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ORIGINAL ARTICLE

Associations between physical activity, sleep, and self-reported health with burnout of medical students, faculty and staff in an academic health center

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Abstract

Background and objectives Health behaviors of physical activity and sleep are critical to the prevention of numerous chronic diseases. The health behaviors of healthcare professionals are even more critical, as healthcare providers who practice positive health behaviors are more likely to promote these healthy behaviors in their patients.

Aims To assess the health status and health behaviors of medical students, faculty, and staff in an academic health center in the US, and examine the associations between behaviors, physical and mental health outcomes and burnout.

Methods Students, faculty, residents and staff from a large university medical system completed an online survey between late-September and mid-November 2019. Associations were examined between health behaviors and health status including mental health outcomes with burnout.

Results Participating in any leisure time physical activity and having a Pittsburgh Sleep Quality Index score < 5 were associated with fewer physical health conditions and lower odds of reporting pain at any site ($n = 2060$; students $n = 242$, residents $n = 32$, staff $n = 1425$, faculty $n = 361$). Leisure physical activity and fewer sleep symptoms were associated with fewer reported depressive, anxiety and stress-related symptoms. Participating in leisure physical activity and good-quality sleep were associated with lower odds of burnout.

Conclusions The current study found high rates of physical inactivity and poor sleep among medical students, faculty and staff at an academic health center. These health behaviors were associated with poor mental health and high burnout. Programs and policies are needed improve these health behaviors to reduce burnout.

Keywords Physical activity · Sleep · Faculty · Medical students

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Introduction

The mental and physical health of healthcare professionals, as all workers, is essential within a total worker health framework [1] to prevent injury and illness and to advance health and well-being [2]. In particular, the well-being of healthcare workers and medical students in university hospitals may have additional impact on the community, as these training institutes and large community care providers have the potential to influence both current and future care. Poor physical and mental health among healthcare professionals and medical students in these settings is likely to impact their care and performance [3, 4]. One issue that is affecting medical students and healthcare workers at alarming rates is burnout, and reducing is a focus of many medical centers [5, 6]. Healthcare worker well-being is increasingly important as increased stress,

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as evidences by the COVID-19 pandemic have likely influenced the health of healthcare workers [7]; thus, it is important to assess the health and well-being of those in the healthcare setting.

Health behaviors (i.e., physical activity and sleep) contribute directly to overall health with insufficient physical activity, poor nutrition, and tobacco use associated with poor physical and mental health among healthcare workers [8–10]. Additionally, evidence suggests that physicians who practice positive health behaviors are more likely to promote health behaviors to patients leading to better patient outcomes [11, 12]. However, few studies have assessed the relationship between multiple health behaviors and both mental and physical health including burnout among medical students, residents, faculty and staff in an academic health center setting. There is a need to examine the holistic relationship between health, health behaviors and burnout in the academic health center setting.

Unfortunately, international studies of health behaviors among physicians and medical students suggest health behaviors are poor [13–15], but limited studies have examined these in US populations. One recent survey of US pediatricians found they reported poorer sleep yet better physical activity than a matched US sample, but also reported poorer health overall [16]. Surveys among US medical students have found 36–78% of students meeting physical activity guidelines, but they have used various physical activity questionnaires [17, 18]. Similar to physical activity, a meta-analysis of sleep quality among international medical students found poor sleep quality among 53% of students [19] and shift work has shown to negatively affect healthcare worker's sleep [20]. Thus, an updated assessment of the health and health behaviors of health care workers and medical students in academic health centers in the US is warranted.

The purpose of the current study was to assess the health and health behaviors of medical students, faculty and staff in a large, university hospital in the US to provide estimates of poor health behaviors and poor health for stakeholders. Second, this study examined the associations between these health behaviors with physical and mental health outcomes. Third, and most clinically relevant for this setting, this study examined associations between health behaviors and health conditions with burnout, which is a timely and critical outcome for medical and academic health institutions. It was hypothesized that students, faculty and staff would report high levels of poor health behaviors of physical inactivity and poor sleep, and that these poor health behaviors would be associated with higher rates of physical and mental health symptoms in addition to burnout. The ultimate goal of this research is to help identify potential influences on burnout among medical students, faculty and staff to inform future policies and programs to reduce levels of burnout and improve quality care.

Methods

Study design

Cross-sectional survey.

Participants

We recruited a convenience sample of students, faculty, residents and staff from a large university medical system between September 24, 2019 and November 15, 2019. Two emails were sent from university administration to all members (10,500 faculty and staff, 2727 students, 875 residents), and participants were eligible if they identified as faculty, students, staff or residents of the university medical system. An additional email reminder was sent to students from the a top university administrator, to increase participation. In discussion with stakeholders, not all questions were asked of the faculty sub-group due to concerns about sensitive health topics among a small sample. Thus, faculty were only given questions on physical activity and sleep behaviors. Participants who were interested were entered into a drawing for t-shirts from campus wellness. All procedures were approved by the University of Arkansas for Medical Sciences and University of Arkansas Fayetteville Institutional Review Board.

Measures

The anonymous survey was administered online via Qualtrics survey software in English and consisted of basic demographic questions, medical conditions, mental health, physical activity, sleep, and other health behaviors. A total of 2060 (students $n=242$, residents $n=32$, staff $n=1425$, faculty $n=361$) participants provided basic demographic information of gender and age range. This sample corresponds to a 15.7% response rate for staff, 25.1% among faculty, and 8.9% among students.

Health behaviors

Physical activity

All participants completed the International Physical Activity Questionnaire (IPAQ)—long form which asks about physical activity in the past 7 days. The IPAQ has shown validity when compared to device-measured physical activity [21]. IPAQ was processed using standardized instructions [22]. Total metabolic equivalent (MET) minutes summed across domains, as well as the dichotomous variable of

performing any leisure time physical activity was used as variables, as leisure time physical activity may be particularly associated with favorable outcomes [23].

Sleep

The Pittsburgh Sleep Quality Instrument (PSQI) was used to assess both quantity and quality of sleep [24]. The PSQI is a validated, 19-item questionnaire with a global score ranging from 0 to 21 with higher scores indicating poorer sleep. As per standard methods, a global score of 5 or greater was considered a "poor" sleeper.

Other behaviors

The survey also included questions on alcohol consumption, smoking, and e-cigarette use modified from the Behavioral Risk Factor Surveillance System [26]. Alcohol questions included number of days binge drinking (males more than 5 drinks, women more than 4 drinks) in the past 30 days, and tobacco questions asked about current practices with the response options of "daily", "less than daily" or "not at all". For the analyses, responses were dichotomized into smoking tobacco (yes/no) or using e-cigarettes (yes/no).

Health

Participants were asked "Have you ever been diagnosed as having any of the following conditions?" and provided a list. They had the options of answering NO, YES (diagnosed within the last 12 months), or YES (diagnosed more than 12 months ago). For the purposes of this study, both YES responses were combined into a single category. Mental health was also assessed using the 21-item Depression, Anxiety and Stress Scale (DASS-21) which assesses depression, anxiety, and stress symptoms [27]. Scores range from 0 to 42 with higher scores indicating poorer mental health/higher symptoms. It is not a clinical diagnostic tool; however, symptom scores were categorized using published cut-points for mild, moderate, severe, and very severe categories [28].

Burnout

The Copenhagen Burnout Inventory (CBI) is an open access instrument developed in Denmark and validated in multiple languages and settings. The CBI is one of the instruments recommended by the National Academy of Medicine Clinician Wellbeing initiative [29] and is comprised of nineteen questions measuring burnout in three different areas: Personal, Work- and Client-related burnout. The CBI has been used in a number of healthcare-related surveys and a recent study of its psychometric structure provided evidence for good reliability and discriminant validity as well as construct validity supporting its proposed three-factor structure [30]. The scores on the CBI range from 0 to 100 and for clinical interpretation, burnout was considered a score of greater than 50 similar to previous studies [31].

Statistical analysis

We calculated descriptive statistics by role (student, faculty, resident, staff) for all available data to limit biases from eliminating those with partial data, including all faculty. However, we have provided descriptives and analyses for those with complete data ($n = 748$) in Supplementary Tables. To assess associations between health behaviors and health, we used logistic regression, ordinal logistic regression or negative binomial regression adjusting for gender and age category depending on the distribution of the dependent variable. Estimates are presented as incidence rate ratios or odds ratios. All analyses were conducted in Stata/IC v14.2 (Stata Corp, College Station, TX, USA) with statistical significance set at $p < .05$.

Results

A total of 2060 (students $n = 242$, residents $n = 32$, staff $n = 1425$, faculty $n = 361$) participants provided basic demographic information of gender and age range. 80.9% were white. A total of 76.8% self-reported as female. The majority of students reported to be in the 20–29 age range (76.9%), residents reported in the 20–29 (46.9%) and 30–39 (46.9%) age categories, and staff and faculty, respectively, reported in the 30–39 (21.1%, 27.5%), 40–49 (26.3%, 8.1%), 50–59 (29.9%, 21.1%) and 60 + (15.3%, 21.4%) categories. Due to the small number of residents reporting, medical students and residents are reported together.

A summary of reported health behaviors can be seen in Table 1. The most commonly reported diagnosed physical medical condition across the whole sample was high blood pressure with 33.2% having ever had this diagnosed as seen in Table 2. For students and residents, asthma was the most prevalent condition (16.5%). Of reported diagnosed mental health disorders, the most common among all groups was anxiety as seen in Table 2. The prevalence of personal-related burnout was highest (38.1%) among all participants, compared to work related (27.6%) and client related (12.8%). Students and residents had higher prevalence of burnout compared to staff and faculty.

Table 1 Summary of self-reported health behaviors, Median (25th–75th percentile) or *n* (%)

	Total	Students and residents	Faculty	Staff
Physical activity (IPAQ) ($n^a = 1962$)				
Total MET h/week	36.6 (15.8, 73.5)	35.8 (16.2, 69.3)	36.4 (16.9, 69.3)	37.4 (15.2, 76.9)
% No leisure time physical activity	504 (25.8%)	62 (23.9%)	67 (19.1%)	375 (28.0%)
Sleep (Pittsburgh sleep quality index) ($n = 1357$)				
Score	5 (3, 8)	5 (3, 7)	4 (3, 6)	5 (3, 8)
Poor sleeper (score ≥ 5)	823 (59.0%)	136 (62.7%)	101 (42.6%)	563 (62.4%)
Good sleep and leisure physical activity and food secure ($n = 1106$)	280 (25.3%)	56 (25.9%)	NA	224 (25.2%)
Days binge drinking (> 4 drinks females, > 5 males) ($n = 1559$)	0 (0, 0)	0 (0, 1)	NA	0 (0, 0)
Smoke tobacco ($n = 1689$)	70 (4.1%)	11 (3.9%)	NA	59 (4.2%)
e-Cigarette	43 (2.5%)	8 (2.9%)	NA	35 (2.5%)

NA not asked, *IPAQ* International Physical Activity Questionnaire, *MET* metabolic equivalent

[a]*n* includes participants who had responses for gender, age, role (student or resident, faculty or staff), and target health behavior

Associations between health behaviors and physical health conditions

Reporting any leisure time physical activity was associated with reduced odds of high blood pressure (OR 0.58, 95% CI 0.45, 0.75, < .001), high cholesterol (OR 0.63, 95% CI 0.49, 0.83, .001), and heart problems (OR 0.62, 95% CI 0.40, 0.96, .031) compared to those reporting no leisure time physical activity. Having a score of < 5 on the PSQI was associated with reduced odds of high blood pressure (OR 0.73, 95% CI 0.54, 0.98, $p = .039$), and heart problems (OR 0.32, 95% CI 0.15, 0.65, .002) compared to those reported a score of 5 or above on the PSQI. Reporting any leisure time physical activity and having a PSQI score less than 5 was associated with reduced odds of high blood pressure (OR 0.57, 95% CI 0.41, 0.80, $p = .001$), high cholesterol (OR 0.56, 95% CI 0.39, 0.80, $p = .001$), and other heart problems (OR 0.18, 95% CI 0.06, 0.50, $p = .001$).

Participating in any leisure time physical activity and having a PSQI score < 5, was associated with lower odds of reporting pain at all sites. Similarly, having both positive behaviors (leisure physical activity and good sleep) was associated with lower odds of pain at the hand (OR 0.52, 95% CI 0.39, 0.69, $p < .001$), shoulder (OR 0.49, 95% CI 0.38, 0.64, $p < .001$), low back (OR 0.54, 95% CI 0.42, 0.71, $p < .001$), knee (OR 0.54, 95% CI 0.41, 0.72, $p < .001$) and foot (OR 0.47, 95% CI 0.35, 0.64, $p < .001$).

Associations between health behaviors and mental health

Reporting any leisure time physical activity was associated with lower odds of diagnosed depression (OR 0.51, 95% CI 0.41, 0.65, $p < .001$) and anxiety (OR 0.65, 95% CI 0.51, 0.82, $p < .001$), as well as lower rates of depression (IRR 0.63, 95% CI 0.54, 0.73, $p < .001$), anxiety (IRR 0.70, 95% CI 0.60, 0.81, $p < .001$) and stress (IRR 0.74, 95% CI 0.66, 0.83, $p < .001$) symptoms on DASS-21. Having a score of < 5 on the PSQI was associated with lowers odds of diagnosed depression (OR 0.40, 95% CI 0.30, 0.54, $p < .001$), anxiety (OR 0.41, 95% CI 0.31, 0.55, $p < .001$) and other mental health conditions (OR 0.26, 95% CI 0.13, 0.54, $p < .001$) as well as lower rates of depression (IRR 0.28, 95% CI 0.24, 0.33, $p < .001$), anxiety (IRR 0.34, 95% CI 0.28, 0.40, $p < .001$) and stress (IRR 0.42, 95% CI 0.37, 0.47, $p < .001$) symptoms on DASS.

Associations between health behaviors and health with burnout

Participating in leisure physical activity was associated with lower odds of personal-related (OR 0.61, 95% CI 0.50, 0.76, $p < .001$) and work-related (OR 0.79, 95% CI 0.63, 0.995, $p = .046$) burnout as seen in Table 3. Good-quality sleep was associated with lower personal-, work- and client-related burnout. Similarly, poor mental health was associated with higher odds of personal-related and work-related burnout. More physical health conditions were associated with higher odds of personal-related burnout.

Discussion

The current study found high reports of physical and mental health conditions among medical students, residents, faculty and staff at a large university medical system. Second, this sample reported high rates of no leisure time physical activity and poor sleep. Importantly, poor health

Table 2 Summary of self-reported physical and mental health, Mean (SD), Median (25th–75th percentile) or *n* (%)

	Total	Students and residents	Faculty	Staff
Physical health				
Medical conditions (ever diagnosed)				
High blood pressure ($n^a = 1658$)	549 (33.1%)	23 (8.4%)	NA	526 (38.0%)
High cholesterol ($n = 1636$)	401 (24.5%)	16 (5.9%)	NA	385 (28.3%)
Asthma ($n = 1585$)	206 (13.0%)	45 (16.5%)	NA	161 (12.3%)
Diabetes ($n = 1601$)	152 (9.5%)	7 (2.6%)	NA	145 (10.9%)
Other heart problems ($n = 1582$)	97 (6.1%)	8 (2.9%)	NA	89 (6.8%)
Cancer ($n = 1587$)	95 (6.0%)	4 (1.5%)	NA	91 (6.9%)
Coronary artery disease ($n = 1575$)	23 (1.5%)	1 (0.4%)	NA	22 (1.7%)
2 or more physical conditions ($n = 1562$)	337 (21.6%)	17 (6.5%)	NA	320 (20.5%)
Pain (any in past 3 months)				
Hand/wrist ($n = 1651$)	728 (44.1%)	89 (32.7%)	NA	639 (46.3%)
Shoulder/neck/upper back ($n = 1663$)	1,057 (63.6%)	175 (64.1%)	NA	882 (63.5%)
Low back ($n = 1657$)	974 (58.8%)	136 (50.0%)	NA	838 (60.5%)
Knee ($n = 1651$)	715 (43.3%)	83 (30.6%)	NA	632 (45.8%)
Foot ($n = 1660$)	645 (38.9%)	71 (26.2%)	NA	574 (41.3%)
Mental health				
Medical conditions (ever diagnosed)				
Depression ($n = 1614$)	530 (32.8%)	75 (27.4%)	NA	455 (34.0%)
Anxiety ($n = 1605$)	572 (35.6%)	102 (37.4%)	NA	470 (35.3%)
Other mental health ($n = 1561$)	98 (6.3%)	27 (10.0%)	NA	71 (5.5%)
DASS-21 depression ($n = 1655$)				
Mild	132 (8.0%)	26 (9.7%)	NA	106 (7.6%)
Moderate	156 (9.4%)	40 (15.0%)	NA	116 (8.4%)
Severe	71 (4.3%)	20 (7.5%)	NA	51 (3.7%)
Extremely severe	64 (3.9%)	22 (8.2%)	NA	42 (3.0%)
DASS-21 anxiety ($n = 1662$)				
Mild	99 (6.0%)	19 (7.0%)	NA	80 (5.8%)
Moderate	159 (9.6%)	48 (17.7%)	NA	111 (8.0%)
Severe	60 (3.6%)	21 (7.7%)	NA	39 (2.8%)
Extremely severe	67 (4.0%)	25 (9.2%)	NA	42 (3.0%)
DASS-21 stress ($n = 1662$)				
Mild	146 (8.8%)	37 (13.8%)	NA	109 (7.8%)
Moderate	112 (6.8%)	30 (11.2%)	NA	82 (5.9%)
Severe	79 (4.8%)	31 (11.5%)	NA	48 (3.5%)
Extremely severe	26 (1.6%)	11 (4.1%)	NA	15 (1.1%)
Burnout (%)				
Personal burnout ($n = 2055$)	784 (38.1%)	130 (53.7%)	29 (36.0%)	507 (35.6%)
Work burnout ($n = 2317$)	568 (27.6%)	148 (54.0%)	108 (30.3%)	354 (24.9%)
Client burnout ($n = 1834$)	229 (12.8%)	NA	57 (16.2%)	163 (11.6%)

NA not asked

[a]*n* includes participants who had responses for gender, age, role (student and resident, faculty or staff), and target health behavior

behaviors were associated with poor physical and mental health including burnout, suggesting that interventions are needed to improve health behaviors of both current and future healthcare workers.

Self-reported health behaviors were poor in this current study. In the current study, 60% of participants reported poor sleep with a score of 5 or higher on the PSQI. This is slightly higher than a meta-analysis of medical students which found a prevalence of 53% poor sleep using the PSQI

Table 3 Associations between health behaviors and health conditions with burnout (yes/no), odds ratio[a] (95% confidence interval), *p*-value

	Personal-related burnout[b]	Work-related burnout	Client-related burnout
Leisure physical activity (vs none)	**0.61 (0.50, 0.76), < .001**	**0.79 (0.63, 0.995), .046**	0.93 (0.67, 1.30), .686
Good sleeper (vs poor sleeper)	**0.30 (0.23, 0.38), < .001**	**0.28 (0.21, 0.37), < .001**	**0.55 (0.38, 0.81), .003**
Good sleep and leisure PA	**0.30 (0.23, 0.39), <.001**	**0.31 (0.23, 0.42), <.001**	**0.65 (0.44, 0.95), .027**
Physical health conditions (#)	**1.28 (1.14, 1.42), < .001**	1.12 (0.996, 1.26), .058	1.03 (0.87, 1.23), .725
Diagnosed depression	**2.35 (1.89, 2.92), < .001**	**2.01 (1.66, 2.64), < .001**	1.40 (0.996, 1.97), .053
Diagnosed anxiety	**2.26 (1.83, 2.81), < .001**	**2.17 (1.73, 2.73), < .001**	**1.53 (1.10, 2.15), .012**
Other mental health	**2.47 (1.61, 3.79), < .001**	**1.76 (1.15, 2.71), .009**	0.91 (0.44, 1.89), .805
DASS			
Depression score	**1.13 (1.12, 1.15), < .001**	**1.11 (1.09, 1.13), < .001**	**1.06 (1.05, 1.08), < .001**
Anxiety score	**1.16 (1.13, 1.18), < .001**	**1.10 (1.08, 1.12), < .001**	**1.06 (1.03, 1.08), < .001**
Stress score	**1.14 (1.12, 1.15), < .001**	**1.11 (1.09, 1.13), < .001**	**1.08 (1.06, 1.10), < .001**

[a]Logistic regression adjusted for reported gender and age, bold indicates $p < .05$

[b]Burnout defined as score > 50 on Copenhagen Burnout Inventory

[19]. The data in the current study were collected prior to COVID-19, and it is likely that behaviors have worsened since then. Recent studies have reported on sleep in nurses during the COVID-19 pandemic and found sleep disturbance in 43% [32]. Importantly, this poor sleep among healthcare workers has been shown to increase the incidence of adverse safety outcomes [10], and, thus, efforts are needed to improve sleep. In addition, one out of four participants report no leisure time physical activity. While healthcare workers may have high levels of occupational physical activity, it is important to encourage leisure time physical activity to maximize the benefits of an active lifestyle [9]. Both of these behaviors were assessed via validated, self-report questionnaires and it is likely that device-based measures such as accelerometers would find lower rates of physical activity and shorter sleep durations due to biases from self-reported data. It is unknown in the current study, which job status is reporting the highest levels of poor health behaviors and health as the staff category includes a diverse range of occupations, and future studies should examine whether these estimates and further health associations are consistent across medical system roles However, this inclusive group is useful for potential policies and programming that would apply to all staff. The combination of poor sleep and inadequate physical activity is likely to have the greatest impact on health and performance, as health behaviors are interrelated [35]. Thus, interventions targeting multiple health behaviors are needed through wellness initiatives.

In addition to poor health behaviors, participants also reported a high prevalence of physical and mental health conditions or symptoms. Among the current study, 38% of staff reported high blood pressure, 28% reported high cholesterol and 11% reported diabetes. The US national estimates among adults is 45% for high blood pressure [36], 12% for high total cholesterol, and 10.5% for diabetes. Together, this suggests medical staff and students have several lifestyle related conditions, as well as conditions that may need to be managed during an exercise or wellness program. In addition to cardiorespiratory conditions, 64% of the current sample reported shoulder, neck or upper back pain, and 58% reported low back pain in the past 3 months. These estimates are higher than US averages of 29% of US adults reporting low back pain and 15% reporting neck pain [37]. These high rates are alarming, as back pain had a direct medical cost of $315 billion per year and can lead to both absenteeism, presenteeism and poor work quality [37]. Future studies should collect more detailed information on the pain such as its chronic or acute nature, and start to identify sources of pain to enable the implementation of effective interventions to reduce pain.

Participants reported similarly poor mental health. On the DASS-21, 25% of participants reported depressive symptoms, 23% reported anxiety symptoms and 22% reported stress symptoms. The current depressive symptom estimates are consistent with a meta-analyses which reported prevalences of 27% for medical students [38] and 28.8% among residents [39]. While the data in the current study were collected prior to COVID-19, a more recent meta-analysis of healthcare workers during COVID-19 found a prevalence of depression as 24%, 26% for anxiety and 45% for stress [40]. With the increasing concern among burnout among healthcare workers, there appears to be a link between burnout and depression, with some proposing burnout being more correctly identified as a depressive condition [41]. Thus, treating and preventing depression may be critical to delaying and preventing burnout in the field.

The current study found an association between health behaviors and health, as previously found among medical students [42, 43]. While these are cross-sectional associations, the magnitude of the effects suggests are likely to have

clinical relevance. Participating in leisure physical activity was associated with 42% reduction in the odds of high blood pressure and good sleep was associated with 45% reduction in the odds of low back pain. The positive effect of good health behaviors may be critical in times of stress, such as the COVID-19 pandemic [44]. Another key behavior, diet, was not assessed in the current study, although food intake is known to influence health outcomes both through body composition and independent pathways. Future studies should include measures of diet and body composition, such as BMI, as potential mediators of the relationships between health behaviors and health condition outcomes. Importantly, these health behaviors and health conditions were associated with student, faculty and staff burnout which in turn has been associated with increased medical errors, lower quality of care, reduced productivity, and increased turnover among other adverse outcomes [5, 6].

The poor health behaviors and health found in the current study provide further need to help healthcare workers and medical students improve these behaviors [45–47]. Social media [48] or wearable technology [49] may be less costly interventions that have widespread reach among medical students and university hospital staff. While these efforts have indicated small success, a more systematic approach to improving healthcare and future healthcare workers well-being is needed. Efforts such as culinary medicine and "Exercise is Medicine" (American College of Sports Medicine, exerciseismedicine.org) are initiatives that may fit well within the healthcare field to promote health and well-being not only among patients, but also healthcare workers.

The current study population is limited to a single academic health center with an overall 20% response rate among a convenience sample. While these findings may not be generalizable to other university hospital systems or geographical areas, there is stronger internal validity. However, due to the convenience sampling, this is not a true estimate of prevalence, and participants are likely to report better behaviors due to social desirability bias leading to more conservative estimates of poor health. To reduce reporting biases, the study was conducted by an outside organization and the anonymity of the participants was conveyed to the participants.

Conclusion

Unfortunately, this cross-sectional survey of a university medical system found medical students, residents, faculty and staff reported poor health behaviors of physical activity and sleep, mental and physical health. University medical systems may benefit from similar periodic assessments to better understand the health status of their students, faculty and staff and to track changes in health over time. Importantly, these health behaviors were associated with burnout. If future studies show that improving health behaviors can reduce rates of burnout in academic medical centers, programs and policies targeting physical activity and sleep may be effective interventions for reducing high rates of burnout among students, faculty and staff and ultimately improving the quality of medical care.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11332-022-00902-7.

Conflict of interests The authors have no conflict of interest to declare.

Ethical approval All procedures were approved by the UAMS and UAF Institutional Review Boards.

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