

1 **Physician Burnout and Associated Factors: Orthopaedics vs Anesthesia**

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4

5 **Abstract:**

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7 **BACKGROUND:** Physician burnout has garnered increased attention in recent studies. It is attributed to the intrinsic stresses of
8 medical practice and affects the quality of patient care. Previous studies have reported roughly half of orthopedic surgery and
9 anesthesiology faculty and residents suffer symptoms of burnout.

10 **OBJECTIVE:** The purpose of this study is to determine if there is a significant difference in burnout rates among orthopedic surgeons
11 and anesthesiologists, between faculty and residents in both specialties, and possible associated factors that may predispose
12 participants to experience burnout.

13 **METHODS:** Data was gathered using the Maslach Burnout inventory survey (42 questions), which was distributed during the
14 spring/summer of 2017 to orthopaedic surgery and anesthesiology residents and attending physicians, anesthesiology residents,
15 orthopedic surgery faculty, and orthopedic surgery residents from various programs in the northeastern United States.

16 **RESULTS:** Survey Response rate was $238/666 = 38\%$ response. As compared to attendings, residents scored: worse on Emotional
17 Exhaustion; worse on Depersonalization and worse on Personal Accomplishment. When comparing specialties; for Emotional
18 Exhaustion, Orthopaedic surgery scored better as compared with Anesthesiology. On Personal Accomplishment, Orthopaedic
19 surgery scored better as compared with Anesthesiology. Residents had higher levels of burnout compared to attendings. Regarding
20 specialty, Orthopaedic surgery scored significantly lower with regard to Emotional Exhaustion and Personal Accomplishment. It was
21 also discovered that Orthopaedic surgeons overall have more social events, and more residents have mentors.

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23 **CONCLUSION:** Residents consistently demonstrated higher levels of burnout than attendings in both anesthesiology and orthopaedic
24 surgery. Having a mentor and more interdepartmental social events may protect against burnout.

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28 **Introduction**

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30 Physician burnout has become a significant concern in recent years. In 2012, a national study found that 46% of United States
31 physicians reported at least one symptom of burnout.¹ A meta-analysis found that the aggregate rates of suicide were 1.41-2.27 higher
32 in physicians than that of the general population and found that workplace dissatisfaction and burnout were almost three times higher
33 in practicing physicians compared to non-physicians.² The same meta-analysis demonstrated mental illness, likely linked to physician
34 burnout, demonstrated a strong correlation to physician suicide.² The most commonly accepted definition of occupational burnout
35 syndrome consists of three equally important domains: 1) emotional exhaustion 2) depersonalization, and 3) a perceived lack of
36 personal accomplishment, which are components of the Maslach Burnout Inventory: Human Services Survey (MBI-HSS).³
37 Absenteeism, personnel turnover, cynicism, emotional depletion, and decreased job satisfaction have all resulted from physician
38 burnout and may have a negative impact on co-workers and patients.⁴

39 In 2004, Sargent et al, found that orthopaedic surgery residents reported higher rates of burnout compared to faculty, demonstrating
40 higher rates of emotional exhaustion and depersonalization. In 2009, Sargent et al, surveyed 384 residents and 264 faculty at
41 orthopaedic surgery residency programs using the MBI-HSS.⁵ It was found that roughly 30% of residents and faculty showed high
42 levels of emotional exhaustion and more than half of residents and a quarter of faculty showed high levels of depersonalization.

43 Burnout affects anesthesiologists as well. In the same 2012 national study, nearly half of the 309 anesthesiologists who responded to
44 the survey also experienced burnout, only slightly lower than the fraction of orthopaedic surgeons.¹ In a 2013 national study of 1508
45 United States anesthesiology residents, high burnout risk was found in 41%. Residents who were at high risk of burnout and
46 depression also reported more medical errors, more mistakes resulting in negative consequences for patients, and less vigilance in
47 patient monitoring.⁶

48 Lifestyle differences are evident between orthopaedic surgeons and anesthesiologists. Based on the 2017 Medscape Physician
49 Compensation Report, the average annual salary for orthopaedic surgeons and anesthesiologists are \$489,000 and \$364,000.⁷
50 Anesthesiologists work on average 43-55 hours per week and take call 1.5 nights per week.⁷ In 2011, Balch et al, studied 155 private
51 practice and academic orthopaedic surgeons and found that they averaged 51.1 work hours per week and 1.8 nights on call per week,
52 with a career satisfaction rate of 80%.⁸

53 The purpose of this study is to determine if there is a significant difference in burnout rates among orthopaedic surgery and
54 anesthesiology residents and faculty overall, and between residents and faculty in each specialty. Based on previous studies, we expect
55 burnout rates between specialties to be similar and expect residents to have higher rates of burnout. While burnout at one point in time
56 among these groups has been studied and published in the past using the MBI-HSS survey, no study to our knowledge has directly
57 compared these groups.

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59 **Methods and Statistical analysis**

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61 Rights to use the validated Maslach Burnout Inventory: Human Services Survey (MBI-HSS) were purchased and permission to
62 perform this study was obtained from our Institutional Review Board. A cross-sectional online survey was distributed during the
63 spring and summer of 2017 to orthopaedic surgery and anesthesiology residents and attending physicians from various urban
64 academic programs in the northeastern United States. The survey, consisting of forty-two questions, included the MBI-HSS survey
65 plus additional questions examining potential indicators of burnout such as sociodemographic and work stressors. A total of 228
66 surveys were collected from orthopaedic surgery attendings (29), orthopaedic surgery residents (61), anesthesia residents (63), and
67 anesthesia attendings (75). Responses were collected via an online survey tool and responses were completely anonymous.

68 Statistical analysis was performed by the Temple Clinical Research Institute Department of Clinical Sciences. The dependent variable
69 was professional burnout, measured by three subscales of the Maslach Burnout Inventory survey. Degrees of burnout (low, average,
70 and high) have been used frequently in the literature to compare and contrast burnout among different groups. The cut off values in
71 Table 1 [from the Third Edition of the Maslach Burnout Inventory Manual, Maslach et al. (1996)] are typically cited in the literature
72 as representative of low, average, and high degrees of burnout.

73 High levels of depersonalization and emotional exhaustion or low scores on personal accomplishment indicated professional burnout.

74 Statistical analyses as categorical variables of the individual question data was performed as well as a statistical analysis of continuous

75 variables of the three core scales relating to the burnout syndrome - Emotional Exhaustion, Depersonalization, and Personal
76 Accomplishment. A statistical analysis of categorical variables regarding the degree of burnout associated with the three core aspects
77 of burnout syndrome was also performed. Lastly, a univariable analyses of Emotional Exhaustion, Depersonalization, and Personal
78 Accomplishment scores based on the partitions created by the responses to Question 25 through Question 41 was performed.

79 Scores for each of the three core scales were partitioned into low, average, or high categories based on the criteria for each scale
80 (Table 1). The resulting categorical data was assessed using the Chi-Square test (or the Fisher's exact test as appropriate) for each
81 score for each of the three respondent partitionings. Question 39 identified respondents as either orthopaedic surgery attendings (29),
82 orthopaedic surgery residents (61), anesthesiology residents (63), or anesthesiology attendings (75).

83 Derived scores for the three core scales of burnout syndrome (Emotional Exhaustion, Depersonalization, and Personal
84 Accomplishment) were assessed using non-parametric methods. For this study, the Wilcoxon test was used if two groups were
85 compared and the Kruskal-Wallis test was used if three or more groups were compared. . Based on statistical analysis, the results of
86 the study were found to have a non-normal distribution based on three tests of normality.

87 A univariable analysis of the three core scales of burnout was created using responses to questions 25 through 41 using the Kruskal-
88 Wallis and Wilcoxon tests as described above. The data was cleaned as respondent 135 responded 6 (i.e. 'Every day') to all 23
89 burnout questions and identified him or herself as both an anesthesia resident and attending in separate responses. In addition, two
90 respondents seemed to have made "fat finger errors" on Q41 of the survey, in which they identified themselves as residents but

91 responded that they had been practicing for 1-5 years as attendings. These respondents answered all other questions in the survey as
92 residents consistently.

93 For selected questions, alternative data sets creating a derived response were created excluding responses of “prefer not to answer”
94 and for those who “did not take any call” in questions 31 – 33. These alternative data sets were created such that only informative
95 answers were analyzed.

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97 **Results**

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99 The Survey Response rate was $238/666 = 38\%$ response rate. As compared to attendings, residents scored worse on Emotional
100 Exhaustion (M 21.50 vs. 24.00, SE 1.25 vs 1.06, $p=0.1075$); worse on Depersonalization (M 6.0 vs 10.5, SE .64 vs.63, $p<.0001$); and
101 worse on Personal Accomplishment (M 41.0 vs 38.0, SE .59 vs .63 $p=0.0051$) (Table 2). For Emotional Exhaustion, orthopaedic
102 surgery scored better compared to anesthesiology (M 20.0 vs 24.5p, SE 1.19 vs 1.07, $p=0.0181$). On Depersonalization,
103 anesthesiology scored better than orthopaedic surgery (M 9.5 vs 7.5, WE .73 vs .60 $p=0.0867$). On Personal Accomplishment,
104 orthopaedic surgery scored better as compared with anesthesiology (M 42.0 vs 38.5, SE .67 vs .58 $p=0.0117$) (Table 3). It was also
105 discovered that orthopaedic surgeons overall have more social events (table 4), residents take more overnight call (higher rates of

106 burnout), more anesthesiologists are married (81.5 vs. 69.5 $p=0.0365$, higher rates of burnout), more anesthesiologists take in-house
107 call (higher rates of burnout), and more residents have mentors (higher rates of burnout).

108 Inspecting levels of burnout partitioned by role, we found a similar trend, particularly with regard to Depersonalization and
109 Personal Accomplishment, with residents showing increased rates of “high” burnout (Depersonalization 54.8% vs 34.6 %, $p= 0.0012$,
110 Personal Accomplishment 24.2% vs. 13.5% $p=.0317$). Regarding specialty, orthopaedic surgery scored significantly better in
111 Emotional Exhaustion and better in Personal Accomplishment (Emotional Exhaustion 30.0% vs 44.2%, $p=0.0371$, Personal
112 Accomplishment 14.4% vs 22.5%, $p=.0068$) (Table 4).

113 Univariable analysis results demonstrated many statistically significant findings with results reported for those that the authors
114 felt were most revealing. Regarding gender, (Q25alt, excluding those who “prefer not to respond”) male respondents had higher
115 median Personal Accomplishment scores (suggesting lower burnout) as compared with female respondents ($p=0.0446$) (Table 5).
116 Regarding partnerships, respondents in a partnership had lower median Depersonalization scores (suggesting lower burnout) as
117 compared with respondents in that are not in a partnership ($p=0.0400$) (Table 6). For the revised response data (Q29 alt), having fewer
118 social events was associated with higher Emotional Exhaustion scores ($p=0.0364$, suggesting higher burnout) and was associated with
119 lower Personal Accomplishment ($p=0.0066$), suggesting higher burnout). (Table 7)

120 When only considering respondents that take call (Q31 alt), respondents for whom a majority (greater than 50%) of their call
121 was home call (defined as not required to physically remain in the hospital at all times) had a higher median Personal Accomplishment

122 scores (suggesting lower burnout) as compared with respondents for whom a majority of their call was in-house call ($p=0.0163$)
123 (Table 8). A derived response data set was imputed from Q31, Q32, and Q33 identifying whether the respondent takes or does not take
124 any call. Based on this derived data set, respondents that did not take call had lower median Emotional Exhaustion and
125 Depersonalization scores (suggesting lower burnout) as compared with respondents that do take call ($p=0.0188$ and 0.0148 ,
126 respectively).

127 In regards to having a mentor, respondents who had a mentor (Q35) had higher Depersonalization scores (suggesting higher
128 burnout) and lower Personal Accomplishment scores (suggesting higher burnout) as compared with those who had no mentor
129 ($p<0.0001$ and 0.0185 , respectively). However, regarding the reported agreement relative to the benefits of having a mentor (Q35 alt),
130 statistically significant associations between agreement and scores were observed. Those respondents who strongly agreed or agreed
131 that having a mentor benefitted them had lower median Emotional Exhaustion scores, lower median Depersonalization scores, and
132 higher median Personal Accomplishment scores ($p=0.0487$, $p=0.0195$, and $p=0.0002$, respectively for each score, based on an overall
133 comparison of all five levels) (Table 9).

134 There was a statistically significant association between Emotional Exhaustion and exercise (Q37) ($p=0.0389$), in which those
135 exercising the least had the highest burnout and those exercising the most had the lowest burnout. found (Table 10). Regarding sleep
136 (Q38), there was a statistically significant association between Emotional Exhaustion and sleep ($p=0.0040$) where those sleeping the
137 least had the highest burnout and those sleeping the most had the lowest burnout. For Depersonalization and sleep, the association

138 approached statistical significance ($p=0.0600$), in which those sleeping the least had the highest burnout and those sleeping the most
139 had the lowest burnout. Those sleeping less than five hours had the highest burnout (Table 11).

140 Looking at years of practice for attendings only (Q41 alt), there is a statistically significant association between years of practice
141 and Depersonalization scores ($p=0.0414$). Based on these data, attendings with more than thirty years of practice have lower
142 Depersonalization scores, suggesting lower burnout rates.

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144 **Discussion**

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146 Results of our study demonstrated that overall, residents experience higher rates of burnout than attendings in both orthopaedic
147 surgery and anesthesiology, which is consistent with previous findings. However, our results suggest that anesthesiology residents
148 and attendings experience higher levels of burnout when directly compared to their orthopaedic surgery counterparts, which is
149 inconsistent with previous studies and surprising.¹ This challenges the common belief that surgical specialties carry a higher
150 prevalence of burnout due to increased hours and a more stringent call schedule. A 2011 study of 384 orthopaedic surgery residents
151 and 264 full-time orthopaedic surgery faculty reported residents work an average of 74.2 +/- 20.2 hours per week and faculty 62.8 +/-
152 18.2 hours per week.⁹ This is compared to a 2013 study which found that 76% of anesthesiology residents work less than 70 hours a
153 week and 24% work more than 70 hours per week. The same study found that 56% of anesthesiology residents have less than 5 days
154 between calls while 44% have more than 5 days between calls.¹⁰ An important difference between specialties that was found to

155 directly correlate with physician burnout is number of social events per year. Orthopaedic surgery was found to have significantly
156 more social events and overall lower rates of physician burnout.

157 Socialization outside of work settings helps promote teamwork and comradery. This strategy of teambuilding and morale-
158 boosting events outside of the work setting has been utilized and found to be effective in the financial and corporate world. Results of
159 the study indicated an inverse correlation between number of social events and burnout, based on the three core values. One
160 possibility for the observed difference in number of social events between orthopaedic surgeons is that more anesthesiologists were
161 found to be married, which limits time outside of work to be spend with fellow colleagues due to the responsibilities inherent to
162 partnership and family. Married orthopaedic surgery residents who had higher Revised Dyadic Adjustment Scale scores had a greater
163 sense of personal achievement, while married faculty with higher scores was strongly associated with lower emotional exhaustion,
164 lower depersonalization, and higher personal achievement.⁷ A 2012 study comparing burnout and satisfaction with work-life balance
165 of 7,288 US physicians and 3,442 working United States adults found that being married was associated with a lower overall risk of
166 burnout (1).

167 Another possibility is that orthopaedic surgeons tend to come from background of competitive sport where teamwork and the
168 understanding of the importance of supporting one's associate is imperative to success. Social events, focused around team-building
169 activities should be a regular occurrence among residency departments and must involve both residents and attendings, so that the
170 whole department feels engaged in efforts to build relationships and bonds that can be carried over into the workplace. These building

171 blocks, forged away from the familiar hospital setting, can develop relationships that can act as pillars of support and strength should a
172 physician experience the symptoms of burnout. Closer relationships with colleagues may help an attending or resident physician seek
173 help before symptoms severely impact patient care and one's mental health.

174 Findings of our study highlight that mere involvement in a mentor-mentee relationship does not protect against symptoms of
175 burnout. More residents have a mentor, but experience higher levels of burnout than attendings in both orthopaedic surgery and
176 anesthesiology. However, regarding the reported agreement relative to the benefits of having a mentor, statistically significant
177 associations between agreement and scores were observed. Those respondents who strongly agreed or agreed that having a mentor
178 benefitted them had lower overall rates of burnout than those who disagreed and strongly disagreed. In a study of three hundred and
179 eighty-four orthopaedic surgery residents, Sargent, et al, found that 60% reported having at least one mentor. Levels of emotional
180 exhaustion decreased and personal achievement increased as the frequency of contact between mentor and mentee increased.⁹ Higher
181 personal achievement, lower emotional exhaustion, and lower depersonalization scores were also found in those who reported it
182 helpful to speak with their mentors.⁷

183 Often times mentors are assigned to a resident when they begin residency randomly with no prior relationship between the two.
184 In order to create more valuable mentor-mentee relationships, care must be taken to provide mentees with mentors that are an optimal
185 "fit." If attendings and residents can socialize and familiarize themselves with one another to establish relationships ahead of time,

186 this can be achieved. Random pairing of mentors to mentees can lead to this relationship being suboptimal due to differences in
187 personalities, professional and personal interests, and the parities' overall interest in a mentor-mentee relationship.

188 One suggestion to help foster this important relationship is to have residents seek out attendings who they would like to have
189 as a mentor based on an already established relationship. This way residents can choose whether or not they would like a mentor at
190 all. If so, they can select a relationship which they feel will help them grow personally and professionally. Those who may feel this
191 relationship has no benefit, can save themselves the time and strain associated with a mentor that they did not choose, or has little
192 interest in truly being a mentor. One study of a radiology residency program found that residents having self-selected their mentors
193 were significantly more likely to consider their faculty mentor as their primary mentor than those with assigned mentors. They also
194 reported significantly higher satisfaction with the mentoring program than those with an assigned mentor.¹⁰ Another study of an
195 emergency medicine residency program concluded that an individual's active participation in mentor selection can yield better
196 outcomes, as 44% of residents thought shared academic interest and 44% thought a comfortable personal dynamic were most
197 important to a successful mentor-mentee match. In this program, at the end of intern year, residents provided a list of three possible
198 mentors for the remainder of training and were assigned one of those mentors.¹¹

199 There are several weaknesses inherent in our study. One weakness is that the surveys were collected during a single time point
200 during the spring and summer months in the northeastern United States. Temporal and seasonal difference may impact survey results,
201 as rates of seasonal depression peak in the winter. We only polled physicians in large urban medical centers. Opportunity for future

202 studies include redistributing surveys over the course of a year (winter vs. summer) to find if seasonal changes may affect the
 203 outcomes. Studies could compare burnout rates with non-perioperative specialties with mostly daytime hours and thus no overnight
 204 calls and patients without critical illnesses. Comparing rural and urban centers and different areas of the country can give insight to the
 205 potential effects of demographic factors. Given our findings about the impact of social events, studies could explore the details about
 206 the types of social events, frequency, quality, etc. that could potentially impact burnout rates.

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237 The follow 4 tables are our primary tables and figures to be included in the article.

238

239 1. Table 1

Core Scale	Low	Average	High	Directional Interpretation
Emotional Exhaustion	≤18	19–26	≥27	Higher score suggests higher burnout
Depersonalization	≤5	6–9	≥10	Higher score suggests higher burnout
Personal Accomplishment	≥40	39–34	≤33	Lower score suggests higher burnout

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241 2. Table 2: Summary Statistics and Testing of Three Core Scales Partitioning by Role

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Core Scale	N	Mean	StdDev	StdErr	Min	Q1	Median	Q3	Max	p-Value	Method
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Emotional Exhaustion

0.1074 Wilcoxon

<i>Core Scale</i>	<i>N</i>	<i>Mean</i>	<i>StdDev</i>	<i>StdErr</i>	<i>Min</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>Max</i>	<i>p-Value</i>	<i>Method</i>
Attending	104	22.69	12.72	1.25	0.00	12.50	21.50	31.00	54.00		
Resident	124	25.06	11.79	1.06	0.00	17.00	24.00	33.00	52.00		
Depersonalization										<.0001	Wilcoxon
Attending	104	8.08	6.57	0.64	0.00	3.00	6.00	12.00	30.00		
Resident	124	11.68	7.00	0.63	0.00	6.00	10.50	16.50	29.00		
Personal Accomplishment										0.0051	Wilcoxon
Attending	104	40.22	6.04	0.59	18.00	36.50	41.00	45.00	48.00		
Resident	124	37.73	6.98	0.63	11.00	34.00	38.00	43.00	48.00		

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244 3. Table 3: Summary statistics and testing of three core scales partitioning by speciality

<i>Core Scale</i>	<i>N</i>	<i>Mean</i>	<i>StdDev</i>	<i>StdErr</i>	<i>Min</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>Max</i>	<i>p-Value</i>	<i>Method</i>
Emotional Exhaustion										0.0181	Wilcoxon
Orthopaedic surgery	90	21.52	11.34	1.19	0.00	14.00	20.00	30.00	50.00		
Anesthesiology	138	25.58	12.60	1.07	0.00	16.00	24.50	34.00	54.00		
Depersonalization										0.0867	Wilcoxon
Orthopaedic surgery	90	10.92	6.93	0.73	0.00	6.00	9.50	16.00	25.00		
Anesthesiology	138	9.46	7.05	0.60	0.00	4.00	7.50	14.00	30.00		

<i>Core Scale</i>	<i>N</i>	<i>Mean</i>	<i>StdDev</i>	<i>StdErr</i>	<i>Min</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>Max</i>	<i>p-Value</i>	<i>Method</i>
Personal Accomplishment										0.0117	Wilcoxon
Orthopaedic surgery	90	40.08	6.40	0.67	17.00	36.00	42.00	45.00	48.00		
Anesthesiology	138	38.08	6.76	0.58	11.00	34.00	38.50	43.00	48.00		

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246 Table 4: Degree of burnout, four-way partitioning, summary statistics

<i>Scale</i>	<i>Low</i>	<i>Average</i>	<i>High</i>	<i>Total</i>	<i>p-Value</i>	<i>Test Method</i>
Degree of Burnout - Emotional Exhaustion					0.0325	Chi Square
Orthopaedic surgery attending	15 (51.7%)	8 (27.6%)	6 (20.7%)	29 (100.0%)		
Orthopaedic surgery resident	25 (41.0%)	15 (24.6%)	21 (34.4%)	61 (100.0%)		
Anesthesiology attending	28 (37.3%)	16 (21.3%)	31 (41.3%)	75 (100.0%)		
Anesthesiology resident	12 (19.0%)	21 (33.3%)	30 (47.6%)	63 (100.0%)		
Total	80 (35.1%)	60 (26.3%)	88 (38.6%)	228 (100.0%)		
Degree of Burnout - Depersonalization					0.0252	Chi Square
Orthopaedic surgery attending	11 (37.9%)	7 (24.1%)	11 (37.9%)	29 (100.0%)		
Orthopaedic surgery resident	11 (18.0%)	16 (26.2%)	34 (55.7%)	61 (100.0%)		
Anesthesiology attending	33 (44.0%)	17 (22.7%)	25 (33.3%)	75 (100.0%)		
Anesthesiology resident	15 (23.8%)	14 (22.2%)	34 (54.0%)	63 (100.0%)		
Total	70 (30.7%)	54 (23.7%)	104 (45.6%)	228 (100.0%)		
Degree of Burnout - Personal Accomplishment					0.0008	Chi Square

<i>Scale</i>	<i>Low</i>	<i>Average</i>	<i>High</i>	<i>Total</i>	<i>p-Value</i>	<i>Test Method</i>
Orthopaedic surgery attending	21 (72.4%)	5 (17.2%)	3 (10.3%)	29 (100.0%)		
Orthopaedic surgery resident	38 (62.3%)	13 (21.3%)	10 (16.4%)	61 (100.0%)		
Anesthesiology attending	43 (57.3%)	21 (28.0%)	11 (14.7%)	75 (100.0%)		
Anesthesiology resident	18 (28.6%)	25 (39.7%)	20 (31.7%)	63 (100.0%)		
Total	120 (52.6%)	64 (28.1%)	44 (19.3%)	228 (100.0%)		

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UNDER PEER REVIEW