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Sources of Medical Student Stress

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ABSTRACT

Background: Key elements in the clinical practice of prevention, health and wellness are best cultivated in medical professionals during undergraduate medical training. This study explores students' self-assessed stress relative to gender, academic expectations, and level of medical training to guide development of targeted wellness interventions. **Methods:** In early 2012, undergraduate (M1–M4) students in four Southeastern U.S. allopathic medical schools were surveyed about health-related attitudes and behaviors. **Results:** A total of 575 students returned completed questionnaires. Students in the preclinical years (M1–M2), especially females, reported significantly higher stress levels. Academic expectations and satisfaction were also significantly implicated. **Discussion:** These findings highlight the general areas of potential concern regarding stressors associated with medical training. Future research should guide programmatic efforts to enhance students' overall health and wellness vis-à-vis curriculum, skills training, and support services.

Keywords: Health behavior, medical student wellness, stress

Background

Attention to health and wellness is the key element in the clinical practice of prevention that is best cultivated in medical professionals during medical training.^[1] During undergraduate medical training (M1–M4), students often exhibit a general lack of preventive-oriented behavior.^[2] Moreover, research has suggested that the resulting effects, such as fatigue, may increase stress^[3] and decrease academic success.^[4]

This study explores students' self-assessed stress relative to gender, academic expectations, and level of medical training to provide preliminary directions for wellness-related interventions.

Methods

Between February and April 2012, a cross-sectional survey was conducted on all undergraduate students enrolled in four accredited, U.S. allopathic medical schools ($n = 1847$) regionally located in two Southeastern states. Along with various demographic and behavioral items, the instrument contained the Maslach Burnout Inventory (MBI),^[5] the 8-item Epworth Sleepiness Scale (ESS),^[6] and the 4-item Perceived Stress Scale^[7] and was piloted with students not included in the study and revised based on feedback. Approval for the study was obtained from the institutional review boards of each participating institution.

Data collection

An e-mail link to the online survey was sent to students, with follow-up reminders, from each participating school's Office of Student Affairs. The investigators had no direct access to or contact with actual or prospective students, and no individual identifying information was made available. Descriptive statistics are reported as mean \pm standard deviation (SD) or

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median (range). For bivariate analyses, Chi-square statistics, independent *t*-tests, and one-way analysis of variance were used to compare group differences in categorical and continuous variables. Multiple linear regression analyses examined the relationship of various variables on students' self-reported stress. A critical $P < 0.05$ was specified for all inferential tests, and Bonferroni adjustments were made for multiple comparisons, where appropriate. All statistical analyses were performed using SPSS v. 23.0 (IBM SPSS Statistics for Windows, Version 23.0., Armonk, NY: IBM Corp., 2014).

Results

A total of 575 completed questionnaires were received—for a response rate of 31.1%. A small number of students graduating outside the 2015 cutoff ($n = 9$) were subsequently excluded, resulting in a sample size of 566; however, since not all respondents completed all items, sample sizes vary by analysis. Response rates varied only modestly among participating schools, with no significant demographic differences. However, females were more likely to respond comprising 53% of the response population with a response rate of 35.6% compared to males (23.2%). M2 and M4 students were most (35.1%) and least likely (21.2%) to respond, respectively. Respondents ranged in age from 20 to 43 years (mean = 25.1, SD = 2.51).

Sleep/fatigue

Respondents reported an average of 6.75 (SD = 0.93) hours of sleep each night, which did not vary by gender or training year. However, on nights preceding an examination, both M1 (mean = 5.55, SD = 1.69) and M2 students (mean = 5.60, SD = 1.82) reported receiving significantly less sleep than did M3 students (mean = 6.34, SD = 1.40) ($F = 5.93$, $df = 3,506$, $P \leq 0.001$). No other differences were noted, and nightly sleep did not vary by gender.

As shown in Table 1, students' scores on the ESS averaged 7.78 (SD = 4.16), with female students (mean = 8.43, SD = 4.16) reporting significantly higher scores than males (mean = 7.07, SD = 4.06). Females were also significantly more likely ($\chi^2 [3, n = 518] = 9.02$, $P = 0.029$) to report waking up each morning feeling "very fatigued" compared to males (24.6% vs. 15.9%). No differences were found by training year. The ESS ranged from 0 to 24, and scores above 11 are thought to represent excessive day-time sleepiness. The sleep and fatigue variables were modestly correlated ($r_p^{[510]} = -0.27$, $P \leq 0.001$).

Burnout

Students' mean score on the MBI was 2.68 (SD = 2.12). Scores did not vary significantly by student gender; however, mean burnout levels were significantly higher for M2 and M3 students compared to their M1 and M4 classmates.

Stress

Females reported significantly higher mean stress scores than males. *Post hoc* comparisons revealed that both M1 (mean = 6.36, SD = 3.32) and M2 students (mean = 6.46, SD = 3.18) reported significantly higher stress levels than M4 students (mean = 4.85, SD = 3.17). Although not shown in Table 1, stress levels reported by females were consistently higher than those reported by males across all training years—with M1 women reporting the most stress (mean = 7.08, SD = 3.29) and M4 males reporting the least stress (mean = 4.62, SD = 3.05).

Figure 1 summarizes specific areas of medical student stress: "Pressure at school" was significantly more stressful among M1 (mean = 2.67, SD = 0.51) and M2 (mean = 2.72, SD = 0.49) students than their M4 counterparts (mean = 2.45, SD = 0.60) ($F [3,513] = 5.70$, $P = 0.001$); "competitiveness for residency" was significantly greater for M3 (mean = 2.39, SD = 0.67) than M1 (mean = 2.12, SD = 0.75) students ($F [3,514] = 3.68$, $P = 0.012$); and "finances" were significantly more stressful for M4 (mean = 2.20, SD = 0.69) than M2 students (mean = 1.93, SD = 0.72) ($F [3,513] = 3.08$, $P = 0.027$). While not shown, female students reported more stress over "relationships with family" ($F [1,516] = 22.74$, $P \leq 0.001$), "pressures at school" ($F [1,515] = 14.65$, $P \leq 0.001$), and "relationships with friends" ($F [1,516] = 8.32$, $P = 0.004$).

Predictors of stress

Using multiple linear regression analysis, a block-entry procedure was used to examine the effects of various independent variables (i.e., fatigue, academic satisfaction, academic expectations, burnout, gender, and year of training) on self-reported stress. As shown in Table 2, the overall model was statistically significant ($F [6,510] = 46.36$, $P \leq 0.001$) and accounted for 34.5% of the variance in that outcome. Burnout and academic satisfaction were among the strongest predictors; however, being female, in the first 2 years of training, and rating academic expectations as "unreasonable" also contributed to higher reported stress levels. Further analyses (not shown) revealed no significant interactions among independent variables.

Discussion

In our study, most students reported some level of fatigue, with M1 and M2 students reporting, on average, approximately one fewer hour of sleep than other cohorts. Across all undergraduate training years, female students reported higher levels of stress than did males - including more stress in relationships with family and friends and due to academic pressures. For women, stress was linearly related to year of training, being highest during the M1 year and progressively declining over the other years. Females also tended to report more fatigue, although hours slept did not differ. The greatest stressor for M1 and M2 students was "pressures at school,"

Table 1: Medical Students' Wellness-Related Measures by Gender and Year of Undergraduate Training

Variables	n	M1	M2	M3	M4	Overall	F	P
ESS	511	7.47 (3.79)	7.48 (4.01)	8.63 (4.44)	7.70 (4.50)	7.78 (4.16)	2.19	0.089
Female	267					8.43 (4.16)	14.04	<0.001
Male	244					7.07 (4.06)		
Fatigue	518	2.93 (0.68)	2.94 (0.76)	2.97 (0.74)	2.84 (0.80)	2.93 (0.74)	0.54	0.654
Female	272					3.02 (0.73)	8.94	0.003
Male	246					2.73 (0.74)		
Burnout	517	2.10 (1.58)	2.99 (2.33)	3.05 (2.34)	2.58 (1.98)	2.68 (2.12)	6.12	0.001
Female	271					2.82 (2.15)	2.59	0.110
Male	246					2.52 (2.07)		
Stress	518	6.36 (3.32)	6.46 (3.18)	5.53 (3.01)	4.85 (3.17)	5.92 (3.23)	6.64	0.001
Female	272					6.29 (3.17)	7.56	0.006
Male	246					5.51 (3.25)		

Note: Significant differences are bolded

Table 2: Multiple Regression Analysis of Factors Related to Medical Students' Self-Reported Stress Levels (n=516)

Independent variable	Levels/Categories - % (n)	Mean (SD)	β [95% CI]	beta	P
Fatigue	(1) None at all - 3.5% (18) (2) Not much - 20.8% (108) (3) Slightly - 55.2% (286) (4) Very - 20.5% (106)	2.93 (0.74)	0.68 [0.36, 0.99]	0.15	<0.001
Academic Satisfaction	(1) Very unsatisfied - 5.6% (29) (2) Unsatisfied - 19.5% (101) (3) Somewhat satisfied - 49.2% (255) (4) Very satisfied - 25.7% (133)	2.95 (0.67)	-0.98 [-1.27, -0.68]	-0.25	<0.001
Academic Expectations	(1) Extremely unreasonable - 1.0% (5) (2) Unreasonable - 7.3% (38) (3) Reasonable - 80.3% (416) (4) Extremely reasonable - 11.4% (59)	3.02 (0.23)	-1.15 [-1.65, -0.64]	-0.17	<0.001
Burnout	0-10.6% (55), 1-24.0% (124), 2-21.7% (112), 3-15.3% (79) 4-10.6% (55), 5-5.8% (30), 6-6.4% (33), 7-2.9% (15) 8-1.0% (5), 9-1.0% (5), 10-0.4% (2), 11-0.2% (1), 12-0.2% (1)	2.68 (4.47)	0.47 [0.36, 0.58]	0.31	<0.001
Sex	(0) Female - 52.5% (272) (1) Male - 47.5% (246)		-0.74 [-1.21, -0.28]	-0.11	0.002
Year of Training	(1) M1-28.0% (145) (2) M2-30.5% (158) (3) M3-23.0% (119) (4) M4-18.5% (96)		-0.47 [-0.68, -0.25]	-0.16	<0.001

F (6,510)=46.36, P<0.001, adj. R²=0.345

while “competitiveness for residency” was most stressful for M3 students. “Finances” were significantly more stressful for students in their final (M4) year. Students’ academic expectations and satisfaction with their own performance tended to correlate highly with stress levels—which may correspond to the timing of required licensure examinations.

Medical schools should be cognizant of student health and wellness issues and encourage activities that might be easily accomplished outside of class time (e.g., biking to school and walking up stairs). General sleep education may be useful in improving self-awareness of contributors to sleep problems and fatigue,^[8] and school internet microsites can be dedicated to medical student wellness - highlighting mental health,

fitness, nutrition, safety, and sleep. Periodic assessments at key “risk” points in students’ training might help draw attention to stress and guide training programs in developing responses to specific stressors. For example, stress management programs for entering medical students have been shown to be helpful.^[9,10] Strategically timed workshops on study skills, time management, residency selection, and interviews or financial advising could also help to minimize stress as trainees progress across the undergraduate continuum.

Limitations

It is likely that the four participating schools, by virtue of their geographical proximity, may limit generalizability of these findings beyond the Southeastern U.S. In addition, the

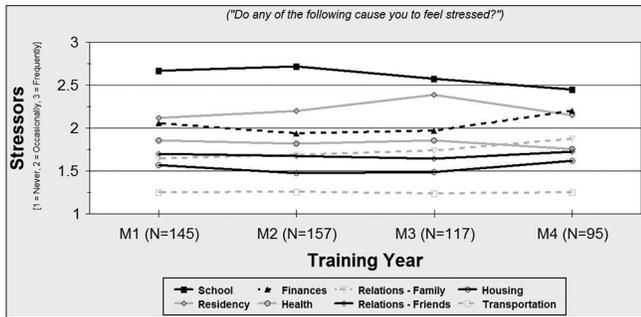


Figure 1: Self-rated stressors of medical students

modest response rate (31.1%), likely due to timing of the survey (around the residency match for graduating M4 students), could temper the validity of some findings. Finally, the cross-sectional study design precludes inferring any causal attributions.

Conclusions

While stress levels were shown to fluctuate by gender and year of training, issues related to perceived academic expectations and performance were also found to be contributing factors. On an average, students' stress levels tended to be highest in the earlier (preclinical) years of undergraduate training, though the stressors varied across time and by gender. For example, female students reported more stress around personal relationships than did their male counterparts. Taking the presence of such moderating factors into account, medical schools may wish to develop and target interventions at key points in training and in response to specific stressors.

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Conflicts of interest

There are no conflicts of interest.

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