


# Orthopaedic Surgeon Mental Health During the COVID-19 Pandemic

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## Abstract

**Introduction:** This study compares rates of depression, suicidal ideation, and burnout among resident/fellow and attending physicians in orthopaedic surgery to other specialties during height/end of the first wave of the coronavirus disease 2019 (COVID-19) pandemic at our institution. Main outcomes and measures included suicidal ideation, Patient Health Questionnaire for Depression (PHQ-9) scores for depression, and 2 single-item measures for emotional exhaustion and depersonalization. This study provides valuable information regarding orthopaedic surgeon mental health during world crises. **Methods:** This is a cross-sectional survey-based study of resident, fellow, and attending physicians from 26 specialties during and after the first wave of the COVID-19 pandemic at our institution from April 24, 2020 to May 15, 2020. The survey contained 22 items. This includes consent, demographics and general data, 2 single-item questions of emotional exhaustion and depersonalization, and the PHQ-9. Subjects were eligible if they were a resident/fellow or attending physician at our institution. **Results:** The response rate for the study was 16.31%. Across all specialties rates were 6.2% depression, 19.6% burnout, and 6.6% suicidal ideation. The results for orthopaedic surgeons are as follows: 0% tentative diagnosis of depression, 3.8% suicidal ideation, and 4% burnout. Anesthesiology had the highest rate of depression (14.3%). Internal medicine and other non-surgical specialties had the highest rate of suicidal ideation (10.2%). Orthopaedic surgeons were significantly more likely to achieve work–life balance and experience less burnout than anesthesiologists and pediatricians. **Discussion:** Depression, suicidal ideation, and burnout continue to affect physicians across all specialties. These issues are amplified in light of crisis. Job satisfaction and rigorous training may be protective factors that allow orthopaedic surgeons to adapt to novel clinical settings under stress when compared to anesthesiologists and pediatricians. Resilience training and stress management strategies should continue to be investigated to better prepare physicians for world crises.

## Keywords

COVID-19, mental health, burnout, depression, suicidal ideation

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## Introduction

The novel coronavirus disease 2019 (COVID-19) has changed health systems worldwide for the foreseeable future. Initially identified in Wuhan, China, in late 2019, the virus was later declared pandemic by the World Health Organization on March 11, 2020. Currently there are 29 708 385 cases and 540 503 deaths in the United States alone.<sup>1</sup> Our

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institution saw exponential growth in COVID-19 patients last March and April. By April 12, our county reported more than 20 000 positive cases. At that time, ventilator supply was near capacity and strict protocols to conserve personal protective equipment and supplies were put into place. Nearly every specialty in our health system was reassigned to staff COVID-19 specific units. More than half of the orthopaedic surgery residency at our institution was reassigned to cover COVID-19, intensive care, and medicine units.

Burnout rates for physicians prior to the pandemic are reported to be highest in orthopaedic surgery, family medicine, emergency medicine, internal medicine, neurology, and otolaryngology.<sup>2</sup> Maslach et al. defined burnout as a syndrome of emotional exhaustion, reduced sense of personal accomplishment, and depersonalization.<sup>3</sup> Depersonalization occurs when one has negative thoughts and cynical attitudes toward patients. They described the Maslach Burnout Inventory (MBI), a widely used and validated instrument for measuring burnout using a 22-question form answered on a 7-point Likert scale. In 2012, Shanafelt et al. performed a survey-based study examining burnout in United States physicians using the MBI.<sup>2</sup> They reported a 45.8% burnout rate, 37% rate of emotional exhaustion, 12% rate for feelings of low personal accomplishment, and 29% rate of depersonalization among 7288 physicians who participated in the study.

The objective of this study was to investigate rates of depression, suicidal thoughts, and burnout among resident/fellow and attending physicians of other specialties compared to orthopaedic surgery. The study was originally designed prior to the COVID-19 pandemic. However, given the lack of data regarding the effects of COVID-19 on physician mental health, we proceeded with the study. This article is complimentary to the original manuscript examining incidence of depression, suicidal ideation, and burnout among physicians during the pandemic.

## Material and Methods

Approval was obtained from the institutional review board. Participants were not compensated for their participation. Qualtrics, a secure electronic survey platform was used to distribute the anonymous survey via electronic mail to resident, fellow, and attending physicians from 26 specialties at our tertiary care center. Subjects met inclusion criteria if they were a resident, fellow, or attending physician at our institution.

Surveys were distributed between April 24, 2020 and May 15, 2020 with weekly reminders. This captured data during the height and end of the first wave of the pandemic at our institution. Using this time frame allows one to collect and examine provisional diagnostic data on depression, suicidal ideation, and burnout from the beginning, height, and end of pandemic.

The survey was composed of 22 items, divided into 4 parts. This includes consent, demographics, 2 single-item questions of emotional exhaustion and depersonalization, and the Patient Health Questionnaire for Depression (PHQ-9).<sup>4</sup> Demographic data collected included age, gender, specialty, professional category, and relationship status. General data collected included number of times on call in the last month, whether the subject has been diagnosed or treated for depression or anxiety in the past, and their perception of adequate work-life balance.

The length of the MBI limits its use and so 2 single-item measures of emotional exhaustion and depersonalization were used. One survey-based study investigating single-item measures for emotional exhaustion and depersonalization was performed on medical students, internal medicine residents and faculty, and practicing surgeons.<sup>5</sup> The authors found that 2 distinct single-item measures could be used to identify burnout. This includes “I feel burned out from my work” for emotional exhaustion and “I have become more callous toward people since I took this job” for depersonalization. These showed 90% and 92% probability of burnout, respectively. Thus, these 2 questions with the highest factor loading on emotional exhaustion and depersonalization were used for the present study. For these questions, subjects were allowed to choose from 7 responses: “never,” “a few times a year or less,” “once a month or less,” “a few times a month,” “once a week,” “a few times a week,” or “every day.”

The last section of the survey examined mental health using the PHQ-9. This is a self-report questionnaire for depression that has been used extensively in surveys of physician mental health.<sup>4,6</sup> Scores of 10 or greater on the PHQ-9 are required for provisional diagnosis of major depression. Subjects were also considered to have suicidal ideation if they scored 1 or greater on question 9 of the PHQ-9.

Resident/fellow physicians as well as attending physicians were reassigned to cover medicine floors and COVID-19-specific units during the study. Work duties were similar and dependent on unit. A limited number of attending physicians were reassigned and so reassignment data for this cohort are not included. [Table 1](#) shows resident/fellow reassignment by specialty group from April 4 through May 1, 2020 and response rates.

## Statistical Analysis

Subjects were placed into 1 of 8 specialty groups to allow for greater power to detect inter-group differences. This included Internal Medicine and Other Non-surgical Specialties (Cardiology, Dermatology, Endocrinology, Fertility, Gastroenterology, Geriatrics, Infectious disease, Neurology, Pain management, Primary Care, Pulmonary, Radiology, and Rheumatology), Anesthesiology, General Surgery and

**Table 1.** Response Rates and Redeployment of Residents/Fellows During the Study Period.

Specialty group	Survey response rate	Redeployment rate per specialty group
Orthopaedic surgery	52% (26/50)	67% (18/27)
Anesthesiology	18.5% (21/113)	80% (32/40)
Internal medicine and other non-surgical specialties	11.1% (57/514)	65% (129/146)
Emergency medicine	18.1% (17/94)	0%
General surgery and other surgical specialties (excluding orthopaedic surgery)	15.6% (33/211)	77% (57/74)
Obstetrics and gynecology	13.2% (12/91)	100% (20/20)
Pediatrics	20% (31/155)	36% (14/39)
Psychiatry	18.5% (28/151)	43% (17/40)
Total	16.31% (225/1379)	74.4% (287/386)

Other Surgical Specialties excluding Orthopaedic Surgery (Ophthalmology, Otolaryngology, Neurosurgery, Urology, Plastic and Reconstructive Surgery), Psychiatry, Pediatrics, Emergency Medicine, Obstetrics and Gynecology, and Orthopaedic Surgery.

Depression was evaluated as a categorical (clinical depression defined by PHQ-9 score greater than or equal to 10) and as a continuous variable (depression severity and PHQ-9 score). A general linear model was used to investigate the relationship between PHQ-9 score and gender, professional category, relationship status, age, number of times on call in the last month, and previous diagnosis or treatment for depression or anxiety. Logistic regression analysis was used for presence of clinical depression with the above covariates.

Chi-square for categorical variables and t-Student for quantitative variables were used to examine differences between women and men, and between attending and resident/fellow physicians.

Logistic regression analysis was performed for the question "Do you feel you have adequate work life balance?" as a dependent variable, and gender, professional category, relationship status, age, being on call in the last month, number of calls in the last month, and previous diagnosis or treatment for depression or anxiety as independent variables.

Cumulative logistic regression analysis was used for the questions "I have become more callous toward people since I took this job" and "I feel burned out from my work" as dependent variables and gender, professional category, relationship status, age, number of calls in the last month, and previous diagnosis or treatment for depression or anxiety as independent variables.

## Results

Surveys were sent out via email to the eligible 478 resident/fellow physicians and 901 attending physicians for a total of 1379 possible subjects. The response rate for this study

was 16.31%. There were 334 surveys started and 225 completed. Only completed surveys were included in the analysis. The depression rate was 6.2% with 7 (6.3%) attendings and 7 (6.2%) residents meeting the PHQ-9 criteria for clinical depression. The rate for suicidal ideation in the last 2 weeks was 6.7%. No difference was found between residents/fellow and attending physician rates of depression severity ( $t = 145$ ;  $P = .146$ ), suicidal ideation ( $t = .641$ ;  $P = .522$ ), or feelings of burnout,  $\chi^2(1, n = 225) = 3.2$ ,  $P = .736$ .

Rate of suicidal ideation for attendings and resident/fellow physicians was 7.1% and 6.2%, respectively. Average age of resident/fellow and attending physicians with tentative diagnosis of major depression was  $30.57 \pm 3.46$  and  $44.71 \pm 9.27$ , respectively. Of married participants, 6.5% had tentative diagnosis of major depression and 5.8% reported suicidal ideation. Of single participants, 4.9% had tentative diagnosis of major depression and 7.4% reported suicidal ideation. 16.7% of those who were separated or divorced reported tentative diagnosis of major depression or suicidal ideation. Female resident/fellows and attending physicians comprised 10.3% and 4.2% of those with tentative diagnosis of major depression, respectively. Rate of suicidal ideation for female resident/fellow and attending physicians was 6.9% and 5.6%, respectively.

Rates of depression and suicidal ideation by specialty are described in Table 2. Orthopaedic surgery had 100% without tentative diagnosis of major depression; however, 3.8% described having suicidal ideation. Anesthesiology had the highest rates of depression (14.3%). Internal medicine and other non-surgical specialties had the highest rates of suicidal ideation (10.2%). Overall burnout rates are described in Table 3. Burnout rates per specialty can be reviewed in Table 4 (emotional exhaustion) and Table 5 (depersonalization).

Tentative clinical diagnosis of depression was positively associated with number of times on call in the last month (OR: 1.17, 95% CI [1.04, 1.32],  $P = .01$ ) and a past

**Table 2.** Depression and Suicidal Ideation by Specialty.

Specialty	Total study sample	No tentative diagnosis of major depression	Tentative diagnosis of major depression	Suicidal ideation
Anesthesiology	21 (9.3%)	18 (85.7%)	3 (14.3%)	2 (9.5%)
Emergency medicine	17 (7.6%)	16 (94.1%)	1 (5.9%)	1 (5.9%)
Surgical specialties (excluding orthopaedic surgery)	31 (13.8%)	30 (96.8%)	1 (3.2%)	1 (3.2%)
Internal medicine and other non-surgical specialties	59 (26.2%)	54 (91.5%)	5 (8.5%)	6 (10.2%)
Obstetrics and gynecology	12 (5.3%)	11 (91.7%)	1 (8.3%)	1 (8.3%)
Orthopaedic surgery	26 (11.6%)	26 (100%)	0 (0%)	1 (3.8%)
Pediatrics	31 (13.8%)	29 (93.5%)	2 (6.5%)	2 (6.5%)
Psychiatry	28 (12.4%)	27 (96.4%)	1 (3.6%)	1 (3.6%)

Tentative diagnosis of major depression defined as PHQ-9 => 10; suicidal ideation defined as answering >0 in question 9 of the PHQ-9. Column 1, "total study sample" is read vertically so that rates (%) for all, attendings, and residents/fellows for each area occur as a percentage of the total study sample for that sub-population. Columns 2, 3, and 4 are read horizontally such that the rates (%) occur as a percentage of the respective denominator for that sub-population in column 1.

**Table 3.** Overall Burnout in Study Population.

N (%)	Total study sample	No tentative diagnosis of major depression	Tentative diagnosis of major depression	Tentative diagnosis of major depression
Feeling burned out from work at least a few times a week				
All	45 (20.0%)	30 (66.7%)	13 (28.9%)	7 (15.6%)
Attendings	25 (22.3%)	19 (76.0%)	6 (24.0%)	5 (20.0%)
Residents/fellows	18 (15.9%)	11 (61.1%)	9 (50.0%)	2 (11.1%)
Become more callous toward people since I took this job at least a few times a week				
All	36 (16.0%)	12 (33.3%)	8 (22.2%)	5 (13.9%)
Attendings	13 (11.6%)	10 (76.9%)	3 (23.1%)	3 (23.1%)
Residents/fellows	23 (20.4%)	18 (78.3%)	5 (21.7%)	2 (8.7%)

Tentative diagnosis of major depression defined as PHQ-9 => 10; suicidal ideation defined as answering >0 in question 9 of the PHQ-9. Column 1, "total study sample" is read vertically so that rates (%) for all, attendings, and residents/fellows for each area occur as a percentage of the total study sample for that sub-population. Columns 2, 3, and 4 are read horizontally such that the rates (%) occur as a percentage of the respective denominator for that sub-population in column 1.

diagnosis and treatment for depression or anxiety (OR: 15.01 95% CI [3.59, 62.77],  $P < .001$ ). A general linear model showed that PHQ-9 scores were predicted by specialty group, age, number of calls, as well as whether the participant had been previously diagnosed or treated for depression or anxiety. Older age was found to be a protective factor while a previous diagnosis or treatment for depression or anxiety and number of times on call were positively associated with PHQ-9 scores. Suicidal ideation was positively associated with number of times on call in the last month (OR: 1.17, 95% CI [1.04, 1.32],  $P = .02$ ), a history of being diagnosed or treated for depression or anxiety (OR: 1.17, 95% CI [1.04, 1.32],  $P = .01$ ), and younger age (OR: .07, 95% CI [.04, .14],  $P = .05$ ). Burnout was negatively associated with age (OR: .95, 95% CI [.92, .99],  $P = .004$ ), positively with a history of depression or

anxiety (OR: 2.38, 95% CI [1.40, 4.07],  $P = .0014$ ), and number of times on call in the last month (OR: 1.06, 95% CI [1.02, 1.11],  $P = .008$ ).

## Discussion

To our knowledge, this is the first study in the United States examining depression and burnout in orthopaedic surgeons during the height of the COVID-19 pandemic. The initial goal of this study was to compare burnout and depression in orthopaedic surgeons vs other specialties. However, at that time, the COVID-19 pandemic struck our health system.

Response rates for the study were low (16.31%) however not entirely unexpected. The pandemic likely increased professional and home workload for staff

**Table 4.** Response to “how often do you feel burned out” for Emotional Exhaustion Per Specialty.

	Internal medicine and other non- surgical specialties	Anesthesia	Surgery	Orthopaedics	Psychiatry	Pediatrics	Emergency medicine	OBGYN	Total
Never	7 (12%)	3 (14%)	1 (3%)	4 (15%)	0	2 (6%)	1 (6%)	1 (8%)	19
A few times a year or less	13 (22%)	2 (10%)	10 (29%)	12 (46%)	15 (52%)	3 (10%)	9 (53%)	3 (25%)	67
Once a month or less	12 (21%)	2 (10%)	9 (26%)	1 (4%)	4 (14%)	7 (23%)	2 (12%)	3 (25%)	40
A few times a month	11 (19%)	6 (29%)	8 (24%)	5 (19%)	4 (14%)	7 (23%)	3 (18%)	1 (8%)	45
Once a week	3 (5%)	2 (10%)	1 (3%)	3 (12%)	1 (3%)	2 (6%)	1 (6%)	0	13
A few times a week	9 (16%)	5 (24%)	3 (9%)	1 (4%)	3 (10%)	8 (26%)	0	3 (25%)	32
Every day	3 (5%)	1 (5%)	2 (6%)	0	2 (7%)	2 (6%)	1 (6%)	1 (8%)	12

Rates (%) are presented as a percent of the total population for each specialty.

**Table 5.** Response to Question “I have become more callous toward people since I took this job” for Depersonalization Per Specialty.

	Internal medicine and other non- surgical specialties	Anesthesia	Surgery	Orthopaedics	Psychiatry	Pediatrics	Emergency medicine	OBGYN	Total
Never	16 (28%)	4 (19%)	7 (21%)	6 (23%)	11 (38%)	4 (13%)	3 (18%)	1 (8%)	52
A few times a year	11 (19%)	3 (14%)	11 (32%)	6 (23%)	8 (28%)	10 (32%)	7 (41%)	5 (42%)	61
Once a month or less	6 (10%)	4 (19%)	3 (9%)	3 (12%)	4 (14%)	5 (16%)	2 (12%)	1 (8%)	28
A few times a month	8 (14%)	2 (10%)	4 (12%)	4 (15%)	3 (10%)	5 (16%)	1 (6%)	1 (8%)	28
Once a week	7 (12%)	3 (14%)	3 (9%)	3 (12%)	1 (3%)	2 (6%)	2 (12%)	1 (8%)	22
A few times a week	6 (10%)	4 (19%)	5 (15%)	2 (8%)	1 (3%)	3 (10%)	1 (6%)	3 (25%)	25
Every day	4 (7%)	1 (5%)	1 (3%)	2 (8%)	1 (3%)	2 (6%)	1 (6%)	0	12

Rates (%) are presented as a percent of the total population for each specialty.

thereby reducing participation. This includes COVID-19 reassignments, reduced staffing for primary services, and increased patient population.

Rates of depression (6.2%) across all specialties were slightly lower than earlier studies examining mental health in Asian healthcare workers during the pandemic.<sup>6,7</sup> Suicidal ideation (6.6%) in the past 2 weeks was comparable to previous studies.<sup>2,8,9</sup> Suicidal ideation in orthopaedic surgery (3.8%) was lower than previously published reports in surgery (7%).<sup>10</sup> Psychological distress in orthopaedic surgery was lower than previously published reports (19%–33%) with no participants scoring for tentative diagnosis of depression.<sup>11,12</sup>

Regarding burnout, 20% of individuals endorsed emotional exhaustion (I feel burned out from my work) and 16% reported depersonalization (I have become more callous toward people since I took this job). These are lower rates compared to previous reports which have found 26%–32% burnout among practicing physicians in the United States.<sup>13,14</sup> It is possible this study found lower rates of psychological distress, depersonalization, and

overall burnout due to the pandemic, community support, and physician duty to help others. For some, the pandemic may have provided meaningful work and a sense of duty. Restauri et al. discuss Victor Frankl’s *Man’s Search for Meaning* and physician burnout.<sup>15</sup> The authors discuss “a critical connection between resilience and engagement on the one hand, and burnout on the other, is thought to lie in the ability to cultivate a sense of meaning in work.”

Data gathered from this study show higher scores on single-item measures for burnout were associated with more times on call, younger age, and a history of depression or anxiety. One survey-based study on University of Michigan surgical residencies and the Midwest Surgical Association found that 13% of practicing surgeons showed high depersonalization, 32% showed emotional exhaustion, and 4% felt a low sense of personal accomplishment.<sup>16</sup>

Compared to other specialties, orthopaedic resident/fellow and attending physicians were significantly more likely to achieve work–life balance and experience less burnout than anesthesiology and pediatrics. Reassignment to COVID-19 specific units and medicine floors may have

played a role. Reassignments generally used the following schedule to reduce viral exposure: 5 days working and 5 days off or on backup call. Anesthesiology had a greater reassignment rate (80%) compared to orthopaedics (67%) and pediatrics (36%). Specific intubation teams were established with anesthesia resident and attending physicians which may have increased stress and burnout.

Sargent et al. performed a survey-based study to investigate burnout, quality of life, and mental health in orthopaedic resident and attending physicians.<sup>12</sup> They found that residents worked an average  $70.24 \pm 20.39$  hours per week with faculty working an average  $62.8 \pm 18.2$  hours per week. Sleep hygiene was poor with 46.8% of residents and 31% of faculty reporting “quite a bit” to “a lot” of sleep deprivation. Another study reported an average of 88 work hours per week for residents and 70 for faculty.<sup>11</sup> One study on pediatric residents examined fatigue, work hours, and patient care errors after implementation of Accreditation Council for Graduate Medical Education duty hour limits.<sup>16</sup> Of those who responded 14% on ward rotations and 18% on NICU/PICU rotations reported working greater than 80 hours per week on average. It is possible that the rigor of a surgical residency allowed orthopaedic resident/fellow and attending physicians to adapt work–life balance and reduced burnout in a new clinical setting compared to their pediatric counterparts. Physicians in orthopaedics may also be protected by job satisfaction. Sargent et al. found that 69% of orthopaedic residents and 85% of faculty were fairly satisfied or better with their work.<sup>12</sup> Furthermore, 80% of residents and 88% of faculty were satisfied with the personal sacrifices made for their career.

The pandemic’s long-term effects on orthopaedic surgeon mental health are unknown at this time. Attending physicians facing reduced case load, increased telemedicine visits, and quarantine may be at risk for depression. One study on spine surgeons in Latin America found that 22% had PHQ-9 scores with a tentative diagnosis of depression.<sup>17</sup> Of those surveyed, 76.5% were performing emergency procedures only.

Changes in mental health can also affect physician professional relationships and delivery of care. One study reported that of 7905 surveyed, 9% of physicians had a recent major medical error in the past 3 months.<sup>18</sup> Reporting an error in the last 3 months was associated with a 7-point increase in emotional exhaustion on the MBI and twice the risk of screening positive for depression.

Burnout and depression also place physicians at risk for systemic disease. This includes increased risk for cardiovascular disease, diabetes, substance abuse, and male infertility.<sup>12</sup> Activation of stress response can lead to changes in normal physiologic processes regulating metabolism, inflammation, coagulation, and autonomic function.<sup>19</sup> These changes can predispose to coronary artery disease, a

prothrombotic state, and insulin resistance and cause dysregulation of sleep, appetite, and reproduction.

Mindfulness sessions and counseling have been explored to combat burnout and depression in physicians. A Norwegian study found improvement in emotional exhaustion after physicians completed a course on coping and stress management.<sup>20</sup> One trial of subject-focused mindfulness and resilience intervention with biweekly sessions found that the intervention group had reduced depersonalization and emotional exhaustion after 1 year.<sup>10</sup> Implementing these strategies during a pandemic will prove challenging and further studies providing evidence of efficacy should be performed.

There are multiple limitations to this study. This is a single institution study and variation may exist in orthopaedic surgeon burnout/depression due to department culture, workload, and social support systems. There was a low response rate. We did not collect information regarding attitudes toward reassignment, stress and anxiety, work hours, or sleep deprivation. Single-item measures for burnout were used rather than the full MBI in order to promote participation. The survey collection dates are during and at the end of the first wave of the pandemic at our institution and as such do not factor in long-term effects of the pandemic.

The COVID-19 pandemic has underscored the need to address physician burnout and psychological distress. Future investigations are required to better understand physician stress, mental illness, and burnout in an ever-changing clinical landscape. This will allow orthopaedic surgeons and physicians from other specialties to better prepare for future natural and man-made disasters.

## Supplemental material

Supplemental material for this article is available online.

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## Informed Consent

Consent was obtained from all participants.

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## Supplemental Material

Supplemental material for this article is available online.

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