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Beyond burnout: a four-year survey of osteopathic medical student mental health and the implications for the development of wellness and mental health programs

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Abstract

Context: The mental health crisis in medicine cannot be explained by burnout alone. Physicians are not immune to this crisis and are known to have higher rates of suicide and depression than the general population. A high prevalence of mental health symptoms has been observed in early medical training.

Objectives: This study was completed to characterize medical students' mental well-being and provide guidance for timely intervention.

Methods: An annual prospective, voluntary, anonymous, cross-sectional survey of medical students was completed over a 4-year period in medical school from 2016 to 2019. The survey was created based on standardized psychiatric screening tools assessing symptoms of depression, anxiety, burnout, and sleep problems. In each of those years, 1,257 (2016), 1,254 (2017), 1,221 (2018), and 1,220 (2019) enrolled students, respectively, were invited to participate. Data on students' mental health were analyzed in relation to their year of school separately for each survey year utilizing SAS 9.4.

Results: A total of 973 students in 2016, 889 students in 2017, 547 students in 2018, and 606 students in 2019 participated in the study. For depression and burnout subscales, an increase in symptom scores were observed every survey year (2016, 2017, 2018, and 2019) by the second or third year of medical school with a clinically significant effect size. Persistently high levels of anxiety were observed throughout medical school, with significant increases after the first year noted in the 2016 and 2017 surveys, but not in the 2018 or 2019 surveys. Similarly, significant changes in sleep disturbance were found in the 2016 and 2017 surveys, but not in 2018 or 2019.

Conclusions: Symptoms of burnout, depression, and anxiety were observed throughout all four years of medical school, with increases starting after the first year. Early intervention is needed to support students' mental health and increase access to care and resources.

Keywords: burnout; medical student anxiety; medical student depression; medical student mental health; medical student wellness.

Physicians and medical students who experience loss of meaning in their work accompanied by mental health symptoms are often told that they are experiencing burnout. Burnout is a work-related syndrome characterized by emotional exhaustion, cynicism and depersonalization, and reduction in personal accomplishment and effectiveness [1]. Burnout is associated with lower overall empathy and decreased professionalism in medical students, residents, and faculty [2]. Although many suspect that burnout is a risk factor for psychiatric illness and suicide, the true nature of the relationship remains unclear [3]. A 2019 systematic review and meta-analysis by Koutsimani et al. [4] found that there is “no conclusive overlap between burnout and depression and burnout and anxiety, indicating that they are different and robust constructs.” According to The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, “A mental disorder is a syndrome characterized by

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clinically significant disturbance in an individual's cognition, emotion regulation, or behavior that reflects a dysfunction in the psychological, biological, or developmental processes underlying mental functioning" [5]. Acknowledgement of burnout is critical, but it should be differentiated from treatable psychiatric disorders such as depressive and anxiety disorders, which place the individual at risk for suicide. If all mental health symptoms are misinterpreted as burnout, we will miss the opportunity to recognize mental health symptoms that may be an indication of a treatable psychiatric condition.

Untreated psychiatric illness is a major risk factor for suicide, and more than 90% of suicide victims have a psychiatric disorder [6]. Overall, suicide is one of the top nine leading causes of death in the United States and second leading cause of death among individuals 10 to 14 and 25–34 years old and is the third leading cause of death for ages 15–24 years old [7]. Compared to the general population, physician suicide statistics are staggering. According to the 2012 to 2016 National Violent Death Reporting System, physicians have death rates from suicide that are comparable to the general populations; female physicians, however, appear to have higher rates than female non-physicians [8]. A previous meta-analysis indicates that the suicide rate among male physicians is 1.41 times higher than the general male population, and the rate among female physicians is 2.27 times greater than the general female population [9]. Like the general population, the prevalence of physician suicide rates have increased from 2003 to 2017 [10]. Although rates of physician suicide are increasing, the onset of psychiatric symptoms and suicidal ideation during medical training has not yet been delineated. Prior studies have revealed that compared to the general population, burnout and depressive symptoms are more prevalent among medical students and may progress through medical school [11, 12]. A 2021 meta-analysis indicated that the main risk factors for suicidal ideation and suicide in the medical student population include depression, burnout and comorbid psychiatric conditions, and stress [3]. A study examining factors that contribute to suicide have shown that job dissatisfaction and/or suffering from a known mental health disorder significantly increases the risk of physician suicide [13]. The high rates of depression and suicide in the medical profession should thrust the conversation to move beyond burnout toward the identification and treatment of psychiatric symptoms in the individual.

In light of the recent pandemic and growing evidence that physicians have a significant risk of developing psychiatric symptoms during their professional training, efforts aimed at early identification of psychiatric symptoms may

help us to intervene, ameliorate, and ultimately prevent devastating outcomes. To gauge the mental health of the student body, a survey guided by the concepts in standardized psychiatric inventories was created and distributed to the entire medical student body over the course of 4 years. The aim of our study was to better understand the emergence and prevalence of burnout and psychiatric symptoms in osteopathic medical students.

Methods

Study design

The Medical Student Mental Health Committee (MSMHC) was created in 2015 at the Michigan State University College of Osteopathic Medicine, with the goal of improving access to care and resources available to students, and ultimately increasing awareness and decreasing stigma related to mental health problems. The MSMHC created a survey with the aim of characterizing symptoms and risk factors that students experience in medical school. The study was not funded. The survey was initially considered mandatory, but anonymous. After the initial survey was completed in 2016, MSMHC felt that the result was not only valuable for the development of resources, curricula modification, and improvement, but it also provided insight into the mental health of those in the medical profession as a whole. The survey was then submitted to the Michigan State University Institutional Review Board (IRB) for approval. The IRB required that students had the ability to consent to their information being utilized; therefore, the survey was changed to voluntary for the subsequent years (2017–2019) of distribution. An IRB exemption was granted allowing use of the 2016 survey data. Data on mental health symptoms of first-, second-, third-, and fourth-year medical students in each survey year (2016, 2017, 2018, and 2019) were analyzed in this study.

Participants

All enrolled medical students were eligible to participate in the survey each year. The participants were not compensated. Totals of 1,257 in Fall 2016, 1,254 in Fall 2017, 1,224 in Fall 2018, and 1,228 in Fall 2019 were invited to complete the yearly survey.

Survey

The survey (Appendix A) was created by the authors, including a board-certified psychiatrist and medical student, utilizing standardized screening inventories as a guide [14–17]. No specific questions were utilized from the screening tools, but the constructs of depression, anxiety, sleep problems, and burnout were identified *a priori*, and the items were selected to reflect each question constructed based on the authors' subject matter expertise. There were no preliminary reliability or validity analyses conducted on the survey, which was revised after 2016 to enable the survey to be voluntary. The survey was not intended to be diagnostic due to the inability to identify study participants if acute safety concerns were revealed. The students were notified via email of the assigned survey, which was available for a

2-week period every fall semester on the Michigan State University online educational platform. To standardize response time, students were allowed to complete the survey at their leisure. Most questions asked, “Since the start of medical school, how often have you been bothered by the following?” and then listed various symptoms related to mental health and wellness. The survey included over 40 multiple-choice or short-answer questions focused on symptoms of depression, anxiety, burnout, sleep, and eating habits. Additional questions were added to the Fall 2017 to 2019 surveys to determine the extent of mental health conditions prior to medical school and whether they worsened during medical school. Qualitative short-answer questions asked whether they needed help for mental health concerns and, if so, why they failed to seek help. Students were also asked if they knew where to seek help and what resources were available. Students were notified that their responses would be anonymous and were provided with a link to the Office of Personal Counseling and Health Promotion’s mental health resource page, which listed various resources (24-h crisis numbers, emergency services, the college mental health team, campus resources, and community resources). For 2017 to 2019 surveys, students could choose to opt out and have their responses removed from the data pool and analysis.

Outcome measures

The survey was constructed utilizing a Likert scale with “never, rarely, sometimes, often, or always” options, yes/no answers, and multiple response questions (i.e., “check all that apply”). Items were grouped into four constructs (subscales of the survey): depression (7 items), anxiety (7 items), sleep problems (4 items), and burnout (13 items) (Table 1). The depression subscale was comprised of questions focused on mood, anhedonia, hope, excessive crying, guilt, irritability, and decreases in energy. The anxiety subscale included questions on concentration, control, worrying, trouble relaxing, future orientation, and appetite. The sleep subscale contained questions regarding difficulty with sleep, average hours slept, feeling refreshed in the morning, and the need for medications for sleep. Sleep was quantified into 8+ hours, 6–8 h, 4–6 h, and less than 4 h. The burnout subscale focused on questions relating to failure, giving-up, feeling broken down, exhausted, tired, insensitive, lacking achievement, pressure, having more work than is achievable, being in the wrong profession, unappreciated, disappointment, and others are problem-free. For each subscale separately, items were subjected to an exploratory factor analysis to determine dimensionality. Because there was a single eigenvalue greater than 1 for each subscale, and the remaining eigenvalues were much smaller than the first in magnitude, each subscale was deemed unidimensional, and a single summary score (mean across items, range 0–4) was created for each construct. For each survey year, the internal consistency reliability (Cronbach’s alpha) was excellent (>0.85 across four survey years) for depression, burnout (>0.91), and anxiety (>0.89). For sleep, it was lower (0.59–0.64 across survey years) but acceptable given that the sleep scale had only 4 items.

Data management and statistical analysis

The data for the 4 survey years included data from some of the same individuals, but due to the deidentified voluntary nature of the survey, longitudinal analysis was not possible. Longitudinal analyses require

identification of repeated measures of the same individual across time, which was not possible due to the de-identified nature of the survey. Combining data from all survey years into one, without specification of the random effect for nesting of repeated measures within the individual, would have resulted in incorrect standard errors (SEs). Therefore, survey data from 2016, 2017, 2018, and 2019 were analyzed separately. The scores for the subscales were summarized utilizing descriptive statistics and Pearson correlations among subscale scores. Analyses of variance (ANOVA) were utilized to relate depression, anxiety, burnout, and sleep problems subscale scores to student class (first, second, third, or fourth year). If significant differences among the four classes were indicated by the ANOVA, pairwise comparisons of classes were performed utilizing Bonferroni adjustment for multiple comparisons (alpha level of 0.008). To facilitate interpretation of the magnitude of differences by class, Cohen’s *d* effect size was calculated as the difference between means of two classes divided by the pooled standard deviation. All analyses were performed utilizing SAS 9.4 [18].

Results

A total of 973 students in 2016 (77.4% out of 1,257 invited), 889 students in 2017 (70.9% out of 1,254 invited), 547 students in 2018 (44.7% out of 1,224 invited), and 606 students in 2019 (49.7% out of 1,220 invited) participated in the study (Table 2). Correlations among depression, burnout, and anxiety scores were strong (>0.70) in all survey years. Correlations between these three construct scores and sleep were moderate to strong and ranged from 0.57 to 0.60 in 2016, from 0.60 to 0.64 in 2017, from 0.56 to 0.58 in 2018, and from 0.57 to 0.60 in 2019. The mean subscale scores and their SEs for each student class and survey year are presented in Table 3.

Depression subscale

The striking number of medical students in our study endorsed depressive symptoms (37.7–77.6%). The overall differences for the mean depression subscale scores among student classes were statistically significant in 2016 ($F[3, 908]=14.87$, $p<0.0001$), in 2017 ($F[3, 879]=24.46$, $p<0.0001$), in 2018 ($F[3, 542]=4.24$, $p=0.01$), and in 2019 ($F[3, 602]=2.74$, $p=0.04$). Utilizing the Bonferroni adjustment, in 2016 and 2017, first-year students had statistically significantly lower depressive symptoms compared to students from the three other classes. In 2018 and 2019, first-year students had significantly lower depressive symptoms compared to third-year students. None of the other pairwise differences were statistically significant when controlling for multiple comparisons. A common finding from all surveys was that depressive symptoms were higher for second- or third-year

Table 1: Mental health questions as subscale constructs.

Depression construct questions		
Since the start of medical school, how often have you been bothered by the following?	Feeling down or depressed	Never, rarely, sometimes, often, or always
Since the start of medical school, how often have you been bothered by the following?	Little interest or pleasure in doing things	
Since the start of medical school, how often have you been bothered by the following?	Feeling discouraged or hopeless about the future	
Since the start of medical school, how often have you been bothered by the following?	Crying more than usual	
Since the start of medical school, how often have you been bothered by the following?	Feeling guilty	
Since the start of medical school, how often have you been bothered by the following?	Feeling tired, low in energy, or slowed down	
Since the start of medical school, how often have you done the following?	Become easily annoyed or irritable	
Anxiety construct questions		
Since the start of medical school, how often have you been bothered by the following?	Trouble concentrating or making decisions	Never, rarely, sometimes, often, or always
Since the start of medical school, how often have you been bothered by the following?	Feeling nervous, anxious, or on edge	
Since the start of medical school, how often have you been bothered by the following?	Not being able to control my worrying	
Since the start of medical school, how often have you been bothered by the following?	Worrying too much about multiple things	
Since the start of medical school, how often have you been bothered by the following?	Trouble relaxing	
Since the start of medical school, how often have you been bothered by the following?	Feeling afraid that something awful might happen	
Since the start of medical school, how often have you been bothered by the following?	Worrying to the extent that I lost appetite or overate	
Sleep construct questions		
Since the start of medical school, how many hours of sleep do you get per night on average?	8+ hours, 6–8 h, 4–6 h, or less than 4 h	Never, rarely, sometimes, often, or always
Since the start of medical school, how often have you been bothered by the following?	Trouble falling asleep or staying asleep, or sleeping too much	
Since the start of medical school, how often have you been bothered by the following?	Wake up feeling unrefreshed	
Since the start of medical school, how often have you done the following?	Take anything (e.g., medication, alcohol, etc) to help sleep	
Burnout construct questions		
Since the start of medical school, how often have you been bothered by the following?	Feeling disappointed in myself, feelings of failure, or I have let myself or my family down'	Never, rarely, sometimes, often, or always
Since the start of medical school, how often have you been bothered by the following?	Feeling like giving up or think "I can't take it anymore"	
Since the start of medical school, how often have you been bothered by the following?	Feeling like medical school is breaking me down	
Since the start of medical school, how often have you been bothered by the following?	Feel physically or emotionally exhausted	
Since the start of medical school, how often have you been bothered by the following?	Feel tired when I get up in the morning and have to face another day of school	
Since the start of medical school, how often have you been bothered by the following?	Have become more insensitive to people	

Table 1: (continued)

Since the start of medical school, how often have you been bothered by the following?	Feel like I am achieving less than I should
Since the start of medical school, how often have you been bothered by the following?	Feeling an unpleasant level of pressure to succeed
Since the start of medical school, how often have you been bothered by the following?	Feel that there is more work to do than I can practically handle
Since the start of medical school, how often have you been bothered by the following?	Feel like I am in the wrong profession
Since the start of medical school, how often have you been bothered by the following?	Feel unappreciated or misunderstood
Since the start of medical school, how often have you been bothered by the following?	Feel like I am not getting what I want out of medical school
Since the start of medical school, how often have you been bothered by the following?	Feel like everyone else is problem-free except for me

Table 2: Number of responses per survey year and year of medical school.

Survey year	First years	Second years	Third years	Fourth years	Total and percent out of invited
2016	322	298	165	188	973/1,257 (77.4%)
2017	223	235	224	201	889/1,254 (70.9%)
2018	205	141	121	80	547/1,224 (44.7%)
2019	164	182	167	93	606/1,220 (49.7%)

students compared to first-year students. The effect size for the differences between the first- and second-year students in 2016 was $d=0.43$. In 2017, the difference between the year 1 and year 2 students corresponded to the effect size $d=0.73$. The difference between year 1 and 3 students corresponded to $d=0.36$ in 2018 and $d=0.25$ in 2019.

Anxiety subscale

The majority of students in our survey acknowledged anxiety symptoms (67.0–88.2%).

The overall differences among student classes were statistically significant in 2016 ($F[3, 906]=6.80$, $p=0.0002$), in 2017 ($F[3, 879]=9.67$, $p<0.0001$), but not in 2018 ($F[3, 542]=0.43$, $p=0.73$) or 2019 ($F[3, 602]=2.51$, $p=0.058$). In 2016, first-year students had statistically significant lower mean scores compared to the other classes, with no differences among second-, third-, and fourth-year students. In 2017, first-year students had significantly lower mean scores compared to second- or third-year students. The difference between first- and fourth-year students in 2017 was not significant after Bonferroni adjustment ($p=0.0281$). Differences between year one and year two corresponded to $d=0.33$ in 2016, and $d=0.44$ in 2017.

Table 3: Mean scores and their SEs for each student class and survey year.

Score	Year	Fall 2016 Mean (SE)	Fall 2017 Mean (SE)	Fall 2018 Mean (SE)	Fall 2019 Mean (SE)
Depression	1st	1.23 (0.04)	1.15 (0.05)	1.53 (0.05)	1.59 (0.06)
	2nd	1.54 (0.04)	1.67 (0.05)	1.73 (0.06)	1.62 (0.05)
	3rd	1.66 (0.06)	1.60 (0.05)	1.80 (0.07)	1.76 (0.06)
	4th	1.47 (0.06)	1.60 (0.05)	1.57 (0.08)	1.78 (0.07)
Anxiety	1st	1.43 (0.05)	1.40 (0.06)	1.75 (0.06)	1.74 (0.06)
	2nd	1.71 (0.05)	1.78 (0.06)	1.80 (0.07)	1.69 (0.06)
	3rd	1.71 (0.07)	1.76 (0.06)	1.85 (0.08)	1.84 (0.06)
	4th	1.61 (0.07)	1.71 (0.06)	1.74 (0.10)	1.95 (0.09)
Sleep problems	1st	1.42 (0.04)	1.31 (0.04)	1.52 (0.05)	1.65 (0.05)
	2nd	1.50 (0.04)	1.58 (0.04)	1.61 (0.05)	1.62 (0.05)
	3rd	1.63 (0.05)	1.58 (0.04)	1.61 (0.06)	1.67 (0.05)
	4th	1.47 (0.05)	1.63 (0.04)	1.57 (0.07)	1.67 (0.07)
Burnout	1st	1.11 (0.04)	1.04 (0.05)	1.42 (0.05)	1.48 (0.06)
	2nd	1.52 (0.04)	1.58 (0.05)	1.63 (0.07)	1.53 (0.06)
	3rd	1.69 (0.07)	1.59 (0.05)	1.68 (0.07)	1.70 (0.06)
	4th	1.40 (0.06)	1.60 (0.05)	1.48 (0.09)	1.69 (0.08)

SE, standard error.

Burnout subscale

Many of our surveyed students also experienced burnout symptoms. Burnout symptoms were most elevated in years 2 and 3 in the 2016 and 2018 surveys, years 2–4 in the 2017 survey, and years 3–4 in the 2019 survey. For burnout, the overall differences among student classes were also statistically significant in 2016 ($F[3, 906]=24.41$, $p<0.0001$), in 2017 ($F[3, 879]=30.30$, $p<0.0001$), in 2018 ($F[3, 542]=3.60$, $p=0.0134$), and in 2019 ($F[3, 602]=3.23$, $p=0.0220$). In 2016, first-year students had statistically significantly lower burnout symptoms compared to all other classes; in addition, scores were significantly lower among fourth-year students compared to third-year students. In 2017, as in

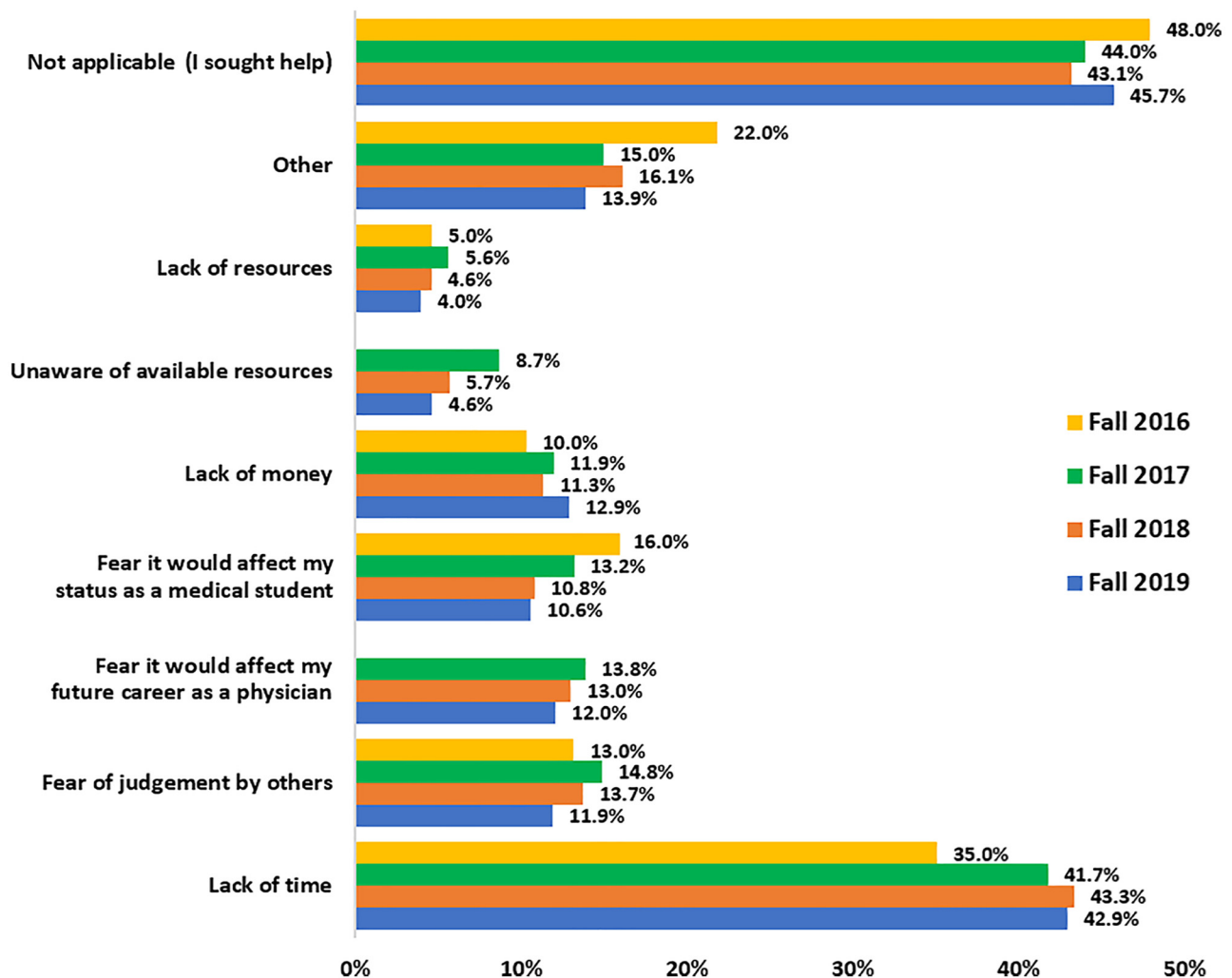


Figure 1: Medical students' reasons for not seeking help.

2016, first-year students had significantly lower burnout symptoms compared to other classes, but there was no significant difference between third- and fourth-year students that existed in 2016. In 2018 and 2019, the only statistically significant pairwise difference was in lower burnout scores among first-year students compared to third-year students. A common finding from all four surveys is similar to that for depressive symptoms in that the burnout scores increased by the second or third years of school. The magnitude of difference between year 1 and year 2 corresponded to $d=0.54$ in 2016 and $d=0.72$ in 2017. The effect size for the comparisons of first- and third-year students was $d=0.13$ in 2018 and 2019.

Sleep subscale

The majority of students in each survey year averaged 6–8 h of sleep per night. The overall differences among student classes

were statistically significant in 2016 ($F[3, 905]=3.42$, $p=0.0168$) and in 2017 ($F[3, 879]=11.53$, $p<0.0001$), but not in 2018 ($F[3, 542]=0.80$, $p=0.497$) or 2019 ($F[3, 602]=0.19$, $p=0.90$). In the 2016 survey, sleep problems were statistically significantly lower for first-year students compared to third-year students. In the 2017 survey, sleep problems were significantly lower for first-year students compared to all other classes. The effect size for the difference between year 1 and year 3 was $d=0.33$ in 2016. In 2017, the difference between year 1 and year 2 corresponded to $d=0.41$.

Results for help seeking

Most students (43.1–48.0%) who acknowledged experiencing mental health symptoms sought help. Of those who did not seek help, the vast majority knew where to find mental health resources and recognized that their concerns would remain confidential. Students who chose not to seek

help cited lack of time (35.0–43.3%) as the most common reason for failing to do so (Figure 1).

Discussion

The rates of depression and suicidal ideation during medical training cannot be ignored or simply categorized as burnout. A 2015 meta-analysis indicated that depressive symptoms in resident physicians ranged from 20.9 to 43.2%, and its prevalence increased with each calendar year by 0.5%, with the median absolute increase in depressive symptoms of 15.8% at the onset of residency training [19]. Another 2016 meta-analysis among medical students, including studies from 43 countries, revealed a 13.5% increase in depressive symptoms during medical school with no significant difference between clinical and preclinical students. Unfortunately, the authors of this study found that only 15.7% of medical students who screened positive for depression sought treatment [20]. With such concerning data, the COVID-19 pandemic revealed again that physicians are not immune to the exacerbation of psychiatric symptoms under stress [21]. In a 2020 meta-analysis of over 33,000 healthcare workers, a significant proportion of healthcare workers experienced anxiety (23.2%), depression (22.8%), and insomnia (38.9%) during the outbreak [22]. Discussion of burnout without further investigation into mental health symptoms may foster missed opportunities to address treatable psychiatric conditions. Although acknowledging the existence of burnout in the medical profession has propelled efforts toward much-needed change, categorizing all mental health symptoms into burnout fails to delineate symptoms that may be a sign of a treatable medical condition.

This study supports the growing body of evidence that medical students are at increased risk for depression and burnout and emphasizes that risks begin early in medical school by the second or third year. Many of the effect sizes in our study corresponding to the increases were above 0.5 (one half of the standard deviation), which is the threshold for clinical significance in patient-reported outcomes [23], and most exceeded 0.33 (a third of the standard deviation), another cutoff proposed in the literature [24] noting its significance. We hypothesize that student distress increases with the increasing demands of medical education leading to burnout and a more worrisome potential exacerbation of underlying psychiatric symptoms. Although the medical profession is raising awareness of substantial rates of burnout and depression [25], there is room for immense improvement to identify depressive symptoms in medical students and to prevent clinically tragic outcomes such as suicide. Our study highlights the need to assess for symptoms and implement interventions early in training.

Our findings also demonstrate that the majority of students acknowledge substantial anxiety symptoms (67.0–88.2%). Although anxiety and sleep problems were lower for first-year students in 2016 and 2017, this was not the case in the 2018 or 2019 surveys, which may be due to the overall highly elevated levels of anxiety for all classes, every year, making demonstration of change for the 2018 and 2019 survey difficult. Regardless, anxiety persists in all classes, warranting further examination. Perhaps students are predisposed to psychiatric conditions due to the rigors required in obtaining admission and/or due to personality characteristics allowing for academic success, which suggests that further examination of premedical student mental health is needed. Better characterization of baseline symptoms could help to elucidate when these elevated rates begin and whether clinical follow-up is needed. Future studies examining baseline levels of depression, burnout, anxiety, and sleep disturbance in pre-medical students may help to determine whether symptoms begin before or after matriculation.

Although there are growing collaborations aimed at enhancing interventions for mental wellness in the medical profession, there is no mandate for medical schools to report mental health information [26], making it difficult to evaluate trends over time. Unlike previous literature, reporting that only 15.7% of students who screened positive for depression sought treatment [20], our study showed the unexpected result that 43.1–48.0% of students sought mental health assistance. And more importantly, the majority knew where and how to seek treatment (Figure 1). The MSUCOM MSMHC gathered each medical student class, twice per year, during a mandatory mental health awareness event and discussed mental health symptoms, and resources in the college, larger university, and community. Once available, the MSMHC also shared the survey results with the student body. We suspect the dissemination of information regarding services available, and the normalization of seeking help allowed the students to access care at higher rates. The committee events helped destigmatize mental illness symptoms and establish a culture at MSUCOM that allowed more students who were suffering from mental health symptoms to know how and where to seek assistance. We suspect that the increased knowledge of mental health symptoms, and when and how to seek treatment, impacted the rate of seeking care. Our findings are consistent with the literature indicating that US medical students demonstrate more depressive and burnout symptoms than their nonmedical student peers [11, 12]. Of the students who had mental health symptoms on the survey and did not seek help, the main reason cited for not seeking help was a lack of time. We believe that the mandatory nature of the event

allowed students the time to attend the events and learn about resources, but this did not translate into all medical students with symptoms seeking help. Further studies are warranted to better understand time constraints as a barrier to seeking mental health services.

Although prior studies supported the idea that medical training is a time of increased risk, few pointed to a specific time period and replicability from year to year. Our study demonstrates that symptoms of burnout and depression increase between the first and third years of medical training and, more importantly, remain elevated in the fourth year. A shift in focus from awareness to intervention in medical training may identify those at risk for suicide and help all medical students to develop the skills needed to navigate the challenges of a career in medicine, which would prove most beneficial for the medical community and public.

Limitations

Given the voluntary and anonymous nature of the survey, an expected decrease in participation over the course of 4 years was observed, which limits the generalizability of our findings due to the potential of selection bias among those who chose to participate in the study. We speculate that the 2016 survey was the most characteristic of the student body due to 2016 having the highest response rates in the initial mandatory survey. Even though the questionnaire was mandatory in 2016 and recommended in 2017, 2018, and 2019, there was no method to enforce participation. Our survey questions were generated specifically for this survey, and instruments were not established utilizing previously validated scales, making the results of this study difficult to compare to the results of other surveys. Also, to maintain confidentiality and anonymity, no identifying or demographic information was gathered, which did not permit student responses to be tracked and analyzed longitudinally. Therefore, all data had to be analyzed cross-sectionally. Annual administration of the survey also limited our ability to evaluate episodic and environmental fluctuations. Despite this limitation, the response rate was high, providing a large sample size to capture significant trends throughout medical training. Further investigation that considers demographic information would help to determine the most vulnerable populations.

Conclusions

Many students endorse symptoms of depression, anxiety, and burnout throughout medical school. Our study demonstrates significant increases in symptoms of depression

and burnout by the second or third year of medical school. Anxiety and sleep disturbance are observed every year with a statistically significant increase in symptoms with progression in medical school confirming persistently high levels of anxiety throughout medical school. Future exploration regarding the rates of burnout, depression, and anxiety prior to medical school would be helpful in determining baseline vulnerability prior to medical training. Based on our study, supportive and time-sensitive interventions are indicated during the first year of medical school because anxiety may be elevated at the beginning of medical training, whereas depressive symptoms and burnout appear early and worsen throughout training. With the increased stressors of the pandemic, increasing administrative load, less time with patients, fear of litigation, variable electronic medical records, and overwhelming medical school debt, students are at higher risk than ever. The next step is moving beyond burnout. Implementation of measures that identify psychiatric symptoms in struggling medical students will prove most beneficial for both the students and their future patients.

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Competing interests: None reported.

Ethical approval: The 2016 study was granted exemption by the Michigan State University Institutional Review Board (IRB). The 2017–2019 was study reviewed and approved by the Michigan State University IRB (IRB number: x16-1558e; i053015).

Informed consent: All participants in this study provided written informed consent prior to participation, and participation in the survey was fully voluntary on this basis.

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