Factors Associated With Burnout Amongst Medical Students, Residents, And Attendings In Orthopaedics

David S. Kirwin

Follow this and additional works at: https://elischolar.library.yale.edu/ymtdl

Recommended Citation

This Open Access Thesis is brought to you for free and open access by the School of Medicine at EliScholar – A Digital Platform for Scholarly Publishing at Yale. It has been accepted for inclusion in Yale Medicine Thesis Digital Library by an authorized administrator of EliScholar – A Digital Platform for Scholarly Publishing at Yale. For more information, please contact elischolar@yale.edu.
Factors Associated with Burnout Amongst
Medical Students, Residents, and Attendings in Orthopaedics

A Thesis Submitted to the
Yale University School of Medicine
in Partial Fulfillment of the Requirements for the
Degree of Doctor of Medicine

By
David S Kirwin
2022
Table of Contents:

Abstract: 3
Acknowledgements: 4
Introduction: 5
Statement of Purpose: 18
Methods: 19
Results: 21
Discussion: 24
References: 33
Factors Associated with Burnout Amongst Medical Students, Residents, and Attendings in Orthopaedics. David S. Kirwin, B.S. Jonathan N. Grauer, M.D. Department of Orthopaedics and Rehabilitation, Yale University School of Medicine, New Haven, CT, USA

Burnout is an important and timely topic in medicine as a whole and orthopaedics as a specialty. Prior studies analyzing burnout in orthopaedics generally assess for the prevalence of burnout, without using a targeted analysis on possible causes and/or the potential association with work hours.

An anonymous survey was given to 24 medical students on surgical rotations, 20 orthopaedic residents, and 20 orthopaedic surgeons between June 2019 and August 2019 at a single academic institution. The survey inquired about demographics, general attributes (job satisfaction, home support, control over life/schedule), work hours, and included the abbreviated Maslach Burnout Inventory [aMBI].

Residents worked the most hours per week (p <0.0001). Control over life/schedule was greatest for attendings (p= 0.0036). In terms of the aMBI scores, depersonalization was highest for residents (p= 0.0020), and personal accomplishment was highest for attendings (p=0.0095). Taking all survey participants together, work hours positively correlated with greater depersonalization (p=0.015), greater sense of personal accomplishment (p=0.049), but not with emotional exhaustion.

With work hours positively correlating with depersonalization and personal accomplishment, continuing to focus on these factors seems important. With higher job satisfaction correlating with lower emotional exhaustion and higher personal accomplishment, thinking of ways to increase job satisfaction is a potential area of future research. Burnout is a topic that will need to continue to be addressed for the well-being of our profession and further considered in the era of COVID stresses on healthcare providers.
Acknowledgements:

I want to recognize Dr. Jonathan Grauer for his support during the creation of this thesis. His steadfast guidance was pivotal to its completion. Since my start at Yale School of Medicine in 2018, Dr. Grauer has been a mentor, and an inspiration. He taught me countless lessons about clinical work and research, and did it with passion and grace. But most importantly were his lessons of character. How one can be successful, yet humble; productive, yet patient; stern; yet gentle.
Introduction:

Physician burnout is an important and timely topic in medicine as a whole and in orthopaedics as a specialty. While burnout can be variably defined, an overarching description is “a state of physical, emotional, or mental exhaustion caused by long term involvement in situations that are emotionally demanding” [1]. One study by Shanafelt et al. found doctors in general were more burnt out (38%) than the general US population (28%) [2]. Burnout can have profound detrimental effects on physicians themselves, patients, and the entire US healthcare system.

A standardized questionnaire tool (the abbreviated Maslach Burnout Inventory [aMBI]) is commonly used to assess burnout [3]. The aMBI consists of three facets: emotional exhaustion, depersonalization, and personal accomplishment. Each facet in the aMBI is scored on a 0-18 scale. For emotional exhaustion and depersonalization, higher scores indicate more burnout. For personal accomplishment, higher scores indicate less burnout. According to Maslach et al, these three facets can interact in different gradations, making burnout presentation heterogenous [3].

Daniels et al. found emotional exhaustion to be positively associated with physical exhaustion and poor judgment, depersonalization to be positively associated with cynicism and impaired patient and colleague relationships, and feelings of low personal accomplishment to be positively associated with decreased effectiveness and productivity [4]. Shanafelt et al. further found a correlation between all three metrics of burnout in the aMBI, and increased medical error [2].

The effect of physician burnout on patient care is worrisome. In a meta-analysis by Panagioti et al. in 2017 analyzing 47 studies with over 42,000 physicians, burnout was
Factors Influencing Physician Burnout

positively associated with an increased risk of patient safety incidents (OR, 1.96; 95% CI, 1.59-2.40), poorer quality of care due to low professionalism (OR, 2.31; 95% CI, 1.87-2.85) and reduced patient satisfaction (OR, 2.28; 95% CI 1.42-3.68) [5]. Interestingly, the study found a larger association between burnout and low professionalism in residents and early career physicians (≤ 5 years post residency) compared to physicians later in their careers (Cohen Q = 8.14; P = 0.007) [5]. This may be due to lack of experience; one garners more professional behavior as they have more experience interacting with patients. It is also postulated, as is investigated further in the current study, increased work hours and job stress early in one’s career negatively affect their attitude and treatment of patients.

Halbesleben et al. also found detrimental effects of burnout on physician patient relationships and patient outcomes. In a survey study based on 178 matched pairs of patients and physicians, the depersonalization metric of physician burnout on the Maslach Burnout Inventory predicted lower patient satisfaction post treatment and longer post discharge recovery time [6]. The authors controlled for severity of illness and other demographic factors.

Medical error is a serious consequence of physician burnout. Shanafelt et al. studied 7905 surgeons in 2008 to assess the relationship between burnout and medical error induced morbidity and mortality for patients [2]. Of the near 8,000 surgeons included in the study, 700 admitted concern they made a major medical error in the last three months [2]. The majority of these physicians (70%) credited the error due to individual factors, rather than system level variables [2]. For every single point increase in the depersonalization metric of burnout came with an 11% increase in the chance of
Factors Influencing Physician Burnout

reporting a medical error [2]. Likewise, each single point increase in emotional exhaustion was positively associated with a 5% increase in the chance of reporting a medical error [2]. After controlling for many personal and professional variables, depression and physician burnout persisted as independent predictors of reporting a recent major medical error [2].

Interestingly, making medical errors seemed to compound burnout leading to a vicious cycle. The study analyzed physician’s mental quality of life, symptoms of depression, and the three domains of burnout in the Maslach burnout inventory [2]. Physicians that reported a major medical error in the last three months also reported a significant change for the worse in all three of these metrics [2]. The presence of a major medical error in the last three months also predicted career dissatisfaction. When asked “would you become a physician again” (career choice), significantly fewer physicians responded yes who had a major medical error in the last three months [2]. When asked “would you become a surgeon again” (specialty choice), significantly fewer physicians responded yes who had a major medical error in the last three months [2]. When asked “would you recommend your children pursue a career as a physician/ surgeon”, again, significantly fewer physicians responded yes who had a major medical error in the last three months [2]. Evidently, whether burnout is the inciting event, or major medical error, one can lead to the other, which can lead to more of both.

Physician burnout can exacerbate physician shortages already seen in the United States. Between 2008 and 2014, Shanafelt et al. attempted to quantify the detrimental effects of burnout on the amount of time physicians devote to spending with patients. This study used a unit called full time equivalents (FTE), in which a physician working
Factors Influencing Physician Burnout

full time received a FTE of 1.0 and a physician working half time received a FTE of 0.5 [7]. Every one-point increase in emotional exhaustion was positively correlated with a greater likelihood of reducing FTE over the following 24 months (odds ratio [OR], 1.43; 95% CI, 1.23-1.67; P<.001) [7]. Likewise, every one-point decrease in job satisfaction was positively associated with greater likelihood of reducing FTE over the next 24 months (OR, 1.34; 95% CI, 1.03-1.74; P=.03) [7].

Burnout is associated with lower health metrics for physicians. A recent study published in 2020 by Menon et al. attempted to elucidate the connection between physician burnout and suicidal ideation. Between 2018-2019, this cross sectional survey study randomly sampled attendings and postgraduate trainee physicians from the American Medical Association Physician Masterfile [8]. Participant candidates were emailed an online survey until a convenience sample of 1200 practicing physicians decided to partake [8]. 1354 physicians ended up participating, consisting of a large range of ethnicities and ages [8]. An 85% increased odds of suicidal ideation was associated with each standard deviation increase in burnout (odds ratio [OR], 1.85; 95% CI, 1.47-2.31); however, the associated dissipated after correcting for depression status (OR, 0.85; 95% CI, 0.63-1.17) [8]. The authors took the analysis one step further and discovered each increase in standard deviation for burnout positively correlated with an increase in self-reported medical errors (OR, 1.48; 95% CI, 1.28-1.71) [8]. Dissimilarly, depression did not positively correlate with self-reported medical errors (OR, 1.01; 95% CI, 0.88-1.16) [8]. These results may suggest depression is a risk factor for suicidal ideation, whereas burnout’s effect is more dubious.
Factors Influencing Physician Burnout

However, many consider burnout and depression different perspectives for the same spectrum of symptoms. In 2014, Ahola et al. used a person-centered approach to study the relationship between burnout and depressive symptoms. By considering how the symptom constellations and trajectories are connected to the baseline sociodemographic and psychosocial work characteristics, the authors found that burnout and depression present strikingly alike [9]. Their results suggest the symptoms of burnout and depression group together and grow in parallel [9]. In the work context, the authors argue burnout and depression manifest and develop in such a similar manner that it is important to consider both when either is of concern [9].

Bianchi et al. corroborate this point in a perspective article published in 2015. The authors caution burnout should not be considered as a diagnostic category in isolation [10]. The authors reviewed the most recent literature on the overlap between depression and burnout, including the similarity of the three metrics of burnout and overt symptoms of major depressive disorder, and skepticism that burnout is defined by its job related character [10]. This analysis of burnout’s origin suggests burnout and depression are on a spectrum of presentation [10]. Therefore, considering the effects of burnout on physicians, patients, and our healthcare system may warrant an inclusive view of the syndrome’s depressive essence.

Physician burnout has an overt emotional and psychological cost to the physician, an indirect cost to quality of patient care, and also a tangible monetary cost. The United States spends more money on healthcare than any other developed country, by a significant margin [11]. The extra spending is made more inefficient by absenteeism, medical errors, and poorer patient satisfaction due to physician burnout [2, 12].
Physicians who score higher on burnout assessments such as the Maslach Burnout Inventory are more likely not to show up to work, and have higher rates of days missed [12]. The economic impact of physician burnout is clear, but difficult to quantify.

Using an economic model, in 2014 Dewa et al. found the cumulative cost of burnout in Canada due to early retirement and reduction in clinical hours to be $213.1 million, $185 million from early retirement and $28 million from reduced clinical hours [13]. Breaking the results down by specialty, family physicians accounted for 59% of burnout costs, surgeons accounted for 25% of burnout costs, and other specialists accounted for 16% of burnout costs [13]. Shanafelt et al. also attempted to quantify the economic burden of physician burnout using a financial return on investment conservative formula model utilizing consistently available organizational characteristics from past studies [14]. They found the lost revenue associated with recruiting one new physician through the Association of Staff Physician Recruiters was $990,000, incorporating recruiting agency fees, advertising costs, interview costs, and lost revenue during the recruitment, onboarding, and training process [14]. Their results are corroborated with a recent report by Atrius Health estimating the total organization and administrative cost to replace a physician to be in the range of $500,000 to $1,000,000 [14].

Dr. Tait Shanafelt continued to investigate the financial scourge of physician burnout two years later in 2019, working with Shasha Han, MS. They used contemporary published research findings and industry reports to similarly model economic inputs associated with physician burnout [15]. Similarly to their previous work, they estimated
Factors Influencing Physician Burnout

costs using physician turnover and reduced clinical hours, finding $4.6 billion in costs attributable to physician burnout in the United States annually [15].

Evidence for the financial burden of physician burnout in the United States is considerable. These estimates are significant, and they are only using two variables, physician turnover and reduced clinical hours, omitting many difficult to measure variables. Variables like malpractice costs, lower patient satisfaction, lower quality of patient care, and worse patient outcomes were not included in these analyses [15]. As such, it is likely these studies vastly underestimate the annual economic cost of physician burnout in the United States.

With long work hours in stressful environments in medicine, links have been made between workhours and burnout. This is particularly studied in residents due to the well-known Libby Zion case of 1984 [16]. At the New York Hospital, in March of 1984, a young 18 year old woman named Libby Zion passed away shortly after being admitted through the emergency department [17]. A few months earlier in January of 1984, Libby sought professional mental health treatment for intractable stress, at which time she was prescribed the monoamine oxidase inhibitor (MAOi) antidepressant phenelzine [17]. Between January and March of that year, Libby was prescribed a number of other medications including aspirin/oxydodone hydrochloride for pain after a dental procedure, chlorpheniramine and erythromycin for fever and ear pain, as well as a slew of other prescriptions like doxycycline, tetracycline, flurazepam, diazepam, and imipramine [17]. On March 4th, Libby’s fever carried on and reached 41 degrees Celsius, along with other systemic symptoms like body and muscle aches [17]. Her father, a lawyer and journalist
Factors Influencing Physician Burnout

for the *New York Times*, contacted a doctor he knew at New York Hospital who recommended Libby be taken to the emergency department there [17].

That night an intern and a junior emergency room resident took care of her. She was never seen by an attending physician during her stay [18]. Libby told the residents she abstained from taking her phenelzine and erythromycin that day due to feelings of nausea, but the history by the junior resident did not mention the other medications (imipramine, diazepam, etc) [17]. The history documented recent marijuana use, without any uses of other illicit substances. Both the junior resident and intern took separate histories and physical examinations, each noting significant physical agitation which was attributed as voluntary [17]. A diagnosis of viral illness was made by the intern, and acetaminophen and meperidine was given for symptomatic relief [17]. Over the course of the night Libby’s agitation worsened, and the house staff ordered haloperidol and restraints to sedate her and control her thrashing movements [17]. Her phenelzine and erythromycin were being held for the time being [17].

Just after 6:00 am that morning, the patient was noted to have a 42 degree Celsius fever, for which the intern ordered cooling blankets and cold compresses [17]. At 7:30 am, Libby Zion went into cardiopulmonary arrest, and died [19]. Traces of cocaine were found in Libby’s nares by the medical examiner that day, as well as radioimmunoassay results corroborating the presence of cocaine, although the results were never officially definitive [17]. It is believed the combination of phenelzine, meperidine, and other substances in Libby’s system led to serotonin syndrome, explaining her spiking fevers and psychomotor agitation [20].
Based on the testimony and evidence from the Libby Zion case, the grand jury issued five recommendations to the State Department of Health [17]. The first recommendation pointed out the error Libby was never seen by an attending physician [17]. The second recommendation advised closer mentorship and monitoring of residents by attendings when residents serve as the primary care givers [17]. The third recommendation, which lead to the most drastic systemic change in the health care system, addressed that the intern and resident caring for Libby were working for 18 consecutive hours prior to her admission, and admonished a limit on consecutive work hours for interns and junior residents in teaching hospitals [17]. The fourth recommendation involved double checking a patient’s status in person before placing them in restraints, and the fifth recommendation suggested an automated system to check for contraindications for coadministration of drugs [17].

Numerous medical boards and counsels, state and nationally, reviewed the grand jury’s recommendations, including the Accreditation Council of Graduate Medical Education (ACGME), the American Medical Association, and the Committee of Interns and Residents [17]. It was clear the changes suggested would require an increase in attending physician staff members, resident physician staff members, and money to fund such intense changes. The Committee on Emergency Services finally came out with 19 recommendations to the New York State Department of Health, of which the 13th recommendation was eventually adopted by the ACGME [17, 21]. The 13th recommendation read as:

“Individual residents who have direct patient care responsibilities in areas other than the Emergency Department shall have a scheduled work week which will not
Factors Influencing Physician Burnout

exceed an average of 80 hours per week over a 4 week period and should not be scheduled to work as a matter of course for more than 24 consecutive hours, with one 24 hour period of non-working time per week” [17]

The changes being implemented into the medical system were met with opposition. Many members of the notable boards mentioned above cautioned against changing the existing resident weekly/call schedules [18]. An MD named F. Davidoff from the American College of Physicians warned “It would be unrealistic to expect residents to absorb the realities of caring for their equally fragile and needy patients if their working hours were fixed according to an arbitrary schedule, however well intended” [18]. Another admonishment against changing house staff hours concerned the continuity of care for patients [18]. This argument cautioned the same MD who admits a patient and does their initial history and physical exam, should be the same MD who sees their care all the way through to discharge [18]. An MD named J. Albers from the American Medical Association testified “The care of my patients is enhanced when the physician who initially evaluated them after admission to the hospital cares for them for an extended period of time.” [18]. One more recurring warning addressed the additional costs limiting resident work hours would have on the United States health care system [18].

To this day, resident work hour restrictions from the Accreditation Council for Graduate Medical Education (ACGME) have evolved as a result of such considerations. In 2006, Martini et al. compared burnout among medical residents before and after implementation of work hours restriction and found a marked reduction in burnout post work hours mandate (as measured by aMBI) [22]. Eligible participants in this survey
Factors Influencing Physician Burnout

study included all interns and residents in general surgery, psychiatry, internal medicine, family medicine, pediatrics and obstetrics/gynecology at Wayne State University School of Medicine in 2005 [22]. The authors measured burnout across four categories: <40 hours per week, 40-59 hours per week, 60-80 hours per week, and >80 hours per week [22]. Rates of burnout increased significantly in correlation with higher hours worked (linear by linear chi square = 5.12, df = 1, p = 0.024) [22]. The prevalence of burnout in residents working >80 hours per week was 69.2% [22]. The percentage of interns disclosing burnout was 43% (95% confidence interval 25%, 61%), compared to 77% pre-workhour restrictions [22]. This 34 percentage point decrease brought intern burnout prevalence into a similar range as burnout prevalence in other years of residency [22].

Most physician burnout studies have been conducted in general medicine. A massive study in 2008-2009 by West et al. examined quality of life, burnout, educational debt, and medical knowledge for internal medicine residents. Included samples were 16394 residents who took the internal medicine In-Training Examination, representing 74.1% of all eligible US internal medicine residents during this time period [23]. Quality of life was rated “as bad as it can be” or “somewhat bad” by 2402 of 16,187 residents who responded, representing 14.8% of the total [23]. Overall burnout was described by 8343 of 16192 residents who responded, representing 51.5% of the total [23]. Similarly, high levels of emotional exhaustion and depersonalization were reported by 7394 of 16154 residents who responded and 4541 of 15737 residents who responded, representing 45.8% and 28.9% of the total, respectively [23]. In analyses using multivariable models, international medical graduates seemed less susceptible to burnout than US medical graduates (45.1% vs 58.7%; odds ratio, 0.70 [99% CI, 0.63-0.77]; P .001) [23]. At
minimum one symptom of burnout positively correlated with greater educational debt (61.5% vs 43.7%; odds ratio, 1.72 [99% CI, 1.49-1.99]; P .001 for debt $200 000 relative to no debt) [23]. Performance on the internal medicine In-Training Examination was also influenced by burnout and measured quality of life [23]. Residents reporting quality of life “as bad as it can be” and emotional exhaustion symptoms daily had mean internal medicine In-Training Examination scores 2.7 points lower (99% CI, 1.2-4.3; P .001) and 4.2 points (99% CI, 2.5-5.9; P .001) than those with quality of life “as good as it can be” and no emotional exhaustion symptoms, respectively [23]. By the methodology of this study, causation cannot be determined, but the association is a starting point for questioning.

A study by Williams et al. in 2010 found high job stress led to decreased job satisfaction and decreased mental and physical health for physicians [24]. This resulted in feelings to withdraw from practice and less concern for patients [24].

Burnout studies focusing on surgery exist as well, but there are few. Campbell et al. studied burnout amongst graduates of University of Michigan surgical residencies, 1222 total, and members of the Midwest Surgical Association, 484 total [25]. Of those sampled, 44% responded, resulting in 582 actively practicing surgeons to analyze [25]. Interestingly, younger surgeons positively correlated with higher levels of burnout (r = −0.28, P <.01) [25]. Of actively practicing surgeons, 32% showed high levels (according to thresholds set in study) of emotional exhaustion, 13% showed high levels of depersonalization, and 4% had low levels of personal accomplishment [25]. The study also included pertinent negatives. Of note, burnout was not associated with caseload, practice setting, or percent of patients insured by a health maintenance organization [25].
Risk factors in the study included a sense that work was “overwhelming” \( (r = 0.61, P < .01) \), a perceived imbalance between career, family, and personal growth \( (r = -0.56, P < .01) \), perceptions that career was unrewarding \( (r = -0.42, P < .01) \), and lack of autonomy or decision involvement \( (r = -0.39, P < .01) \) \( [25] \). A desire to retire early and elements of burnout also came out as a strong association \( (r = 0.50, P < .01) \) \( [25] \).

A few burnout studies were performed specifically in orthopaedics. In 2007, Saleh et al. assessed burnout in 282 orthopaedic department chairs and reported 43% scored in the highest range for emotional exhaustion and 27% scored in the highest range for depersonalization \( [1] \). When asked how these feeling affected their lives, 70% of respondents indicated the stressors had a moderate to extreme impact. Interestingly, survey responses also suggested perceived job satisfaction had declined substantially over the previous five years, and there was anticipation that, in a year, the job satisfaction would decrease even further \( [1] \). Such data may imply the problem of burnout in orthopaedics is only getting worse.

In 2004, Sargent et al. conducted a burnout survey on 21 orthopaedic residents and 25 orthopaedic full time faculty \( [26] \). Residents reported substantial burnout, with a high level of emotional exhaustion and depersonalization and an average level of personal achievement, whereas faculty reported minimal burnout, showing a low level of emotional exhaustion, an average level of depersonalization, and a high level of personal achievement \( [26] \). A different study in 2009 by Sargent et al. revealed a similar trend, with high levels of burnout in 56% of residents and 28% of faculty \( [27] \).

One cannot draw a consensus statement from past studies on burnout in orthopedics, because of heterogenous methodologies. This is most likely due to a general
dearth of studies on physician burnout in the field of orthopedics, and brings attention to a need for more. One may conclude residents are more prone to burnout than attendings in orthopedics, which is mostly accepted as true in medicine in general.

Prior studies analyzing burnout in orthopaedics have limitations. Many studies analyzing burnout in orthopaedics assess for the prevalence of burnout, without using a targeted analysis on possible causes. Further, the potential linkage of work hours on burnout in orthopaedics has not been directly assessed. Finally, burnout has not been assessed along the full spectrum of the orthopaedist’s career. The current study targets possible protective factors for burnout in orthopaedics, incorporating control over life/schedule into analysis, a variable not yet assessed in orthopaedics burnout literature. The full hierarchy of medical training is also included in our study, from medical students to attendings, to assess the potential progression of burnout through the orthopaedic surgeon’s career.
Factors Influencing Physician Burnout

Statement of Purpose:

Hypothesis/Purpose:

The purpose of the current study is to assess burnout along the spectrum of an orthopaedist’s career, and to elucidate risk factors/ protective factors for burnout. We hypothesize residents will experience the highest level of burnout, and job satisfaction, home support, and control over life/schedule will be protective factors against physician burnout.

Study Design: Cross Sectional Study

Specific Aims:

1. To investigate physician burnout in the Department of Orthopaedics and Rehabilitation at Yale School of Medicine.

2. To assess burnout through an orthopaedist’s training, from medical student, to resident, to attending.

3. To assess risk factors and protective factors for physician burnout.
Factors Influencing Physician Burnout

Methods:

Survey

A survey was developed, optimized on trial subjects, and then anonymously administered to a convenience sample of medical students on surgical rotations, orthopaedic residents, and orthopaedic attendings at our institution between June 2019 and August 2019. The study was approved by our institutional Investigational Review Board.

The initial part of the survey inquired about demographics and general attributes. Demographic questions asked about age, gender, marital status, level of medical training (medical student, resident, or attending), and year in program. General attribute questions consisted of rating job satisfaction, home support, and control over life/schedule on a 1-5 scale (5 being most job satisfaction etc). The subsequent portion of the survey inquired about work hours. These were assessed in tabular form.

The survey then included the standardized aMBI which consists of 9 burnout questions, each rated on a 0-6 scale (6 being the most severe). Three questions ask about emotional exhaustion, three questions ask about feelings of depersonalization, and three questions ask about personal accomplishment.

Data analysis

When correlations were assessed for one variable vs another, such as total work hours across all academic levels, unpaired t-tests were used. Two tailed analyses were used, as directionality of findings were not known.
Factors Influencing Physician Burnout

When correlations were assessed between more groups, such as the correlation between emotional exhaustion and job satisfaction across medical students, residents, and attendings, ANOVA tests were used. For such ANOVA tests, Turkey’s multiple comparisons test was used to determine where significance existed within the comparisons.

To assess trends between variables across entire cohorts, linear regressions were used. For example, this was used to assess hours at work vs emotional exhaustion across all academic levels.

Alpha level was set at 0.05 for all statistical tests. Data was analyzed using Graphpad Prism Version 8.0.
Factors Influencing Physician Burnout

Results:

Demographics

In total, 24 medical students on surgical rotations, 20 orthopaedic residents, and 20 orthopaedic attendings completed the survey. Demographics of these groups are presented in Table 1.

The average (standard deviation) age of students was 26.5 (2.83) years old, residents 30.25 (3.58) years old, and attendings 52.47 (14.77) years old. The percent of females for students, residents, and attendings were 46%, 20%, and 20%, respectively. The percent married were 17%, 45%, and 85%, respectively.

Work Hours

Work hour results are shown in Table 2 and Figure 1. The mean (standard deviation) hours at work/week was 52.65 (17.24) hours for students, 71.30 (13.14) hours for residents, and 49.20 (10.34) hours for attendings (greatest for residents, p <0.0001).

Hours worked at home was not significantly different for students, residents, and attendings. The mean total work hours were 66.63 (20.68) for students, 80.38 (18.43) for residents, and 58.55 (14.83) for attendings (greatest for residents, p <0.0015).

General Attributes

Job satisfaction and home support were not significantly different between students, residents, and attendings (Table 2 and Figure 2). Control over life/schedule for students was 2.67 (1.24) out of 5, for residents was 2.25 (0.91) out of 5, and for attendings was 3.45 (1.10) out of 5 (greatest for attendings, p= 0.0036).
Factors Influencing Physician Burnout

*aMBI Scores*

Emotional exhaustion was not reported to be different between students, residents, and fellows overall (not statistically different, Table 2 and Figure 3). However, looking at specific emotional exhaustion questions, residents most frequently were emotionally drained from work, with 30% of residents experiencing this exhaustion at least “a few times a week”, while students most commonly experienced it once per week, and attendings once per month (Table 3). Students, residents, and attendings all felt tired waking in the morning, but residents experienced strain from working with people more often, with 20% of residents experiencing this once a week, while students/attendings experienced it a few times a year.

Depersonalization was found to be significantly higher for residents (7.10 [4.13]) than for students (3.63 [3.31], \( p=0.0073 \)) or attendings (3.25 [3.55], \( p=0.0042 \)) (Table 2 and Figure 3). Residents were also more likely to treat patients as if they were impersonal objects and become callous toward people (Table 3). Students, residents, and attendings, overwhelmingly cared what happens to patients all the time.

Personal accomplishment was found to be significantly higher for attendings (16.60 [1.39]) than for students (14.25 [2.85], \( p=0.0066 \)), but not significantly different than residents (15.30 [2.74]) (Table 2 and Figure 3). Residents and attendings were more likely to be able to deal effectively with their patient’s problems and to feel they were positively influencing other’s lives through their work (Table 3). All participants felt exhilarated after working closely with patients on a regular basis.
Cumulative Analysis

Taking all survey participants together, increased work hours positively correlated with greater depersonalization (p=0.0155) and greater personal accomplishment (p=0.0492), but not greater emotional exhaustion (Figure 4). When considering work hours within each training level, work hours vs burnout was not significant for any of the three metrics of burnout for attendings. The same is true for resident data. Interestingly, greater hours at work positively correlated with higher ratings of personal accomplishment for medical students (P = 0.0137).

In addition, incremental comparisons showed higher job satisfaction positively correlated with lower emotional exhaustion and higher personal accomplishment but not lower depersonalization (Figure 5).

Gender did not correlate with level of burnout in our study, with two notable exceptions. Considering all levels of training, females scored significantly higher for emotional exhaustion compared to males (p=0.0375). For resident data specifically, females also scored significantly higher for emotional exhaustion compared to males (P=0.0175).

Age did not significantly correlate with differences in burnout when assessing all training levels together, or either of the three training levels specifically.
Factors Influencing Physician Burnout

Tables:

Table 1: Demographics of those completing survey

<table>
<thead>
<tr>
<th></th>
<th>Student</th>
<th>Resident</th>
<th>Attending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size (n)</td>
<td>24</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Age (years [SD])</td>
<td>26.5 (2.83)</td>
<td>30.25 (3.58)</td>
<td>52.47 (14.77)</td>
</tr>
<tr>
<td>Year in Program (years [SD])</td>
<td>3.04 (0.20)</td>
<td>3.11 (1.41)</td>
<td>17.59 (14.60)</td>
</tr>
<tr>
<td>Female (n[%])</td>
<td>11 (46%)</td>
<td>4 (20%)</td>
<td>4 (20%)</td>
</tr>
<tr>
<td>Married (n[%])</td>
<td>4 (17%)</td>
<td>9 (45%)</td>
<td>17 (85%)</td>
</tr>
</tbody>
</table>

SD= standard deviation
Table 2: Work hours and results from the standardized aMBI survey*

<table>
<thead>
<tr>
<th></th>
<th>Student</th>
<th>Resident</th>
<th>Attending</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Work hours</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours at Work</td>
<td>52.65 (17.24)</td>
<td>71.30 (13.14)</td>
<td>49.20 (10.34)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hours at Home</td>
<td>13.98 (14.59)</td>
<td>9.08 (10.22)</td>
<td>9.35 (7.76)</td>
<td>0.2806</td>
</tr>
<tr>
<td>Total Work Hours</td>
<td>66.63 (20.68)</td>
<td>80.38 (18.43)</td>
<td>58.55 (14.83)</td>
<td>&lt;0.0015</td>
</tr>
<tr>
<td><strong>Overview questions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job Satisfaction (1-5)</td>
<td>4.00 (0.93)</td>
<td>4.30 (0.66)</td>
<td>3.80 (0.95)</td>
<td>0.1873</td>
</tr>
<tr>
<td>Home Support (1-5)</td>
<td>4.59 (0.59)</td>
<td>4.70 (0.47)</td>
<td>4.55 (0.60)</td>
<td>0.6816</td>
</tr>
<tr>
<td>Control Over Life/Schedule (1-5)</td>
<td>2.67 (1.24)</td>
<td>2.25 (0.91)</td>
<td>3.45 (1.10)</td>
<td><strong>0.0036</strong></td>
</tr>
<tr>
<td><strong>Standardized aMBI survey scores</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional Exhaustion (1-18)</td>
<td>7.54 (4.37)</td>
<td>9.50 (5.26)</td>
<td>8.40 (4.92)</td>
<td>0.4138</td>
</tr>
<tr>
<td>Depersonalization (1-18)</td>
<td>3.63 (3.31)</td>
<td>7.10 (4.13)</td>
<td>3.25 (3.55)</td>
<td><strong>0.0020</strong></td>
</tr>
<tr>
<td>Personal Accomplishment (1-18)</td>
<td>14.25 (2.85)</td>
<td>15.30 (2.74)</td>
<td>16.60 (1.39)</td>
<td><strong>0.0095</strong></td>
</tr>
</tbody>
</table>

* Values presented as mean(SD)

# All P-Values calculated using a one-way ANOVA test with alpha set at 0.05. Bold indicates statistical significance.
Factors Influencing Physician Burnout

### Table 3: Answers to aMBI

<table>
<thead>
<tr>
<th>Emotional Exhaustion Questions</th>
<th>Every day</th>
<th>A few times a week</th>
<th>Once a week</th>
<th>A few times a month</th>
<th>Once a month or less</th>
<th>A few times a year</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel emotionally drained from my work</td>
<td>R = 2 (8%)</td>
<td>S = 3 (13%)</td>
<td>R = 6 (30%)</td>
<td>A = 4 (20%)</td>
<td>S = 6 (25%)</td>
<td>R = 5 (25%)</td>
<td>A = 3 (15%)</td>
</tr>
<tr>
<td></td>
<td>S = 3 (13%)</td>
<td>R = 5 (25%)</td>
<td>S = 3 (13%)</td>
<td>R = 0 (0%)</td>
<td>A = 5 (25%)</td>
<td>S = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>S = 4 (17%)</td>
<td>R = 3 (15%)</td>
<td>S = 3 (13%)</td>
<td>R = 1 (5%)</td>
<td>A = 2 (10%)</td>
<td>S = 2 (8%)</td>
<td>A = 1 (5%)</td>
</tr>
<tr>
<td></td>
<td>S = 5 (21%)</td>
<td>R = 1 (5%)</td>
<td>S = 2 (8%)</td>
<td>R = 2 (10%)</td>
<td>A = 2 (10%)</td>
<td>S = 2 (8%)</td>
<td>A = 1 (5%)</td>
</tr>
<tr>
<td>I feel fatigued when I get up in the morning and have to face another day on the job</td>
<td>S = 0 (0%)</td>
<td>R = 1 (5%)</td>
<td>S = 1 (4%)</td>
<td>R = 3 (15%)</td>
<td>S = 2 (5%)</td>
<td>R = 2 (10%)</td>
<td>A = 1 (5%)</td>
</tr>
<tr>
<td></td>
<td>S = 2 (8%)</td>
<td>R = 6 (30%)</td>
<td>S = 2 (8%)</td>
<td>R = 1 (5%)</td>
<td>A = 2 (10%)</td>
<td>S = 2 (8%)</td>
<td>A = 2 (10%)</td>
</tr>
<tr>
<td></td>
<td>S = 3 (13%)</td>
<td>R = 3 (15%)</td>
<td>S = 3 (13%)</td>
<td>R = 3 (15%)</td>
<td>A = 3 (15%)</td>
<td>S = 3 (13%)</td>
<td>A = 2 (10%)</td>
</tr>
<tr>
<td></td>
<td>S = 4 (17%)</td>
<td>R = 3 (15%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 2 (10%)</td>
<td>S = 2 (8%)</td>
<td>A = 1 (5%)</td>
</tr>
<tr>
<td></td>
<td>S = 5 (21%)</td>
<td>R = 1 (5%)</td>
<td>S = 2 (8%)</td>
<td>R = 2 (10%)</td>
<td>A = 2 (10%)</td>
<td>S = 2 (8%)</td>
<td>A = 1 (5%)</td>
</tr>
<tr>
<td>Working with people all day is really a strain for me</td>
<td>S = 0 (0%)</td>
<td>R = 1 (5%)</td>
<td>S = 2 (8%)</td>
<td>R = 3 (15%)</td>
<td>A = 2 (10%)</td>
<td>S = 2 (8%)</td>
<td>A = 2 (10%)</td>
</tr>
<tr>
<td></td>
<td>S = 3 (13%)</td>
<td>R = 3 (15%)</td>
<td>S = 2 (8%)</td>
<td>R = 1 (5%)</td>
<td>A = 3 (15%)</td>
<td>S = 3 (13%)</td>
<td>A = 2 (10%)</td>
</tr>
<tr>
<td></td>
<td>S = 4 (17%)</td>
<td>R = 1 (5%)</td>
<td>S = 3 (13%)</td>
<td>R = 3 (15%)</td>
<td>A = 3 (15%)</td>
<td>S = 3 (13%)</td>
<td>A = 2 (10%)</td>
</tr>
<tr>
<td></td>
<td>S = 5 (21%)</td>
<td>R = 1 (5%)</td>
<td>S = 2 (8%)</td>
<td>R = 2 (10%)</td>
<td>A = 2 (10%)</td>
<td>S = 2 (8%)</td>
<td>A = 1 (5%)</td>
</tr>
<tr>
<td>I feel I treat some patients as if they were impersonal objects</td>
<td>S = 0 (0%)</td>
<td>R = 3 (15%)</td>
<td>S = 2 (8%)</td>
<td>R = 1 (5%)</td>
<td>A = 2 (10%)</td>
<td>S = 2 (8%)</td>
<td>A = 2 (10%)</td>
</tr>
<tr>
<td></td>
<td>S = 2 (8%)</td>
<td>R = 1 (5%)</td>
<td>S = 2 (8%)</td>
<td>R = 1 (5%)</td>
<td>A = 3 (15%)</td>
<td>S = 2 (8%)</td>
<td>A = 3 (15%)</td>
</tr>
<tr>
<td></td>
<td>S = 3 (13%)</td>
<td>R = 3 (15%)</td>
<td>S = 3 (13%)</td>
<td>R = 1 (5%)</td>
<td>A = 3 (15%)</td>
<td>S = 3 (13%)</td>
<td>A = 3 (15%)</td>
</tr>
<tr>
<td></td>
<td>S = 4 (17%)</td>
<td>R = 1 (5%)</td>
<td>S = 3 (13%)</td>
<td>R = 3 (15%)</td>
<td>A = 3 (15%)</td>
<td>S = 3 (13%)</td>
<td>A = 3 (15%)</td>
</tr>
<tr>
<td></td>
<td>S = 5 (21%)</td>
<td>R = 1 (5%)</td>
<td>S = 2 (8%)</td>
<td>R = 2 (10%)</td>
<td>A = 2 (10%)</td>
<td>S = 2 (8%)</td>
<td>A = 1 (5%)</td>
</tr>
<tr>
<td>I’ve become more callous toward people since I took this job</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>S = 1 (4%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>S = 1 (4%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>S = 2 (8%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>S = 2 (8%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>S = 3 (13%)</td>
<td>R = 0 (0%)</td>
<td>S = 2 (8%)</td>
<td>R = 4 (20%)</td>
<td>A = 1 (5%)</td>
<td>S = 3 (13%)</td>
<td>A = 1 (5%)</td>
</tr>
<tr>
<td></td>
<td>S = 4 (17%)</td>
<td>R = 2 (10%)</td>
<td>S = 2 (8%)</td>
<td>R = 2 (10%)</td>
<td>A = 1 (5%)</td>
<td>S = 4 (17%)</td>
<td>A = 1 (5%)</td>
</tr>
<tr>
<td></td>
<td>S = 5 (21%)</td>
<td>R = 2 (10%)</td>
<td>S = 3 (13%)</td>
<td>R = 2 (10%)</td>
<td>A = 2 (10%)</td>
<td>S = 5 (21%)</td>
<td>A = 2 (10%)</td>
</tr>
<tr>
<td>I don’t really care what happens to some patients</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td>Personal Accomplishment Questions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I deal very effectively with the problems of my patients</td>
<td>R = 12 (60%)</td>
<td>S = 8 (33%)</td>
<td>R = 6 (30%)</td>
<td>S = 5 (25%)</td>
<td>R = 1 (5%)</td>
<td>A = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>A = 17 (85%)</td>
<td>S = 2 (8%)</td>
<td>A = 3 (15%)</td>
<td>S = 1 (4%)</td>
<td>R = 2 (10%)</td>
<td>A = 2 (10%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td>I feel I’m positively influencing other people’s lives through my work</td>
<td>R = 14 (70%)</td>
<td>S = 8 (33%)</td>
<td>R = 6 (30%)</td>
<td>S = 2 (8%)</td>
<td>R = 1 (5%)</td>
<td>A = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>A = 15 (75%)</td>
<td>S = 2 (8%)</td>
<td>R = 1 (5%)</td>
<td>S = 1 (4%)</td>
<td>R = 2 (10%)</td>
<td>A = 1 (5%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td>I feel exhilarated after working closely with my patients</td>
<td>R = 4 (20%)</td>
<td>S = 7 (29%)</td>
<td>R = 3 (15%)</td>
<td>S = 2 (8%)</td>
<td>R = 0 (0%)</td>
<td>A = 2 (10%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>A = 7 (35%)</td>
<td>S = 11 (46%)</td>
<td>R = 3 (15%)</td>
<td>S = 1 (4%)</td>
<td>R = 0 (0%)</td>
<td>A = 2 (10%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>A = 8 (40%)</td>
<td>S = 3 (13%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>A = 10 (50%)</td>
<td>S = 2 (8%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
<tr>
<td></td>
<td>A = 2 (10%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>S = 0 (0%)</td>
<td>R = 0 (0%)</td>
<td>A = 0 (0%)</td>
<td>A = 0 (0%)</td>
</tr>
</tbody>
</table>

*S = Students. R = Residents. A = Attendings. The format is as follows “xx (%)”, where “xx” represents the number of responses for that question for that group (S, R, or A), and “(%)” represents the number of responses for that question for that group as a percentage.*
Factors Influencing Physician Burnout

For each question, the answer with the highest response for students, residents, and attendings was bolded, respectively. In the case of a tie, both answers were bolded.
Factors Influencing Physician Burnout

Figures:

Figure 1: Work Hours

Figure 1A-C. Depicts a bar graph illustrating A) hours at work, B) hours at home, and C) total work hours compared across medical students, residents, and attendings. The Y-axis represents hours worked. The X-axis represents the different stages of medical training analyzed in this study. For each figure, the difference in means between the three groups was determined with a one way ANOVA test. * represents significance based on an alpha level of 0.05. NS means there were no significant differences found between means.
Factors Influencing Physician Burnout

Figure 2: Overview Questions

A bar graph that depicts how A) job satisfaction, B) home support, and C) control over life/schedule differ for medical students, residents, and attendings. The Y-axis represents survey ratings on Job Satisfaction, Home Support, and Control Over Life/Schedule, scored 1-5. The X-axis represents the different stages of medical training analyzed in this study. For each figure, the difference in means between the three groups was determined with a one-way ANOVA test. * represents significance based on an alpha level of 0.05. NS means there were no significant differences found between means.
Figure 3A-C. A bar graph that depicts how A) emotional exhaustion, B) depersonalization, and C) personal accomplishment differ for medical students, residents, and attendings. The Y-axis represents survey ratings for the three burnout metrics on the aMBI, scored 1-18. The X-axis represents the different stages of medical training analyzed in this study. For each figure, the difference in means between the three groups was determined with a one-way ANOVA test. * represents significance based on an alpha level of 0.05. NS means there were no significant differences found between means.
Figure 4: Hours at Work vs Burnout (All Academic Levels)

Figure 4A-C. A linear regression that depicts how hours at work correlates with A) emotional exhaustion, B) depersonalization, and C) personal accomplishment across all academic levels. The Y-axis represents survey ratings for the three burnout metrics on the aMBI, scored 1-18. The X-axis represents hours at work. For each figure, the difference in means between the three groups was determined with a one-way ANOVA test. * represents significance based on an alpha level of 0.05. NS means there were no significant differences found between means.
Figure 5: Job Satisfaction vs Burnout (All Academic Levels)

Figure 5A-C. A bar graph that depicts how job satisfaction correlates with A) emotional exhaustion, B) depersonalization, and C) personal accomplishment across all academic levels. The Y-axis represents survey ratings for the three burnout metrics on the aMBI, scored 1-18. The X-axis represents survey ratings on Job Satisfaction, scored 1-5. For each figure, the difference in means between the three groups was determined with a one-way ANOVA test. * represents significance based on an alpha level of 0.05. NS means there were no significant differences found between means. One-way ANOVA tests were done between the three metrics of burnout and Home Support, and the three metrics of burnout and Control Over Life/Schedule, each yielding an insignificant result.
Discussion:

Burnout is critical to manage for medicine in general, and surgical fields such as orthopaedics in particular. This topic is garnering increasing attention and is needed to help limit its occurrence and consequences. To our knowledge, this is the first study to look at metrics of and potential contributors to burnout across three different levels of training in orthopaedics using the validated aMBI [2, 16, 28-32].

Total work hours were highest for residents, driven by the hours at work. The average reported for this group was an average of 71.30 hours/week at work, and 80.38 hours/week if including the hours at home. This suggests that all of the allowable 80 hours of work per week are being done, but does not rule out that there could be errors with reporting.

Control over life/schedules was found to be greatest for attendings. This is not a surprise, as there is typically increasing independence as one advances in their career. It was interesting that job satisfaction and home support did not differ for students, residents, and attendings.

We ultimately found residents experienced significantly higher levels of depersonalization, and depersonalization positively correlated with more hours worked per week. This supports the notion that more hours worked contributes to burnout, and poor patient outcomes, corroborating the ACGME restriction on duty hours [2].

Personal accomplishment increased in our study with increased level of training, a finding consistent with previous studies of residents and attendings [33]. It is possible more senior members of the orthopaedic team are able to dedicate more time toward patient care, or are more practiced in documenting efficiently and can thus dedicate more
Factors Influencing Physician Burnout

time to fulfilling clinical tasks. It is interesting hours worked positively correlated with personal accomplishment. This is likely due to the increase in personal accomplishment from medical student to resident, along with the increased work hours with this transition.

Taking all survey participants together, increased work hours positively correlated with greater depersonalization and personal accomplishment, but not emotional exhaustion. Interestingly, longer work hours positively correlated with higher personal accomplishment for medical students specifically. It is possible medical students work longer hours because of the wonder and novelty in their jobs, while longer hours for residents have a negative effect.

Increased depersonalization with increased work hours is a worrisome finding. As Halbesleben et al. discovered in 2008, the depersonalization metric of physician burnout on the Maslach Burnout Inventory predicted lower patient satisfaction post treatment and longer post discharge recovery time [6]. Depersonalization being highest for residents (p=0.0020) and residents working the most hours (p <0.0001), may be a dangerous cocktail for patient outcomes. Intuitively, it makes sense residents experience more medical errors than attendings in orthopedics, but to our knowledge, a study has not been done to officially compares rates.

We found a higher degree job of satisfaction trended toward lower emotional exhaustion and higher personal accomplishment, supporting the theory burnout presents heterogeneously with factors interacting dynamically. More concretely, Strauss et. al. found orthopaedic in-training examination scores were lower for residents who reported symptoms of burnout [34]. Specifically, all orthopaedic surgery residents (62) at a large institution were included in the study [34]. After controlling for general test taking ability
by using Step 1 and Step 2 United States Medical Licensing Examination scores, the authors found emotional exhaustion, depersonalization, and lower feelings of personal accomplishment all positively correlated with lower orthopaedic in-training examination scores [34].

Although control over life/schedule did not positively correlate with metrics of burnout, it was close, with a p-value of 0.08. Future studies may find a significant result between control over life/schedule and burnout with a bigger sample size. This prediction is supported by the results found by Campbell et al. in 2001. With a sample size of 582, and thus more statistical power, the authors detected a significant effect of autonomy/decision involvement for predicting burnout in surgery residents and practicing surgeons in the area (r = −0.39, P <.01) [25].

The relationship between work hours and burnout has been observed in every surgical field [28, 30, 31, 35-38]. With the finding in the current study of increased depersonalization and longer work hours for residents, one might suggest duty hours should be further restricted. Many cringe at the thought, and there is good reason to believe aspects of long work hours are beneficial for surgical training. If duty hours are not going to be reduced further, other strategies to decrease burnout can be implemented, such as aiming to increase job satisfaction in residents. Our finding that residents work the most time in the hospital is consistent with the historical norms of a surgical residency. Of note this number is lower than the 88 hours a similar burnout survey study reported fifteen years earlier [27]. Recent literature draws attention to the possible increase in hours spent working with electronic medical records and the detrimental effect they have on the productivity of orthopaedic practitioners in the clinic [39, 40].
A study done in 2016 by Sinsky et al. attempted to quantify the time physicians spend on different tasks. Using orthopaedic surgeons, and three other specialties, the authors used 57 physicians dispersed throughout 4 states to analyze the proportion of time spent on four activities (direct clinical face time, electronic health record time, administrative tasks, and other tasks) [41]. Just over one fourth of time spent at work (27%) was allocated to direct clinical face time with patients, while time at the electronic health record was 49.2%, just shy of half of the time spent at work [41]. Furthermore, even while in the examination room with patients, over one third of the time (37%) was spent on the computer while only 52.9% of time was spent on direct clinical face time [41]. How this data compares to time spent doing desk work (hand writing notes, hand writing orders and prescriptions, locating and organizing imaging, paper records, laboratory reports) for physicians before the onset of the electronic health record is uncertain [42]. Regardless if these numbers are statistically significant relative to pre-EHR, the absolute figures are staggering.

The concept of increased clerical burden now relative to past years of medical practice is not limited to charting in the EHR. Administrative work in general, including documentation, paperwork, coding, and billing, has increased substantially in recent years [43]. A study by Block et al. found medicine interns spend more than 40% of their time on administrative work, and only 12% of their time directly interacting with patients [43, 44].

These ideas are supported by a number of large medical organizations in recent years. A position paper by the American College of Physicians was recently published titled “Putting Patients First by Reducing Administrative Tasks in Health Care,” arguing
Factors Influencing Physician Burnout

for more patient directed care and less administrative tasks for physicians [43, 45]. A position paper recently released by the National Academy of Medicine also asked for more investigation on how work environment and healthcare delivery organization are linked to rising rates of burnout [43, 46]. Similarly, the American College of Radiologists recently addressed burnout in their society journal by advocating to reshape radiologist work flow rather than radiologists themselves [43, 47].

In addition to potentially increased clerical burden with the onset of the EHR, physicians are facing numerous other obstacles now not present in the past. The current physician must navigate a substantially larger medical knowledge base than in the past, one that is growing exponentially [42]. Because of patient portals like MyChart, physicians are more reachable at all hours of the day than ever before. In addition, unparalleled metrics of inspection into physician’s job performance are emerging like patient satisfaction scores, quality metrics, and transparency of cost [42].

Methods to reduce physician burnout are critical. In 2017, Busireddy et al. attempted to gather meaningful data on interventions to attenuate physician burnout. This meta-analysis studied 19 manuscripts (6 randomized controlled trials and 13 cohort studies) and 2030 residents cumulatively [48]. In these trials, 12 interventions were included in analysis, 9 of which analyzing the 2003 and 2011 ACGME restriction in duty hours [48]. The results of the 2017 study were enticing, and supportive of the data observed in the current study. Restricting work hours positively correlated with a lower score (mean difference, −2.73; 95% confidence interval (CI) −4.12 to −1.34; P < .001) and lower odds ratio for residents measuring emotional exhaustion (42%; OR = 0.58; 95% CI 0.43–0.77; P < .001), a significant reduction in depersonalization score (−1.73;
95% CI −3.00 to −0.46; P = .008), with no significant impact on personal accomplishment (0.93; 95% CI −0.19–2.06; P = .10) [48].

In 2008 McCray et al. attempted to identify interventions for physician burnout through a comprehensive meta-analysis. The authors systematically evaluated the literature using MEDLINE and PubMed databases using a vast range of articles published between 1966 and 2007 [49]. The Strength of Evidence Taxonomy, from level A, the highest, and level C, the lowest, was used to assess the quality of research reviewed [49]. Ultimately only 9 of the studies reviewed were included in analysis, two being randomized controlled trials [49]. A number of interventions were integrated into the reviewed literature including stress management/coping training either alone or in various combinations, workshops, didactic sessions, resident assistance programs, support groups, and self-care interventions [49]. According to the methodology inherent with the Strength of Evidence Taxonomy, none of the analyzed interventions met level A threshold [49]. Such evidence is bleak, but further investigation into interventions against physician burnout yield more hopeful results.

One study included in the meta-analysis by Martins et al. found self-care workshops effective in reducing the depersonalization component of the MBI scale [48, 50]. The self-care workshops concentrated on discussing detrimental effects of burnout on professional activity, the recognition of risk factors for burnout, and tools to cope with burnout [48, 50]. Depersonalization decreased in association with self-care workshops in this manuscript, but the other metrics of burnout in the MBI were unaffected [48, 50]. With depersonalization being highest for residents in the current study, residents working
the longest hours, and work hours correlating with higher levels of depersonalization, self-care workshops may be a promising intervention at the orthopaedic resident level.

Another study included in the meta-analysis, by Vendeloo et al., focused on peer relationships to alleviate physician burnout in orthopedic residents [48, 51]. A significant association was found when investigating interventions aimed at improving peer relationships and the balance between personal and professional life [48, 51].

Most efforts to improve burnout concentrate on improving individual’s resilience to stress [43]. However, reducing a stressful work environment is just as critical, if not more critical a tactic to reduce physician burnout than increasing physician’s ability to handle stress [43]. Squiers et al. uses an interesting analogy in one of his commentary articles. He compares physician burnout to a ship riddled with holes, filling with water [43]. Increasing physician’s resilience to stressful stimuli is like putting all efforts into bailing out water with buckets, whereas addressing the systemic causes of burnout (like increasing administrative demand) is like plugging the holes of the ship [43]. As shown in the current study, job satisfaction is a reliable protective factor against burnout, corroborating with Squiers et al. in that improving work conditions may be the best route to address physician burnout. Most of the failed interventions in the study by McCray et al. also are individual level directed (like self-care workshops) which all proved insignificant protectors of burnout [49].

Exploiting the relationship between depression and physician burnout, and utilizing the massed knowledge of spotting and diagnosing occupational depression is also a promising avenue. For one, classifying depression is more agreed upon and clinically validated [52]. Depending how burnout is classified, the prevalence can range
Factors Influencing Physician Burnout

dramatically. A study in 2016 on general surgery residents measured burnout prevalence to be between 10% and 69% depending how burnout is defined [52, 53]. Diagnosing depression involves subjectivity as well, but has a more concrete, agreed upon definition, and more history of diagnosis and treatment than burnout in isolation.

The issue of physician burnout becomes even more pressing with the current corona virus (COVID 19) pandemic. When the pandemic first hit, Wu et al. investigated the effects of COVID on physicians in China, at a time when China was the hub of infection for the virus [54, 55]. The study used the MBI to study 220 physicians and found that nearly a quarter of participants experienced increased emotional exhaustion and depersonalization, and nearly half of participants experienced decreased personal accomplishment [54, 55].

Another 2020 study by Guisti el al. in Italy also assessed levels of burnout in health care professionals due to COVID using the MBI [54, 56]. Using an online survey, 330 health care professionals participated [54, 56]. Over two thirds of participants had moderate or severe levels of emotional exhaustion [54, 56]. Just under a quarter of participants had moderate or severe levels of depersonalization [54, 56]. Just under three quarters of participants had moderate or severe levels of reduced personal accomplishment [54, 56].

A 2021 cross sectional study by Baptista et al investigated the effects of COVID 19 on primary care physicians between May and June of 2020 [57]. The study used the Copenhagen Burnout Inventory (CBI), the Resilience Scale, and the Depression, Anxiety, and Stress Scales (DASS-21) to assess levels of burnout in this primary care cohort in Portugal [57]. Elevated levels of burnout were found for personal burnout (65.9% of
Factors Influencing Physician Burnout

Participants), work related burnout (68.7% of participants), and patient related burnout (54.7% of participants) [57]. Increased levels of depression positively correlated with increased levels of the three burnout dimensions compared to normal: personal burnout (OR = 4.76; 95% CI = [1.83; 12.4]; P = .001), work-related burnout (OR = 4.79; 95% CI = [1.82; 12.66]; P = .002), and patient-related burnout (OR = 3.33; 95% CI = [1.67; 6.64]; P = .001) [57]. Similar results were found between increased anxiety and increased burnout in the study. It appears burnout is only becoming a more pressing issue in the era of COVID 19.

This study has several limitations. Firstly, while the surveys were anonymous, it is possible residents were reluctant to report working more than the limit of 80 hours. Secondly, the medical students surveyed were on surgical rotations which spanned a variety of surgical specialties, not just orthopaedics. Medical student’s interests are capricious this early in their training, and may not be indicative of their future career. Similarly, the residents surveyed were on a mix of services at the time of completion. This study was conducted at a single large tertiary academic institution in the Northeast, and our conclusions may differ for other geographic, educational, and practice settings. Analyzing burnout at multiple sites has many advantages such as a larger sample size and diversity in culture. However, one of the main focuses of this study is to isolate the changes in burnout based on rank, which is more easily isolated at a single institution. Using multiple institutions brings up a host of confounding factors in this regard including institutional culture, mental health resources and support, and geographic location. We hope this study can function as a pilot for further burnout studies at other locations, with more robust sample sizes.
Factors Influencing Physician Burnout

On a similar note, our study did not compare burnout levels amongst different subspecialties within orthopaedics, which is an interesting point of analysis in future iterations. Assessing burnout over multiple time points in time may also yield interesting trends. To augment this sentiment, the survey assessed burnout over an entire week, to avoid daily mercurial sentiments. Lastly, select previous studies on physician burnout stratify burnout into categories like “low, medium, and high” [48, 50]. The aMBI was not created in a way to stratifying burnout levels, as it is meant to consider burnout along a heterogenous, changing spectrum, so comparing rank based on burnout level was not done in our study.

Based on this pilot study, there is promising direction for future studies/iterations. Burnout was assessed in medical students, but if the level of burnout experienced on surgical rotation differed from other rotations, or if level of burnout influenced career choice, was not assessed. Also, this study did not observe a difference in burnout based on age and gender, but future studies with larger sample sizes may yield interesting results analyzing such demographics.

In summary, residents reported the longest work hours and greatest depersonalization. Attendings reported the highest control over life/schedule and sense of personal accomplishment. With work hours correlating with depersonalization and personal accomplishment, continuing to focus on these factors seems important. However, job satisfaction correlating with lower levels of burnout presents an alternative avenue to decrease burnout, without changing duty hour restrictions for residents. Implementing strategies to increase job satisfaction for residents, for instance with more
resident appreciation events, may bring down levels of burnout for residents without changing hours worked.

Burnout is clearly a key topic which needs attention in orthopaedics, with job satisfaction correlating with lower emotional exhaustion and a higher sense of personal accomplishment. In the post COVID-19 era, this will only be more critical to acknowledge. Burnout needs to continue to be addressed for the well-being of our profession.
Factors Influencing Physician Burnout

References:

Factors Influencing Physician Burnout


Factored Influencing Physician Burnout


46. Dyrbye, L.N., et al., Burnout among health care professionals: a call to explore and address this underrecognized threat to safe, high-quality care. NAM perspectives, 2017.


Factors Influencing Physician Burnout


