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■ GENERAL ORTHOPAEDICS

Orthopaedic provider perceptions of virtual care

WHICH PROVIDERS PREFER VIRTUAL CARE?

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Aims

The purpose of our study was to determine which groups of orthopaedic providers favour virtual care, and analyze overall orthopaedic provider perceptions of virtual care. We hypothesize that providers with less clinical experience will favour virtual care, and that orthopaedic providers overall will show increased preference for virtual care during the COVID-19 pandemic and decreased preference during non-pandemic circumstances.

Methods

An orthopaedic research consortium at an academic medical system developed a survey examining provider perspectives regarding orthopaedic virtual care. Survey items were scored on a 1 to 5 Likert scale (1 = “strongly disagree”, 5 = “strongly agree”) and compared using nonparametric Mann-Whitney U test.

Results

Providers with less experience were more likely to recommend virtual care for follow-up visits (3.61 on the Likert scale (SD 0.95) vs 2.90 (SD 1.23); $p = 0.006$) and feel that virtual care was essential to patient wellbeing (3.98 (SD 0.95) vs 3.00 (SD 1.16); $p < 0.001$) during the pandemic. Less experienced providers also viewed virtual visits as providing a similar level of care as in-person visits (2.41 (SD 1.02) vs 1.76 (SD 0.87); $p = 0.006$) and more time-efficient than in-person visits (3.07 (SD 1.19) vs 2.34 (SD 1.14); $p = 0.012$) in non-pandemic circumstances. During the pandemic, most providers viewed virtual care as effective in providing essential care (83.6%, $n = 51$) and wanted to schedule patients for virtual care follow-up (82.2%, $n = 50$); only 10.9% ($n = 8$) of providers preferred virtual visits in non-pandemic circumstances.

Conclusion

Orthopaedic providers with less clinical experience seem to favourably view virtual care both during the pandemic and under non-pandemic circumstances. Providers in general appear to view virtual care positively during the pandemic but are less accommodating towards it in non-pandemic circumstances.

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Introduction

Widespread access to online technology has enabled virtual care, otherwise known as telemedicine, to emerge as a patient care modality that overcomes both geographical and scheduling barriers.^{1,2} Virtual care has thereby become an innovative avenue for providing high-quality, accessible care to patients.^{3,4} The COVID-19 pandemic has placed numerous restrictions on in-person healthcare services, which has made virtual

care even more pertinent.⁵⁻⁷ In an effort to optimize the efficiency and safety of health-care facilities during the pandemic, several practices have transitioned to virtual platforms.⁸⁻¹⁰ Orthopaedic virtual care was used extensively during the pandemic. However, the perceived effectiveness of the virtual care differed for those with more experience versus those with less experience.

Previous studies demonstrate that orthopaedic providers show satisfaction with

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virtual care and that they also can benefit from the time efficiency of virtual visits.^{11,12} Initial research into orthopaedic provider preferences for virtual care during the COVID-19 pandemic also shows provider satisfaction with virtual visits.^{13,14} However, minimal literature exists regarding which groups of orthopaedic providers prefer virtual care both during the pandemic and under non-pandemic circumstances. Previous studies in general medicine suggest that physicians who are self-sufficient and innovative tend to have higher preferences for virtual care, and that physicians who contribute to developing virtual care programs show higher use of such visits.¹⁵⁻¹⁸ Due to lack of comparability between general medicine and orthopaedic clinical practices, it remains unclear if these sentiments are shared by a large group of orthopaedic physicians. Therefore, it is relevant to investigate which specific factors contribute to orthopaedic provider preferences for virtual care. In response to the COVID-19 pandemic, leaders within orthopaedics have suggested increased use of virtual visits in the future as a solution to in-person restrictions.^{8,19} In order for such administrative initiatives to be successful, it is important to better understand which groups of orthopaedic providers favour virtual care so as to ensure physician satisfaction and effective patient care.

The purpose of our study was to identify which groups of orthopaedic providers prefer virtual care, in addition to assessing overall orthopaedic provider perceptions of virtual care during both the COVID-19 pandemic and non-pandemic circumstances. Our primary hypothesis is that orthopaedic providers with less clinical experience will increasingly favour virtual care over those with more clinical experience. This hypothesis is based on the fact that younger generations tend to be more comfortable with more novel technology.²⁰ Furthermore, we believe that orthopaedic providers will show increased preference for virtual visits during the COVID-19 pandemic and less preference during non-pandemic circumstances. We postulate this would be due to concerns of patient and personal safety in a pandemic setting, but in-person visits in a non-pandemic setting may be preferred due to their familiarity and effectiveness.

Methods

Survey development and description. A survey examining orthopaedic provider perspectives regarding virtual care was developed by a seven-member orthopaedic research consortium, which consisted of orthopaedic providers from various subspecialties at a Midwestern tertiary care and community care academic medical system. This institution comprises two acute tertiary care hospitals, three community care hospitals, and 17 independent clinic sites serving over three million outpatients annually. The developed survey consisted of 12 questions divided into three sections as follows: 1) Provider perceptions of virtual

care during the COVID-19 pandemic; 2) Overall provider perceptions of virtual care (During non-pandemic circumstances); and 3) Provider virtual care recommendations based on visit type. The questionnaire included responses rated on a Likert scale from 1 to 5 ("1" = strongly disagree and "5" = strongly agree). Responses of 1 and 2 were viewed as disagreement with the survey item, responses of 3 as neutrality, and responses of 4 and 5 as agreement. The authors considered adopting a variety of previously validated questionnaires for this study.^{21,22} However, these previously used validated questionnaire tools were not designed for the specific aims of this study. Therefore, a novel questionnaire was created to make sure to capture the cohort's opinions on virtual care in the setting of the pandemic.

Description of virtual visit. At the time of data collection, virtual visits were the only available appointments. Appointments to see orthopaedic providers were scheduled by the patients and office staff via a phone call. Patients scheduled for a video visit were encouraged to set up the MyChart platform through our medical records system.²³ Virtual care specialists were available for patients who had difficulty accessing the platform. At the scheduled time of visit, both the provider and the patient would enter the virtual visit platform. All video visits were scheduled for 20 minutes.

Survey administration. This cross-sectional survey study involved sending questionnaires to all surgeons and non-operative orthopaedic providers (n = 75) in the orthopaedic service line at the aforementioned healthcare system via an email link to Google Forms. The questionnaire was sent to the providers weekly a maximum of three times. The initial email invites were sent from the orthopaedic department chair. Reminder email invites were sent from the orthopaedic department executive vice chair. Once a provider responded to the survey, no further contact was pursued. Data collection took place from 5 May 2020 to 18 May 2020. If a provider submitted multiple survey responses, the most current survey was included in the final results, and all earlier repeat surveys were eliminated from the results. This study received institutional review board approval.

In total, 73/75 queried orthopaedic providers responded to the survey (97% response rate, n = 73). The results included 18 nonoperative providers and 55 surgeons. The cohort included providers from five hospitals and 17 clinic sites. The mean years in practice for all physicians within the cohort was 14.8 years (SD 11.71). Complete demographic data for the surveyed cohort can be found in Table I. The virtual visits provided by all 73 orthopaedic providers during this time period included 212 new, 1,074 established, and 144 postoperative patient visits.

Statistical analysis. Survey responses are presented as categorical data using counts and percentages. Likert-scale

Table 1. Demographic data for survey respondents.

Variable	Total
Mean yrs in practice (SD)	14.8 (11.1)
Yrs in practice, n (%)	
1 to 14	44 (60.3)
15+	29 (39.7)
Commute time, n (%)	
> 30 mins	32 (43.8)
< 30 mins	41 (56.2)
Types of orthopaedic providers surveyed, n (%)	
Sports medicine (nonoperative)	14 (19.2)
Foot and ankle (nonoperative)	2 (2.7)
Generalist (nonoperative)	1 (1.4)
Spine (nonoperative)	1 (1.4)
Spine (operative)	5 (6.8)
Sports medicine (operative)	8 (11.0)
Foot and ankle	4 (5.5)
Generalist	6 (8.2)
Hand and upper limb	9 (12.3)
Joint reconstruction	8 (11.0)
Oncology	1 (1.4)
Paediatrics	1 (1.4)
Podiatry	9 (12.3)
Trauma	4 (5.5)

SD, standard deviation.

data are considered continuous for analysis purposes and were evaluated for normality using histograms, QQ plots, and Shapiro-Wilk tests. No variable met these assumptions so they are described using medians with 25th and 75th percentiles and compared between groups using nonparametric Mann-Whitney U tests. Nonparametric Wilcoxon signed-rank tests are also conducted in order to comparatively assess which patients orthopaedic providers view as best suited for virtual care visits, with a Benjamini-Hochberg correction applied to control the false discovery rate. Statistical significance is set at $p < 0.05$. All analyses are performed using SAS 9.4 (SAS Institute, USA).

Results

When asked about virtual care perceptions during the pandemic, only 16.4% ($n = 12$) of providers did not feel that virtual care enabled them to provide essential care to their patients and only 17.8% ($n = 13$) of providers did not want to schedule patients for virtual care follow-up visits during the pandemic. Providers at large furthermore felt that virtual care limited their exposure to health risks (80.8%, $n = 59$) and that their experiences with virtual care during the pandemic had made them more likely to recommend future virtual care visits (61.6%, $n = 45$).

When asked about overall perceptions regarding virtual care in non-pandemic circumstances, only 10.9% ($n = 8$) of providers preferred virtual visits over in-person visits, with 67.1% ($n = 48$) of providers disagreeing that virtual care provided the same level of care as in-person visits. Many providers felt that virtual care did not allow

for adequate physical examination (80.9%, $n = 59$) even though they appreciated the ease of virtual care (63%, $n = 46$). Moreover, provider responses regarding the time-efficiency of virtual care were mixed.

The majority of orthopaedic providers disagree that virtual care visits are ideal for new patient visits (78%, $n = 57$), whereas only a minority of providers viewed virtual care as suboptimal for preoperative established patients (24.6%, $n = 18$). Furthermore, only 20.6% ($n = 15$) of providers felt that postoperative patients should not receive virtual visits. Overall, orthopaedic providers believe that new patients are significantly less suited for virtual visits when compared to postoperative patients (mean 1.85 on the Likert scale (SD 0.94) vs 3.11 (SD 0.91); $p < 0.001$, Wilcoxon signed-rank test) and preoperative established patients (mean 1.85 (SD 0.94) vs 3.22 (SD 1.15); $p < 0.001$, Wilcoxon signed-rank test) respectively.

When comparing the responses of less experienced providers (one to 14 years) and more experienced providers (15+ years) to questions regarding virtual care during the pandemic, significant differences were found for all four questions (Figure 1). Less experienced providers agreed that follow-up care should be in the form of a virtual care visit when compared to more experienced providers (mean 3.61 (SD 0.95) vs 2.90 (SD 1.23); $p = 0.006$, Mann-Whitney U test), with the less experienced cohort believing that virtual care limited health risks to a greater degree than the more experienced cohort (mean 4.52 (SD 0.73) vs 3.79 (SD 1.26); $p = 0.003$, Mann-Whitney U test). Furthermore, the less experienced providers generally felt that the virtual care they provided was more essential to patient wellbeing when compared to the more experienced cohort (mean 3.98 (SD 0.95) vs 3.00 (SD 1.16); $p < 0.001$, Mann-Whitney U test), and also that they were more likely to agree with recommending virtual care after the COVID-19 pandemic (mean 4.11 (SD 1.02) vs 2.90 (SD 1.50); $p < 0.001$, Mann-Whitney U test).

When asked about overall perceptions regarding virtual care during non-pandemic circumstances, the more experienced and less experienced orthopaedic provider cohorts showed significant differences on four of the five questions (Figure 2). More experienced orthopaedic providers generally disagreed with those with less experience that virtual care provided the same level of care as in-person visits (mean 1.76 (SD 0.87) vs 2.41 (SD 1.02); $p = 0.006$, Mann-Whitney U test) and showed lower preferences for virtual care (mean 1.69 (SD 1.00) vs 2.23 (SD 1.05); $p = 0.033$, Mann-Whitney U test). Moreover, less experienced providers were significantly more likely to agree with the time-efficiency of virtual care (mean 3.07 (SD 1.19) vs 2.34 (SD 1.14); $p = 0.012$, Mann-Whitney U test) and believe that the virtual care application was easier to use (mean 4.07 (SD 0.95) vs 3.28 (SD 1.33); $p = 0.004$, Mann-Whitney U test). Commute time, number of previous visits, and orthopaedic provider

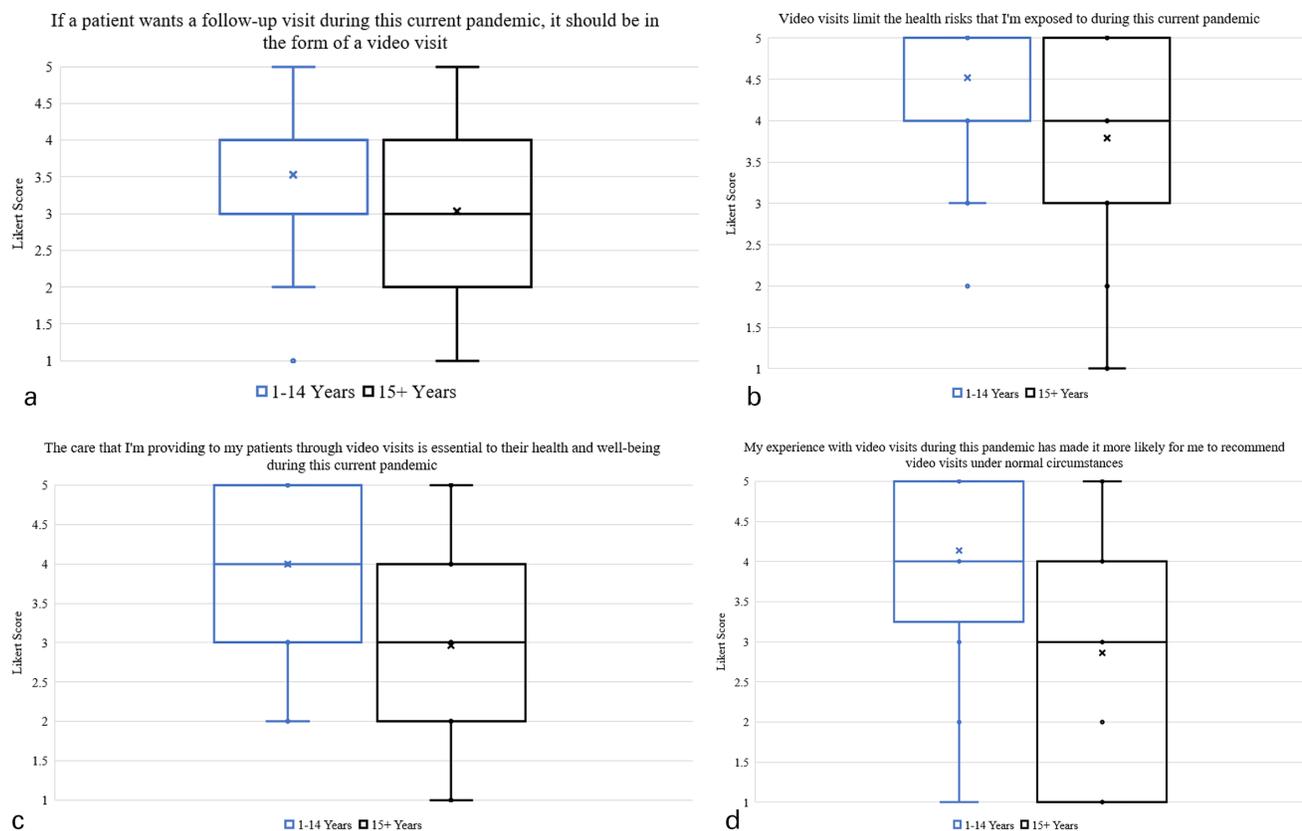


Fig. 1

Orthopaedic provider perceptions of virtual care during the COVID-19 pandemic based on years of experience: Likert scores are scaled from 1 to 5, with 1 representing “Strongly Disagree” and 5 representing “Strongly Agree”. Survey responses are represented using box plots, with means being represented by circle and plus-sign characters. Statistical significance ($p < 0.05$) is indicated by asterisks.

subspecialty had no significant effect on questionnaire responses.

Discussion

The COVID-19 pandemic has placed an exceptional strain on the ability of orthopaedic providers to continue seeing patients due to limitations imposed on in-person visits.⁵⁻⁷ A shift to virtual care has resultantly become necessary in order to limit further delays to patient visits.⁸ However, there is still minimal understanding of how orthopaedic providers view virtual care according to different demographic criteria. The primary purpose of our study was thus to examine which groups of orthopaedic providers favour virtual care. Additionally, we sought to analyze overall orthopaedic provider perceptions of virtual care during both the pandemic and under general non-pandemic circumstances.

Orthopaedic providers with less clinical experience are shown to favourably view virtual care both during the pandemic and under non-pandemic circumstances. When compared to more experienced counterparts, these providers were more likely to recommend virtual care for follow-up visits. Outside the pandemic, these less experienced providers also viewed virtual visits as providing a similar level of care

as, and more time-efficient than, in-person visits. During the pandemic, most providers viewed virtual care as effective in providing essential care. However, only 10.9% ($n = 8$) of providers preferred virtual visits over in-person visits when in non-pandemic circumstances. Thus, providers appear to view virtual care more favourably during the pandemic and are less accommodating towards it in general circumstances. Additionally, orthopaedic providers appear to view virtual care as more suitable for preoperative established and post-operative patient visits.

A similar study surveying 33 orthopaedic providers at an academic medical centre in New York evaluated provider satisfaction with orthopaedic visits occurring over the phone and virtual care during the COVID-19 pandemic.¹³ Orthopaedic providers in this study described themselves as “satisfied” with virtual care (average Likert Score of 3.94 out of 5), and furthermore viewed physical examinations as “moderately effective” (average Likert Score of 2.64 out of 5). Orthopaedic providers in our study similarly felt that virtual care provided essential care to the patients’ wellbeing (mean Likert Score of 3.59 out of 5 (SD 1.14)). However, providers in our study disagreed with the ability of virtual care to provide adequate physical examination (average Likert Score of 1.74

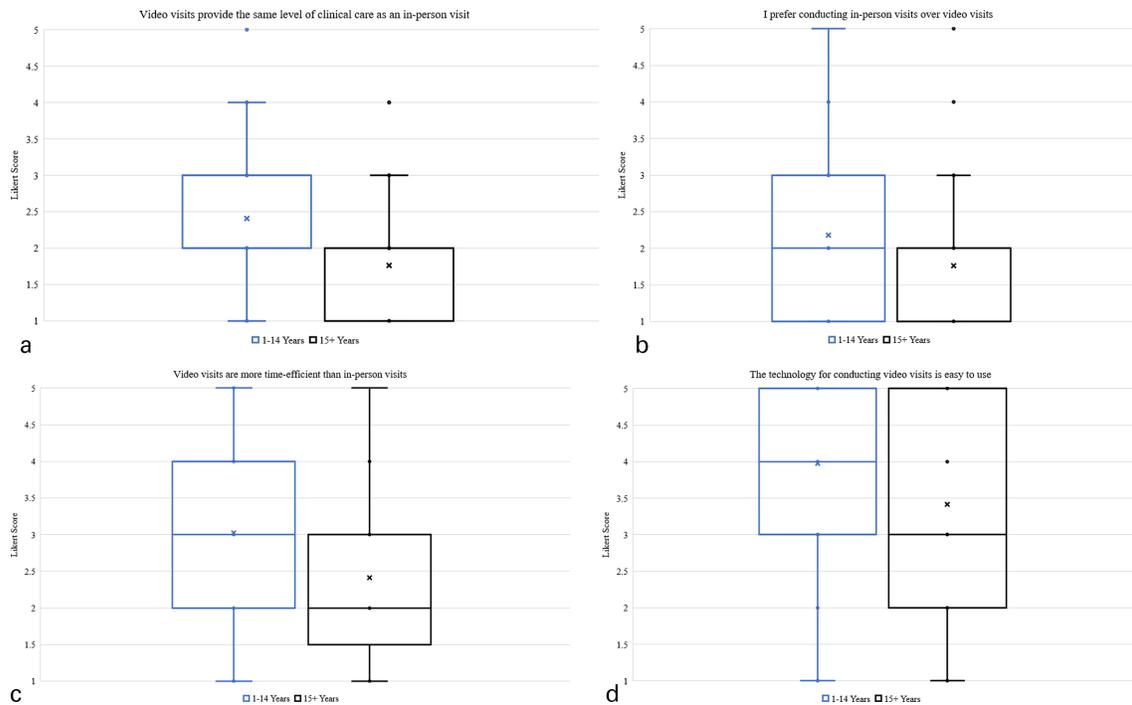


Fig. 2

Orthopaedic provider perceptions of virtual care during non-pandemic circumstances based on years of experience: Likert scores are scaled from 1 to 5, with 1 representing “Strongly Disagree” and 5 representing “Strongly Agree”. Survey responses are represented using box plots, with means being represented by circle and plus-sign characters. Statistical significance ($p < 0.05$) is indicated by asterisks.

our of 5 (SD 0.93)). These differences regarding perceptions of virtual physical examination may be attributed to differences in sample size, as our study surveyed 73 orthopaedic providers, while the New York study included only 33 providers. The increased statistical power of our study thus builds on the findings of the New York study and may provide more generalizable findings. Furthermore, our study includes specific items related to provider perceptions of virtual care in non-pandemic circumstances and assesses provider responses according to demographic criteria.

Another study at a private academic orthopaedic practice in Philadelphia evaluated orthopaedic hand and upper limb physicians’ attitudes regarding phone and virtual care during the COVID-19 pandemic.¹⁴ Each provider filled out a survey after a phone or virtual patient encounter, with a total of 302 surveys completed. It is unclear from the study how many providers submitted surveys. Providers in the study felt that virtual care was suitable for 53% of postoperative visits but only 40% of new patient visits, which is similar to how providers in our study felt. Furthermore, providers in the Philadelphia study felt that they were able to make a definitive diagnosis with telehealth physical examination for 87% of postoperative patient visits and 77% of new patient visits. In our study however, 80.9% ($n = 59$) of providers felt that virtual care was inadequate for physical examination. Differences between the studies regarding the effectiveness of virtual physical examination may be due to differences in the providers surveyed, as our study included providers

across numerous orthopaedic sub-specialties while the Philadelphia study only included hand and upper limb providers. It is therefore plausible to suggest that even though hand and upper limb providers find virtual physical examination useful, other orthopaedic practitioners may not be as satisfied. Regardless, our study expands on this Philadelphia study in a significant manner by assessing provider perspectives of virtual care across the entire orthopaedic clinical spectrum instead of in just one sub-specialty.

One of the limitations of this study is that it was performed at a single healthcare system. This could introduce bias due to the fact that only physicians from a single geographical area were surveyed. However, this healthcare systems includes two acute care hospitals, three community care hospitals, and 17 independent clinical sites that serve over three million outpatients annually, thus making the results of this investigation more generalizable than other single-institution studies with limited patient diversity. Secondly, the survey was created by the authors, which can present with limitations to external validity when compared to other more widely used questionnaires. However, the survey was developed in conjunction with seven different orthopaedic surgeons, who critiqued and edited each aspect of the survey. Lastly, this study included providers with different levels of pre-existing experience with virtual care. Such previous virtual care experience can be a confounding variable that may affect the responses of surveyed providers. However, this is the first study that investigates which groups

of orthopaedic providers favour virtual care, and the results attained are likely of interest to the greater orthopaedic community.

In conclusion, orthopaedic providers with less experience appear to increasingly favour virtual care for all circumstances when compared to their more experienced counterparts. While the less experienced provider may find virtual care similar in effectiveness to in-person visits, practitioners who rely more on the physical exam will likely not find the virtual visit as effective. Outcomes-based research would have to be conducted to make a direct comparison in terms of visit effectiveness. Furthermore, orthopaedic providers appear to positively view virtual care during the COVID-19 pandemic, but the provider affinity for virtual care outside the pandemic seems not to be as high for the majority of providers. Since hospitals have increased efforts to expand virtual care in response to the COVID-19 pandemic, it is especially important to know which particular providers favour virtual care and which types of patients they feel are best suited for virtual care. Based on our study, virtual care initiatives in orthopaedics should evolve around younger, less experienced providers and preoperative established and postoperative patients.



Take home message

- Overall, orthopaedic providers as a whole seem to view virtual care more favourably during the COVID-19 pandemic than outside of it.

- Nonetheless, future orthopaedics virtual care initiatives should incorporate the perspectives of younger providers, who have a more favourable view on using this technology in practice.

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Author contributions:

- N. R. Yedulla: Project lead author, Collected the data, Wrote the manuscript.
- Z. A. Montgomery: Collected the data, Wrote the manuscript.
- D. S. Koolmees: Collected the data, Wrote the manuscript.
- E. B. Battista: Collected the data, Wrote the manuscript.
- C. S. Day: Wrote the manuscript, Analyzed the data, Acted as the senior author.

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