%) patients, this was their first telemedicine encounter with a healthcare provider, while 60 (47.6%) reported more than one previous telemedicine encounter with any healthcare provider. Ninety-four (74.6%) patients found the technology easy to use, employing a range of technologic devices including smartphone (38.9%), laptop (29.4%), tablet (15.9%), desktop computer (6.4%), landline (4.0%), other (3.2%), and no response (2.4%).

Preparation time for clinic or telemedicine visits (including time spent preparing questions or discussing the clinic or telemedicine visit with office staff, downloading and troubleshooting the software, but excluding travel time) was  $<30$  minutes in approximately 90% of the patients in each group (89.7% for clinic visits, 90.5% for telemedicine visits). Forty-six patients (36.5%) traveled up to 1 hour round trip, 41 (32.5%), over 1 hour to 2 hours, 19 (15.1%) over 2 hours to 3 hours, and 14 (11.1%) over 3 hours. Six respondents reported varied travel times depending on traffic circumstances. Travel time ranged from 15 minutes to as high as 9 hours.

Overall, 80.2% (101 of 126) of arthroplasty patients who responded were satisfied with their telemedicine visit. There was no statistically significant difference between males and females reporting satisfaction or dissatisfaction with their telemedicine experience ( $P = .92$ ). There was a statistically significant difference with satisfaction across all age brackets ( $P = .008$ ), as patients under 80 years were more satisfied with arthroplasty telemedicine visits (Fig. 1). Patients with the longest commute times were the most satisfied with telemedicine visits ( $P = .01$ ). There was no other

**Table 3**  
Generalized Anxiety Disorder (GAD-2) Survey Results.

GAD-2 Question/Response	Number (n)
Over the past 2 wk, how often have you been bothered by any of the following problems?	
Feeling nervous, anxious, or on edge	
Not at all	78
Several days	37
More than half the days	6
Nearly every day	2
No response	3
Not being able to stop or control worrying	
Not at all	101
Several days	19
More than half the days	2
Nearly every day	2
No response	2

arthroplasty patient demographic associated with more or less satisfaction with arthroplasty telemedicine visits.

For future orthopedic visits, there was a significant preference for the first visit to be an in-person visit ( $P < .001$ ). There was no statistically significant preference for the follow-up visit to be in-person (Fig. 2).

### Discussion

Despite the rapid, almost overnight, conversion to telemedicine visits in the era of COVID-19 and the need to promptly adapt to new technology, patients and providers embraced telemedicine as a necessary tool in this time and have reported satisfaction with the visits, even in the total joint arthroplasty population [13,14]. Our study further elucidated satisfaction with telemedicine for arthroplasty visits finding that younger patients (below the age of 80 years) and patients with longer commute times were more satisfied with telemedicine visits. The vast majority of patients were satisfied with their telemedicine visit, even patients with prior limited use of technologic hardware. Arthroplasty patients preferred an in-person meeting for their first visit, but had no preference for in-person vs telemedicine for subsequent follow-up visits.

Although the literature notes that patients did express satisfaction with video visits which took place prior to the COVID-19 pandemic, reporting moderate to high levels of satisfaction with their visits [10,11,15–17], telemedicine had a slow introduction as a healthcare tool. In 2019, as few as 8% of Americans utilized telehealth visits [2]. The arrival of the COVID-19 pandemic brought social distancing requirements and decreased resources that prompted telemedicine options for patient care, even in centers which had never utilized this technology [2,18]. Across all age groups, patients have recognized and embraced telemedicine as a safe, convenient route for continuity of care and access to healthcare during the pandemic [13,14]. In this study, patients expressed high (80%) satisfaction with telemedicine visits. Many free text comments appreciated the value of not having to drive into an urban clinic location through traffic and seek limited parking (Table 4). Patients experienced no wait time with telemedicine visits, and respondents stated in free text that they experienced greater undivided attention during telemedicine visit vs in-person encounters.

Not surprisingly, there was a statistically significant overall preference for in-person visits when meeting the provider for the first time, as establishing a patient-provider relationship may be critical to the success of subsequent telemedicine encounters in total joint arthroplasty patients. This result is similar to other studies in a surgical practice environment where there is a clear

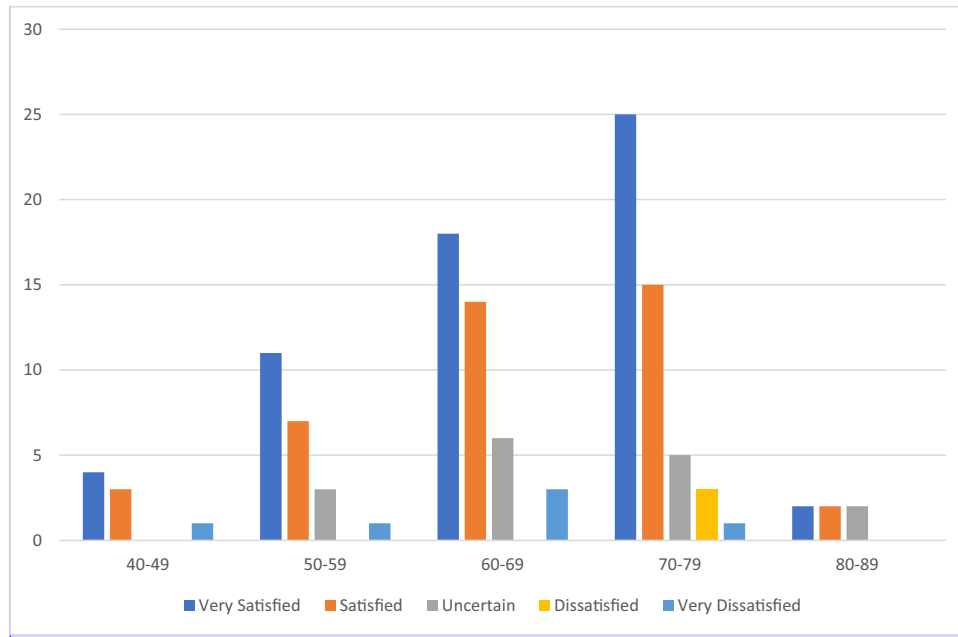


Fig. 1. Patient satisfaction with telemedicine by age bracket.

preference for an in-person visit with the surgical provider first in order to establish trust and comfort [17,19]. Despite concerns that age or technologic impediments might affect receptiveness to telemedicine, a large percentage of patients were amenable to conducting follow-up telemedicine visits.

COVID-19 experiences with telemedicine present an opportunity to integrate telemedicine into future practice [15–19]. Providers need to recognize the importance of the initial relationship with patients and build from this, as well as heed the concerns patients have with telemedicine. In the postoperative setting, for example, if the plan for telemedicine visits is clearly explained in advance, patients may be receptive to their use for initial, uncomplicated postoperative visits. On the other hand, without the

imperative of COVID-19 restrictions, some patients are less eager to utilize telemedicine visits (decrease from 72% to 33%) [1,17]. Hands-on manipulation of extremities and physical examination remains a strong impetus for in-person visits.

Telemedicine visits for arthroplasty patients may continue to be performed post-COVID-19, especially for younger patients under 80 years of age, in the follow-up setting, and for patients who live far away. As patients have become more experienced with telemedicine, they may appreciate the positive aspects of telemedicine, including reduced out-of-pocket costs, decreased insurance cost due to reduced facilities fees (equipment costs, maintenance, and staffing), reduced time costs to the patient (including round trip travel time, time off from work), and the convenience of flexible

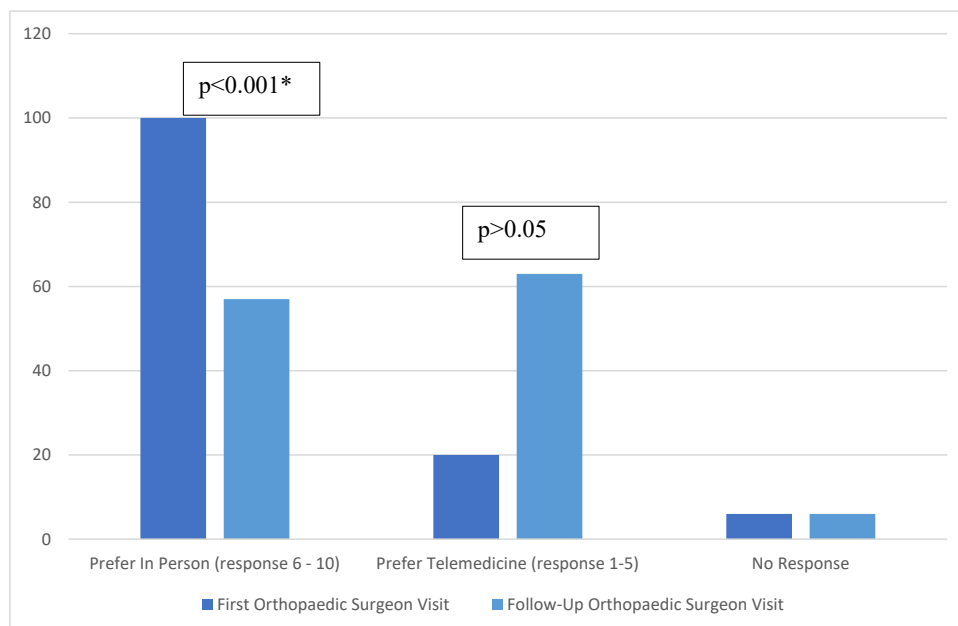


Fig. 2. Visit preference for telemedicine or in-person for the first visit and follow-up visits with an orthopedic arthroplasty surgeon (\*statistically significant).

**Table 4**  
Example of Free Text Responses.

I prefer to see the doctor face to face, especially to get x-rays and labs. But for what we're going through right now [COVID], it's [telemedicine] very effective, especially as I live 1 hour away from Boston

It's convenient, I strongly prefer telemedicine. I'd often take day off for in person visits to go to Boston, lot of time and money spent. Parking is always a major headache. Telemedicine with the doctor was just a minute, I didn't have to spend a long time getting ready and all the hassle of driving or taking the train to get all the way into Boston and figuring out parking. Telemedicine is really just such a great technology; it's made my life so much easier. It helps so I'm not so worried about getting an infection from the hospital, especially now with COVID, but even before COVID people are always worried about getting an infection from the hospital

Like the telemedicine as an option. Issues with traffic and ability to do visit during work is nice. Less preparation and feasible compared to in person visit. Based on needs too

I absolutely loved it [telemedicine] and would love to do everything on it instead of driving 40 minutes to the hospital and back. Especially with the virus I don't want to step into a hospital unless I absolutely have to

Immune deficiency patient prefers to have telemedicine visits with established providers to avoid exposure to hospital environment/patients in waiting rooms

I have found the telemedicine appointments very helpful, time saving, and equal to the care in person. I hope they continue!

I honestly have loved the telemedicine experience with all of my providers. In a lot of ways I prefer it. Additionally, one of the doctors was actually able to do a virtual physical exam - she had me do some postures to check my hip movement. Finally, I drive a distance, so telemedicine is a great option and allows me more scheduling flexibility with less time out of work. I truly hope it becomes a normal option as I found it to be just as effective in all my visits

I think telemedicine improves patient care. I've found that the doctors seem less stressed and less rushed, in general

Love telemedicine. It protects my health its easier for disabled people

I greatly prefer telemedicine and hope it is widely adopted post-covid. It is so much more convenient, takes less time, doesn't involve taking time off work and doesn't require me to go in person to the hospital where I feel like I'm much more exposed to covid than anywhere else. I got the exact same level of care I would have in-person

Both the patient (me) and the physician appeared to be more relaxed

I appreciated being able to complete my appointments through telemedicine. Much easier to work into a busy schedule! I also feel like I got great care!

scheduling for telemedicine visits. If the groundwork is laid at an initial in-person visit with a patient, subsequent telemedicine visits might be more readily embraced in arthroplasty practices.

## References

- Parisien RL, Shin M, Constant M, Saltzman BM, Li X, Levine WN, et al. Telehealth utilization in response to the novel coronavirus (COVID-19) pandemic in orthopaedic Surgery. *J Am Acad Orthop Surg* 2020;28:e487–92. <https://doi.org/10.5435/JAAOS-D-20-00339>.
- Mann DM, Chen J, Chunara R, Testa PA, Nov O. COVID-19 transforms health care through telemedicine: evidence from the field. *J Am Med Inform Assoc* 2020;27:1132–5. <https://doi.org/10.1093/jamia/ocaa072>.
- Tanaka MJ, Oh LS, Martin SD, Berkson EM. Telemedicine in the era of COVID-19: the virtual orthopaedic examination. *J Bone Joint Surg Am* 2020;102:e57. <https://doi.org/10.2106/JBJS.20.00609>. Erratum in: *J Bone Joint Surg Am*. 2020 Oct 21;102(20):e121.
- Chen XT, Chung BC, Jones IA, Christ AB, Oakes DA, Gilbert PK, et al. Patient perception regarding the safety of elective joint arthroplasty surgery during the COVID-19 pandemic. *Arthroplasty Today* 2021;11:113–21. <https://doi.org/10.1016/j.artd.2021.07.015>.
- Ramaswamy A, Yu M, Drangsholt S, Ng E, Culligan PJ, Schlegel PN, et al. Patient satisfaction with telemedicine during the COVID-19 pandemic: Retrospective Cohort study. *J Med Internet Res* 2020;22:e20786.
- Andrews E, Berghofer K, Long J, Prescott A, Cabral-Stevens M. Satisfaction with the use of telehealth during COVID-19: an integrative review. *Int J Nurs Stud* 2020;2:100008. <https://doi.org/10.1016/j.ijn.2020.100008>.
- Grandizio LC, Foster BK, Klena JC. Telemedicine in hand and upper-extremity surgery. *J Hand Surg Am* 2020;45:239–42. <https://doi.org/10.1016/j.jhnsa.2019.09.007>.
- Dullett NW, Geraghty EM, Kaufman T, Kissee JL, King J, Dharmar M, et al. Impact of a university-based outpatient telemedicine program on time savings, travel costs, and environmental pollutants. *Value Health* 2017;20:542–6. <https://doi.org/10.1016/j.jval.2017.01.014>.
- Sharareh B, Schwarzkopf R. Effectiveness of telemedical applications in postoperative follow-up after total joint arthroplasty. *J Arthroplasty* 2014;29:918–922.e1. <https://doi.org/10.1016/j.arth.2013.09.019>.
- Marsh J, Bryant D, MacDonald SJ, Naudie D, Remtulla A, McCalden R, et al. Are patients satisfied with a web-based followup after total joint arthroplasty? *Clin Orthop Relat Res* 2014;472:1972–81. <https://doi.org/10.1007/s11999-014-3514-0>.
- Herrero CP, Bloom DA, Lin CC, Jazrawi LM, Strauss EJ, Gonzalez-Lomas G, et al. Patient satisfaction is equivalent using telemedicine versus office-based follow-up after arthroscopic meniscal surgery: a prospective, randomized controlled trial. *J Bone Joint Surg Am* 2021;103:771–7. <https://doi.org/10.2106/JBJS.20.01413>.
- El Ashmawy AH, Dowson K, El-Bakoury A, Hosny HAH, Yarlagadda R, Keenan J. Effectiveness, patient satisfaction, and cost reduction of virtual joint replacement clinic follow-up of hip and knee arthroplasty. *J Arthroplasty* 2021;36:816–822.e1.
- Chaudhry H, Nadeem S, Mundi R. How satisfied are patients and surgeons with telemedicine in orthopaedic care during the COVID-19 pandemic? A systematic review and meta-analysis. *Clin Orthop Relat Res* 2021;479:47–56. <https://doi.org/10.1097/CORR.0000000000001494>.
- Rao SS, Loeb AE, Amin RM, Golladay GJ, Levin AS, Thakkar SC. Establishing telemedicine in an academic total joint arthroplasty practice: Needs and opportunities highlighted by the COVID-19 pandemic. *Arthroplasty Today* 2020;6:617–22. <https://doi.org/10.1016/j.artd.2020.04.014>.
- Gilbert AW, Jaggi A, May CR. What is the patient acceptability of real time 1:1 videoconferencing in an orthopaedics setting? A systematic review. *Physiotherapy* 2018;104:178–86. <https://doi.org/10.1016/j.physio.2017.11.217>.
- Buvik A, Bugge E, Knutsen G, Småbrekke A, Wilsgaard T. Quality of care for remote orthopaedic consultations using telemedicine: a randomised controlled trial. *BMC Health Serv Res* 2016;16:483. <https://doi.org/10.1186/s12913-016-1717-7>.
- Buvik A, Bugge E, Knutsen G, Småbrekke A, Wilsgaard T. Patient reported outcomes with remote orthopaedic consultations by telemedicine: a randomised controlled trial. *J Telemed Telecare* 2019;25:451–9. <https://doi.org/10.1177/1357633X18783921>.
- Makhni MC, Riew GJ, Sumathipala MG. Telemedicine in orthopaedic surgery: challenges and opportunities. *J Bone Joint Surg Am* 2020;102:1109–15. <https://doi.org/10.2106/JBJS.20.00452>.
- Sorensen MJ, Bessen S, Danford J, Fleischer C, Wong SL. Telemedicine for surgical consultations— pandemic response or here to stay?: a report of public perceptions. *Ann Surg* 2020;272:e174–80. <https://doi.org/10.1097/SLA.0000000000004125>.



## Appendix: Survey Questions

### Demographic Survey

Date of Birth \_\_\_\_\_

### Employment Survey

What is your current work status? (Full Time Employee, Part Time Employee, Unemployed, Disabled, was previously employed and recently joined unemployment, Other)

If other \_\_\_\_\_

### Satisfaction Survey

How satisfied are you with your telemedicine visit? (Very Satisfied, Satisfied, Uncertain, Dissatisfied, Very Dissatisfied)

### Telemedicine Survey

How many times have you used telemedicine before this most recent appointment?

How many minutes did you spend preparing for your telemedicine visit? Time preparing for your telemedicine visit includes discussing telemedicine with office staff, downloading and troubleshooting software, preparing questions for physician, etc.

Excluding travel time, how long do you prepare for your typical in-person orthopaedic clinic visits? Time preparing for your telemedicine visit includes discussing your clinic visit with office staff, preparing questions for physician, etc.

What is your typical travel time (round trip) to an in-person orthopaedic clinic visit?

Were you offered to conduct your telemedicine via telephone, video, or both? (telephone, video, both)

If given an option of video or telephone, which would you prefer? (video, telephone)

What type of device did you use for your telemedicine visit? (Laptop, Desktop Computer, Tablet, Smartphone, Landline Telephone, Other)

If you used at telephone for your telemedicine visit, do you have access to a computer/device with video camera and high speed internet access? (Yes, No)

Using a scale of 1-10, where 1 is very easy and 10 is very challenging, how did you find your ability to do telemedicine with regards to technology?

Using a scale of 1-10, where 1 is poor quality and 10 is high quality, how would you evaluate the care you received at your telemedicine visit?

Using a scale of 1-10, where 1 is poor quality and 10 is high quality, how would you evaluate the care you received at your last in-person orthopaedic clinic visit?

Using a scale of 1-10, where 1 strongly disliked and 10 is strongly liked, how would you rate your patient experience via telemedicine?

Using a scale of 1-10, where 1 strongly disliked and 10 is strongly liked, how would you rate your patient experience during your last in-person orthopaedic clinic visit?

In the future, for a first-time new visit to an orthopedic surgeon, what is your preference for visiting the surgeon via telemedicine (1 = No Preference to 10 = Prefer In-Person)

In the future, for a follow-up visit to an orthopaedic surgeon, what is your preference for visiting the surgeon via telemedicine (1 = No Preference to 10 = Prefer In-Person)

Please provide any additional comments/concerns about your telemedicine experiences.

### COVID-19 Survey

Using a scale of 1-10, where 10 is very worried and 1 is not worried at all, please rate your level of worry of the following:

Getting COVID-19?

Surviving COVID-19 if you were diagnosed with the virus?

Sitting in a doctor's waiting room/getting COVID from the doctor's office?

Health care workers on the front line?

Financial impact of COVID-19 on your access to health care?

Using a scale of 1-10, where 1 is no longer a priority and 10 is very much a priority, is your orthopedic condition still an important healthy priority for you?

Since the beginning of COVID-19, have you continued to go to your health care appointments?

Since the beginning of COVID-19, have you cancelled or postponed seeking orthopaedic care?

### Patient Health Questionnaire (PHQ2) Survey

Over the past 2 weeks, how often have you been bothered by any of the following problems?

Little interest or pleasure in doing things: Not at all, several days, more than half the days, nearly every day

Feeling down, depressed, or hopeless: Not at all, several days, more than half the days, nearly every day

*Generalized Anxiety Disorder (GAD-2) Survey*

Over the last 2 weeks, how often have you been bothered by the following problems?

Feeling nervous, anxious, or on edge: Not at all, several days, more than half the days, nearly every day

Not being able to stop or control worrying: Not at all, several days, more than half the days, nearly every day