

# COVID-19 Impact on Orthopedic Surgeons: Elective Procedures, Telehealth, and Income

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**Objectives:** The purpose of this study was to investigate the response in orthopedic surgery to the coronavirus disease 2019 (COVID-19) pandemic across the United States by surveying surgeons about their care setting, timing of restrictions on elective surgery, use of telehealth, and estimated economic impact.

**Methods:** A survey was distributed via REDCap through state orthopedic organizations between April and July 2020. The 22-question digital survey collected information regarding restrictions on elective procedures, location of care, utilization of telehealth, and estimated reductions in annual income.

**Results:** In this study, 192 participants responded to the survey (average age  $49.9 \pm 11.0$  years, 92.7% male). Responses primarily originated from Alabama (30.2%), Georgia (30.2%), and Missouri (16.1%). The remainder of the responses were grouped into the category “other.” Respondents did not vary significantly by state in operative setting or income type (salary, work relative value units, or collections). Most of the participants documented elective procedure restrictions in hospital and ambulatory settings. The highest frequency of closures occurred between March 18 and 20 (47% in hospital, 51% in ambulatory). Of the participants, financial loss estimates varied across states ( $P = 0.005$ ), with 50% of physicians claiming >50% losses of income in Alabama (24% Georgia, 10% Missouri, 31% other). Regarding telehealth, practices set up for these services before 2020 varied across states. None of the orthopedic practices in Alabama had telehealth before the COVID-19 pandemic (Missouri 25%, Georgia 9%, other 8%,  $P = 0.06$ ); however, respondents generally were split when considering the anticipation of implementing telehealth into routine practice.

**Conclusions:** Most practices did implement restrictions for elective clinic visits and procedures early during the pandemic. COVID-19 ultimately will result in a large revenue loss for elective orthopedic practices. Services such as telehealth may help offset these losses and help deliver orthopedic care to patients remotely.

**Key Words:** COVID-19, elective surgery, orthopaedic surgery, pandemic, telehealth

The novel coronavirus disease 2019 (COVID-19) known as severe acute respiratory-coronavirus-2 (SARS-CoV-2) has drastically affected health care and the economy in the United States.<sup>1</sup> In 2020 and into 2021, government-mandated business shutdowns have plagued the United States during the COVID-19 pandemic.<sup>2</sup> Elective practices within the healthcare industry have been affected, and information on the implications of national policies on the healthcare sector is needed. The unprecedented restrictions on elective surgery directly affected those specialties that rely heavily on these procedures for income, including oral surgery, dermatology, ophthalmology, and orthopedic surgery.<sup>3–7</sup>

The sequence of events leading to restrictions on elective medical practice included announcements from the Surgeon General, medical insurers, and national organizations. On March 14, 2020, the US Surgeon General urged the cessation of elective surgery, with concern regarding the spread of the virus, personal protective equipment supply, and healthcare worker safety.<sup>8</sup> Four days later, the Centers for Medicare & Medicaid Services (CMS) released a position statement encouraging the limitation of nonessential

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B.P. has received compensation from Integra, ODi, Stryker, and Wright Medical Technology. The remaining authors did not report any financial relationships or conflicts of interest.

Accepted January 11, 2021.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text, and links to the digital files are provided in the HTML text of this article on the journal's Web site (<http://sma.org/smj>).

0038-4348/0-2000/114-311

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DOI: 10.14423/SMJ.0000000000001249

## Key Points

- During the coronavirus disease 2019 pandemic, the majority of elective procedures were restricted according to responses in all of the states examined.
- Although the prevalence of established telehealth services before the coronavirus disease 2019 pandemic significantly differed by state, the majority of practices in all states had implemented or were implementing telehealth at the time of survey participation.
- The majority of state physicians reported notable decreases in expected income, with many reporting >50% losses.
- The study revealed the need for more research on the incorporation of remote care strategies such as telehealth medicine into orthopedic surgery practices

surgery and procedures.<sup>9</sup> The American Academy of Orthopaedic Surgeons also provided leadership and encouraged the postponement of elective surgery on April 2, 2020.<sup>10</sup> These new directives and overall patient aversion to elective medical care incentivized groups to prioritize the conservation of cash and to seek an overall decrease in overhead costs and effective personnel on payroll by using services such as telehealth, while also ensuring the opportunity to increase productivity once market demands increased again.<sup>7</sup>

Telehealth is a method for patient care that uses digital interface technology to communicate. Telehealth was implemented to observe social-distancing recommendations.<sup>11,12</sup> Insurance companies have added provisional changes for the coverage of telehealth to comply with government regulations of practice management.<sup>13,14</sup> The technology for telehealth has been present since as early as the 1990s.<sup>15</sup> Many studies suggest the rapid acceptance and growth of telehealth following the presence of COVID-19 in the United States.<sup>15–17</sup>

There is, however, insufficient research addressing the impact of COVID-19 on the practice of orthopedic surgeons across the United States. Thus, a survey was distributed through state orthopedic associations to evaluate care settings, dates related to restrictions, the use of telehealth services, and estimated reductions in annual income. The authors hypothesized that variability would be high among the practices regarding elective procedure shutdown, telehealth use, and reported financial impact.

## Methods

A single survey was administered to gather information regarding COVID-19 effects on orthopedic surgeons. The intent of the study focused on the restrictions placed on elective orthopedic cases. The survey was voluntary and without compensation. Other information collected included demographics, practice characteristics, location of care, dates related to restrictions, telehealth capacity, and estimated annual income reductions. The US State Postal Abbreviations List was used to refer to respective states (Alabama, AL; Georgia, GA; Missouri, MO).<sup>18</sup>

### Source of Participants

The Alabama Orthopaedic Society distributed the survey to its members and contacts at other state-level orthopedic societies. As such, the overall size of the distribution list was not possible to obtain, as the e-mail listservs are the private information of partner state orthopedic societies.

### Data Collection and Statistics

Data were collected from April to July 2020 through a 22-question digital survey administered via REDCap. Characteristics including age, gender, type of practice, specialty, and revenue type were collected. Additional questions were developed to gauge practice restrictions, use of telehealth, and estimates on income reduction. Descriptive statistics and frequency distributions were executed for respondent demographic analysis, and  $\chi^2$  analysis was used to evaluate for significant associations. Survey

responses were then grouped by state, and frequency distributions and  $\chi^2$  analysis were used to determine the statistical significance of variability between groups. The level of significance was determined to be  $P = 0.05$ . The data analysis was performed by a statistician using SAS version 9.4 (SAS Institute, Cary, NC).

**Table 1. Characteristics of and practice information on respondents to the survey, N = 192**

	All respondents, no. (%)
Characteristics	
Age, y, mean $\pm$ SD	49.9 $\pm$ 11.0
Sex	
Male	178 (92.7)
Female	14 (7.3)
Practice information	
Operative setting	
Hospital	65 (34)
Ambulatory surgery center	28 (15)
Both	99 (52)
Practice type	
Academic/university based	24 (13)
Hospital employed	31 (16)
Private practice	136 (71)
VA	0 (0)
Military	1 (1)
Subspecialty training (all that apply) <sup>a</sup>	
Foot and ankle	20 (10)
Hand and upper extremity	25 (13)
Orthopedic oncology	3 (2)
Pediatrics orthopedics	8 (4)
Shoulder and elbow	27 (14)
Spine	19 (10)
Sports medicine	76 (40)
Trauma	23 (12)
Total joint arthroplasty	52 (27)
Other	26 (14)
Size of orthopedic group	
Solo	18 (9)
2–4	19 (10)
5–9	41 (21)
10–15	23 (12)
16–20	26 (14)
21–35	40 (21)
35–75	15 (8)
>75	10 (5)
Income type	
Salaried	31 (16)
wRVU	39 (20)
Collections	122 (64)

SD, standard deviation; VA, Veterans Affairs; wRVU, work relative value units.  
<sup>a</sup>Percentages do not total 100 because some surgeons reported >1 specialty.

External data regarding COVID-19 prevalence by state were referenced on each state's respective public health department Web site. Links to these data can be found in Supplemental Digital Content, Appendix 1 (<http://links.lww.com/SMJ/A220>).

## Results

A total of 192 individuals participated in the survey and were included for analysis. The sample of orthopedic surgeons' age ranged between 30 and 74 years ( $49.9 \pm 11$  years), and 178/192 (92.7%) were male (Table 1). No significant differences were found between operative setting (hospital, ambulatory, or both;  $P = 0.22$ ) or income type (salaried, work relative value units, collections;  $P = 0.12$ ).

Responses were predominately from the following three states: AL 58 (30.2%), GA 58 (30.2%), and MO 31 (16.1%). The remaining responses from 16 other states were grouped as "other" for comparison because of inadequate responses per state. Respondents did not vary in operative setting or income type (salary, work

relative value units, or collections) as grouped by state. The proportions of subspecialty training type were not significantly different across states, with the exception of AL, which had a higher proportion of sports medicine physicians ( $P = 0.01$ ).

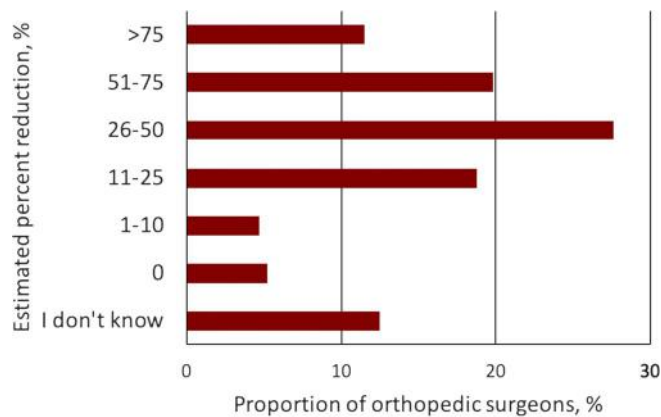
Most respondents documented elective procedure restrictions in hospital and ambulatory settings (Table 2), with 100% of respondents from AL claiming closure of both (GA 98% hospital closure and 88% ambulatory closure, MO 93% and 86%, other 97.5% and 100%, respectively). The highest proportion of practice closure occurred between March 18 and 20 (47% hospital, 51% ambulatory), with the CMS notably presenting a position for elective procedure cessation on Wednesday, March 18.

Of the participants, financial losses varied across states ( $P = 0.005$ ), with 50% of physicians claiming >50% losses of income in AL (Table 2, Fig.). Regarding telehealth, the quantity of practices set up for telehealth services before 2020 when grouped by state was found to be notable but not statistically significant, with 0% of practices in AL having services set in place (MO

**Table 2. Hospital restrictions, telemedicine and economic estimates, grouped by state**

Characteristics	Alabama		Georgia		Missouri		Other		P
	No.	%	No.	%	No.	%	No.	%	
Impact on practice									
Hospital restrictions on elective cases									
Yes	49	100	47	98.0	25	92.6	39	97.5	0.26
No	0	0	1	2.0	2	7.4	1	2.5	
Ambulatory surgical unit restricted elective cases									
Yes	42	100	36	87.8	19	86.4	22	100	0.03
No	0	0	5	12.2	3	13.6	0	0	
Telehealth									
Practice set up for telehealth services									
Yes	32	55.1	43	74.2	12	38.7	25	55.6	0.04
No	7	12.1	6	10.3	7	22.6	4	8.9	
In process of setting up for telehealth services									
Yes	19	32.8	9	15.5	12	38.7	16	35.6	0.06
No	0	0	4	9.3	3	25.0	2	8.0	
Set up for telehealth prior to 2020									
Yes	32	100	39	90.7	9	75.0	23	92.0	0.90
No	0	0	4	9.3	3	25.0	2	8.0	
Missing information (80)									
Anticipate telehealth services becoming a routine part of your future practice									
Yes	35	60.3	32	55.2	18	58.1	28	62.2	0.90
No	23	39.7	26	44.8	13	41.9	17	37.8	
Economic									
Estimate reduction in annual income secondary to COVID-19, %									
0	1	1.7	7	12.1	2	6.5	0	0	0.005
1–10	3	5.2	2	3.5	2	6.5	2	4.4	
11–25	8	13.8	8	13.8	11	35.5	9	20.0	
26–50	13	22.4	20	34.5	5	16.1	15	33.3	
51–75	18	31.0	9	15.5	2	6.5	9	20.0	
>75	11	19.0	5	8.6	1	3.2	5	11.1	
I don't know	4	6.9	7	12.1	8	25.8	5	11.1	

COVID-19, coronavirus 2019.



**Fig.** What reduction in annual income do you anticipate secondary to COVID-19? COVID-19, coronavirus disease 2019.

25%, GA 9%, other 8%,  $P = 0.06$ ); however, respondents reported that most of the practices in all states observed were using telehealth or were in the process of installation at the time of survey participation. In addition, states were generally split when considering the anticipation of implementing telehealth into routine practice (Table 2).

## Discussion

This study uniquely evaluates the implementation and effects of restrictions on elective procedures in response to the recommendations from governmental and nongovernmental organizations for hospital and ambulatory practices of orthopedic surgeons during the COVID-19 pandemic. Responses to this survey demonstrated that the highest proportion of elective procedure restrictions occurred in conjunction with the national position statement from the CMS, most practices were not set up for telehealth, and conflicting views exist regarding the future of telehealth utilization.

## Historical Context

In 2017, Pasquini-Descomps et al analyzed 18 academic articles providing cost-effectiveness or cost-benefit analyses on H1N1 pandemic interventions since 2009.<sup>19</sup> According to the study, literature was lacking on the economic evaluation of business and travel restrictions in a pandemic response.<sup>19</sup> Despite the lack of cost-benefit evidence published previously, school closures, hospital quarantine, and social distancing were implemented during the COVID 19 pandemic. Our study specifically found widespread restrictions of elective orthopedic cases to comply with quarantine and social distancing precautions.

In review of the current literature, we found no reports of similar restrictions on business, travel, and health care before the current pandemic. Several studies have presented strategies for operating in the COVID-19 pandemic and reopening the practice of elective surgery.<sup>20,21</sup> We discuss the unprecedented restrictions during this time, specifically with regard to southern states and orthopedic practice type.

## Demographics and Characteristics

The age and sex of physicians who participated in the survey were approximately representative of orthopedic surgeons across the country according to a report by the American Academy of Orthopaedic Surgeons (survey 92.7% male, age  $49.9 \pm 11$  years; national 92.3% male, age 56.5 years).<sup>22</sup>

## Elective Procedure Guidelines

Following the identification of the first COVID-19-positive patient in the United States on January 20, 2020, medical practices began addressing the issue of rapid viral spread. An early article by Vaccaro et al described the specific responses to the pandemic by three institutions in a collaborative article with authors from different institutions.<sup>7</sup> In this study, almost all of the practices in states examined reported the limitation of elective procedures (Table 2). A major wave of restrictions came immediately following the CMS position encouraging restriction on March 18, 2020. The survey results show that approximately 50% of respondents reported their last day of elective surgery in a hospital and ambulatory center, respectively, as being between Wednesday, March 18 and Friday, March 20.

By April 20, 2020, 36 states had either released official statements or had state officials speak on positions regarding these procedures.<sup>23</sup> The scientific community responded with the creation of safe practice guidelines for conducting surgery.<sup>24</sup> Because of the uncertainty of the definition for “elective procedure,” however, many hospitals imposed self-restrictions to abide by federal CMS recommendations.<sup>25</sup>

## Individual State Impact

Disparity existed within individual state environments regarding surges of COVID-19 patients. According to the departments of health for AL, GA, and MO, the data reveal that peak incidence levels of COVID-19 were not seen until late July to August 2020. On the contrary, states affected by the pandemic earlier in the year such as New York show peaks ranging from early to mid-April 2020. Regardless of COVID case load, however, most states called for postponement of elective procedures (AL March 19, GA April 1, MO no official statement, New York March 20).<sup>23</sup>

## Telehealth

With regard to telehealth, the majority of respondents indicated that their practices were not set up for telehealth before 2020. MO appeared to be more prepared for these services compared with other states in this survey, with 25% reporting having telehealth in place, as opposed to 9.3% in GA and 0% in AL ( $P = 0.06$ ). Following the arrival of COVID-19, the majority of practices had implemented or were in the process of implementing telehealth services ( $P = 0.04$ ), with GA having the highest proportion (74%) of telehealth in place. This correlates with a recent study by Parisien et al noting that of 106 orthopedic institutions across the United States, 83% of survey respondents

reported that the COVID-19 pandemic was the impetus for implementation of telehealth coverage.<sup>26</sup> Furthermore, an article by Tanaka et al describes a virtual orthopedic examination, including protocols and checklists to facilitate implementation.<sup>17</sup>

There is still disagreement involving the continuation of telehealth following COVID-19. In this study, between 55% and 65% of responses in each state indicated the intent to continue telehealth services in future routine practice, without significant variation among individual state responses (Table 2;  $P = 0.90$ ). Conversely, a review article by Lanham et al contends the COVID-19 pandemic has led to a paradigm shift in telemedicine that is here to stay.<sup>27</sup> With the limited present study data and gaps in the literature, additional study is indicated for the topic of telehealth in modern daily orthopedic practice.

### Income

With regionally uniform restrictions placed on elective procedures in all southern states while preparation and viral presence varied, it is not surprising that the economic impact differed significantly in each state. Of note, 50% of physicians in AL report a >50% expected reduction in annual income, compared with 24% in GA and 10% in MO. An opinion article by Anoushiravani et al describes the microeconomic effect on an orthopedic surgery practice associated with an unanticipated reduction in projected revenue in the setting of fixed overhead costs.<sup>20</sup> Although this study cannot determine the causation of the disparity in income reduction, the reasons for the estimated economic impact may be many. Factors including the costs of running a practice, malpractice insurance, access to telehealth services, and staff coupled with reduced the provision of health-care services likely contributed to each surgeon's estimation of a substantial reduction in annual income.

This study is not without limitations. There may have been response bias, which is inherent in most surveys. Furthermore, our overall response rate was low, and most responses were limited to a few states. Thus, the extrapolation of these results to all practices within these states or other regions of the United States is limited. In addition, the responses to the survey came at varying times, which may have affected the responses, especially regarding effects on income and the use of telehealth as more information about COVID-19 was obtained. Finally, the loss of income may not have taken into account small business loans, Medicare grants, and other government stimulus programs installed during this time.

### Conclusions

Although elective procedures were restricted across almost all respondents during the COVID-19 pandemic, the highest proportion of closures occurred in conjunction with the national position statement from the CMS. Of the southern states examined in this study, most practices were not set up for telehealth at the beginning of the pandemic. Even though most practices examined in this study have implemented or are in the process of

implementing telehealth, disagreement exists among the respondents regarding the future use of this service. Further research is needed to investigate the roles of telehealth and governmental regulations in health care and the resulting economic effects on orthopedic surgeons.

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