

Burnout and Alcohol Abuse/Dependence Among U.S. Medical Students

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Abstract

Purpose

To explore the relationship between alcohol abuse/dependence with burnout and other forms of distress among a national cohort of medical students.

Method

In 2012, the authors completed a national survey of medical students from the American Medical Association's Physician Masterfile containing validated items assessing alcohol abuse/dependence, burnout, depression, suicidality, quality of life (QOL), and fatigue. Descriptive and comparative statistical analyses were computed, including chi-square and multivariate logistic regression, to

determine relationships between variables.

Results

Of the 12,500 students, 4,402 (35.2%) responded. Of these, 1,411 (32.4%) met diagnostic criteria for alcohol abuse/dependence. Students who were burned out ($P = .01$), depressed ($P = .01$), or reported low mental ($P = .03$) or emotional ($P = .016$) QOL were more likely to have alcohol abuse/dependence. Emotional exhaustion and depersonalization domains of burnout were strongly associated with alcohol abuse/dependence. On multivariate analysis, burnout (OR 1.20; 95% CI 1.05–1.37; $P < .01$), having \$50,000 to \$100,000

(OR 1.21 versus $< \$50,000$; CI 1.02–1.44; $P < .05$) or $> \$100,000$ (OR 1.27 versus $< \$50,000$; CI 1.08–1.48; $P < .01$) of educational debt, being unmarried (OR 1.89; CI 1.57–2.27; $P < .001$), and being younger (for every five years, OR 1.15; CI 1.02–1.28; $P = .01$) were independently associated with increased risk for alcohol abuse/dependence.

Conclusions

Burnout was strongly related to alcohol abuse/dependence among sampled medical students and increased educational debt predicted a higher risk. A multifaceted approach addressing burnout, medical education costs, and alcohol use is needed.

Excessive alcohol consumption in the United States is a serious public health problem. Each year, harmful drinking claims nearly 88,000 lives and exacts a \$223 billion toll on the U.S. economy. The costs result mostly from losses in workplace productivity, health care expenses, motor vehicle crashes, and law enforcement and other criminal justice expenses related to excessive alcohol consumption.¹ Multiple risk factors among the general adult population have been identified for alcohol abuse/dependence, including younger age, being unmarried, male sex, mood disorders, family history of alcohol abuse/dependence, and lower income.²

A recent national study of U.S. physicians found that 12.9% of male physicians and 21.4% of female physicians met

diagnostic criteria for alcohol abuse/dependence.³ Excessive consumption of alcohol is also common among U.S. medical students.^{4–7} In physicians, alcohol abuse/dependence was strongly associated with younger age and dimensions of distress including burnout, depression, and decreased quality of life (QOL).^{3,8} Previous research indicates that these manifestations of distress are also common among U.S. medical students.^{9,10} Yet, to our knowledge, no previous study has explored the relationship between the presence of alcohol abuse/dependence and distress among medical students.

Method

The methods used in this study have been previously reported.⁹ Briefly, in 2012 we surveyed all 26,760 medical students listed in the American Medical Association's (AMA's) Physician Masterfile (PMF) who had given the AMA permission to contact them by e-mail. We sent each medical student an e-mail message inviting them to participate. According to convention,¹¹ we considered the 12,500 medical students who opened at least one e-mail to have received an invitation to participate in

the study. Participation was voluntary, and responses were anonymous. No compensation was provided. The Mayo Clinic institutional review board approved the study.

Survey measures

The survey included questions about basic demographic items (age, sex, relationship status, year of training) and self-reported estimate of current educational debt. Response options for questions were multiple-choice or Likert scale. Measures of alcohol abuse/dependence, burnout, depression, suicidality, quality of life, and fatigue were also included.

Alcohol abuse/dependence. We used the Alcohol Use Disorders Identification Test (AUDIT-C) screening tool to identify those respondents with alcohol abuse/dependence. The full-length AUDIT was developed by the World Health Organization as a primary care screening tool to identify harmful drinking.^{12,13} The AUDIT-C is a short screening tool derived from the full-length AUDIT and has been shown to be just as sensitive in identifying those with alcohol abuse/dependence.¹⁴ The AUDIT-C scores range

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from 0 to 12. We identified participants as screening positive for alcohol abuse/dependence by having an AUDIT-C score ≥ 3 for females (sensitivity 0.66, specificity 0.94) and ≥ 4 for males (sensitivity 0.86, specificity 0.72).¹⁴

Burnout. The Maslach Burnout Inventory (MBI) is a 22-item questionnaire that has been shown to be valid and reliable in assessing burnout and that has become the standard questionnaire used for its assessment.^{15,16} The MBI evaluates three domains of burnout: emotional exhaustion, depersonalization, and personal accomplishment. Consistent with convention,⁸ those respondents who scored high on either the emotional exhaustion (≥ 27) or depersonalization (≥ 10) domain of burnout were considered to have at least one manifestation of professional burnout, and were thus identified as experiencing burnout. Score from the personal accomplishment subscale is not used to categorize individuals as having burnout.

Depression and suicidality. The two-item PRIME-MD (Primary Care Evaluation of Mental Disorders) depression screen was used to identify depression. This two-item screen has been found to be as valid and reliable as longer screening questionnaires.^{17,18} We assessed suicidality with a one-item screen, asking “During the past 12 months, have you had thoughts of taking your own life?” This item has been used in previous studies of physicians and medical students.^{3,10,19,20}

QOL and fatigue. All participants rated their overall, mental, emotional, and physical QOL over the week prior to completing the survey on a single standardized linear analogue self-assessment scale for each domain of QOL (0 = “As bad as it can be”; 10 = “As good as it can be”). This scale has established validity in a variety of medical conditions and populations.^{21–24} In addition, participants rated their level of fatigue on a similar standardized linear analogue scale (where lower scores indicate higher fatigue). We considered those who recorded a score of 5 or less to have high fatigue.²¹

Statistical analysis

We used standard descriptive statistics and chi-square test, Fisher exact test, or Wilcoxon/two-sample *t* test procedures as appropriate. We conducted multivariate

logistic regression procedures for two purposes: first, to adjust the *P* values for comparisons of variables of interest and alcohol abuse for age, gender, and relationship status; and second, to identify factors independently associated with an increased risk of alcohol abuse/dependence. In the modeling process, we included the following independent variables: relationship status, sex, age, year

of training, educational debt, burnout, depression, overall QOL, suicidal ideation, and fatigue. All analyses were performed using SAS statistical software version 9.2 (SAS Institute, Cary, North Carolina).

Results

Of the exactly 12,500 medical students who opened the e-mail invitation to

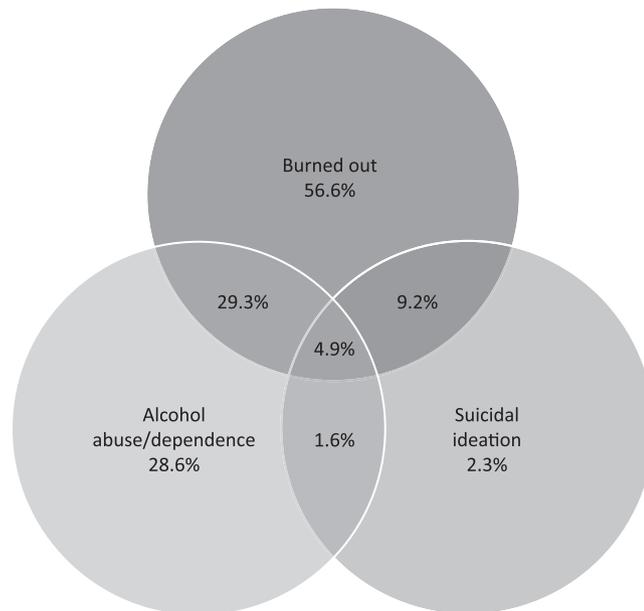


Figure 1 Percentage of 2,964 students with burnout, alcohol abuse/dependence, and/or suicidal ideation, from a study comparing alcohol abuse/dependence and other distress factors among a national sample of medical students, 2012. Figure illustrates the overlap between components and/or general relations, not specific proportions.

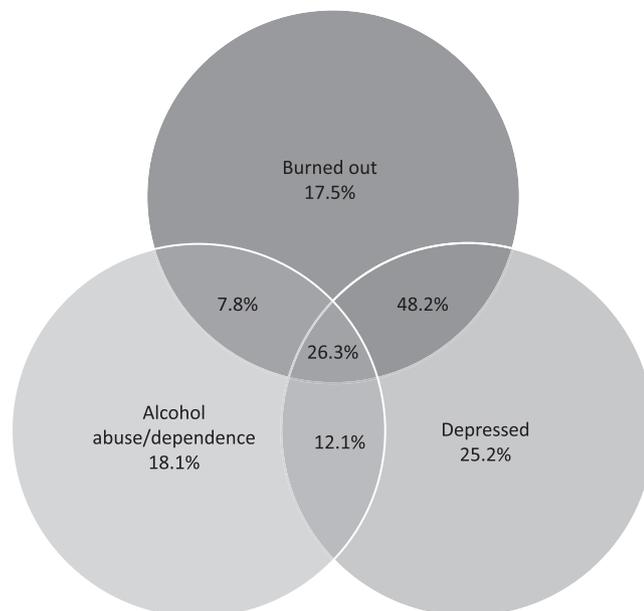


Figure 2 Percentage of 3,389 students with burnout, alcohol abuse/dependence, and/or symptoms of depression, from a study comparing alcohol abuse/dependence and other distress factors among a national sample of medical students, 2012. Figure illustrates the overlap between components and/or general relations, not specific proportions.

Table 1

Demographics and Educational Debt of 4,354 Medical Students by Alcohol Abuse/Dependence, From a National Study Comparing Alcohol Abuse/Dependence and Other Distress Factors, 2012

Characteristic	Alcohol abuse/dependence (n = 1,411)	No alcohol abuse/dependence (n = 2,943)	P value ^a
Sex, no. (%)			.85
Male	622 (31.8)	1,335 (68.2)	
Female	789 (32.9)	1,608 (67.1)	
Missing	0	0	
Age in years, mean	25.7	26.2	.04
Relationship status, no. (%)			< .001
Single	911 (35.4)	1,664 (64.6)	
Married	216 (21.9)	770 (78.1)	
Partnered	282 (35.7)	507 (64.3)	
Widowed/widower	0 (0.0)	1 (100.0)	
Missing	2	2	
Year in school, no. (%)			.06
1	364 (32.3)	764 (67.7)	
2	443 (32.3)	929 (67.7)	
3	277 (33.3)	556 (66.7)	
4	293 (33.3)	588 (66.7)	
Other	30 (24.6)	92 (75.4)	
Missing	4	14	
Educational debt, no. (%)			.01
< \$50,000	468 (30.4)	1,071 (69.6)	
\$50,000–\$100,000	348 (33.8)	683 (66.2)	
> \$100,000	594 (33.4)	1,182 (66.6)	
Missing	1	7	

^aValue adjusted for age, sex, and marital status.

participate, 4,402 completed surveys (35.2% response rate; 4,354 completed the AUDIT-C). The demographic characteristics of those who completed surveys have been previously reported.⁹ Age and year of training were similar to the 66,461 medical students listed in the PMF; however, our participants were less likely to be male (1,972/4,354 [45.3%] versus 35,031/66,461 [52.7%]).

Of the 4,354 students who completed the AUDIT-C, 1,411 (32.4%) met criteria for alcohol abuse/dependence. Rates of burnout, depressive symptoms, suicidal ideation, and QOL have been previously reported.⁹ In aggregate, 3,389/4,218 (80%) had burnout, alcohol abuse/dependence, or depressive symptoms at the time of the survey, and 2,964/4,221 (70%) students had burnout, alcohol abuse/dependence, and/or suicidal ideation present at the time of the survey. The prevalence

of students experiencing burnout, alcohol abuse/dependence, depression, and suicidal ideation is illustrated in Figures 1 and 2.

The relationships between demographic characteristics and alcohol abuse/dependence are shown in Table 1. Age, relationship status, and educational debt each demonstrated a statistically significant association with alcohol abuse/dependence. Specifically, alcohol abuse/dependence was more likely in those who were younger ($P = .04$), were single ($P < .001$), or owed $> \$100,000$ in educational debt ($P < .01$). Although alcohol abuse/dependence appeared to be more common during the first two years of medical school, this trend did not reach statistical significance ($P = .06$). Unlike for the adult U.S. population¹ and physicians,^{3,8,20} no association between sex and alcohol abuse/dependence was observed.

Associations between alcohol abuse/dependence and burnout, depression, recent suicidal ideation, QOL, and fatigue are shown in Table 2. Alcohol abuse/dependence was more common among medical students with burnout ($P = .01$), high emotional exhaustion ($P < .01$), high depersonalization ($P < .001$), and depression ($P = .01$). No relationship was found between suicidal ideation within the last 12 months and alcohol abuse/dependence. Alcohol abuse/dependence was more common among those with lower mental ($P = .03$) and emotional ($P = .016$) QOL, while no association between alcohol abuse/dependence and other QOL dimensions (e.g., physical, overall, fatigue) were observed. Finally, we performed multivariate stepwise logistic regression using relationship status, sex, age, year in school, burnout, overall QOL, recent suicidal ideation, and fatigue as independent variables (Table 3). Alcohol abuse/dependence remained independently associated with burnout (OR 1.20, $P < .01$). Other factors independently associated with alcohol abuse/dependence included being single (versus married, OR 1.89, $P < .001$), being younger (for each five years younger, OR 1.15, $P = .01$), and having educational debt more than \$50,000 (\$50,000–\$100,000 versus less than \$50,000, OR 1.21, $P = .03$; $> \$100,000$ versus $< \$50,000$, OR 1.27, $P < .01$).

Discussion

Alcohol abuse/dependence was strongly associated with several dimensions of distress in this national study of U.S. medical students. Approximately one-third (32.4%) of those students who completed the AUDIT-C met diagnostic criteria for alcohol abuse/dependence. In comparison, only 15.6% of a sample of U.S. college-educated 22- to 34-year-olds met similar criteria.²⁵ Furthermore, the rate observed in our sample was almost twice what was previously reported among participating surgeons,⁸ a national sample of U.S. physicians,^{3,20} and that found in U.S. adult population.^{1,26} We found a higher prevalence of alcohol abuse/dependence among medical students with burnout, depression, and low mental and emotional QOL than for those without.

Medical students with alcohol abuse/dependence in our study were more likely to be younger, single, and have

Table 2

Burnout, Depression, Suicidal Ideation, Quality of Life, and Fatigue of 4,354 Medical Students by Alcohol Abuse/Dependence, From a National Study Comparing Alcohol Abuse/Dependence and Other Distress Factors, 2012

Characteristic	Alcohol abuse/ dependence (n = 1,411)	No alcohol abuse/ dependence (n = 2,943)	P value ^e
Burnout indices^a			
EE, median score	26	25	.01
Low EE: ≤ 18, no. (%)	329 (28.5)	826 (71.5)	.01
Medium EE: 19–26, no. (%)	391 (33.3)	782 (66.7)	
High EE: ≥ 27, no. (%)	646 (34.3)	1,237 (65.7)	
Missing, no.	45	98	
DP, median score	8	7	< .001
Low DP: ≤ 5, no. (%)	432 (28.2)	1,102 (71.8)	< .001
Medium DP: 6–9, no. (%)	351 (34.9)	654 (65.1)	
High DP: ≥ 10, no. (%)	547 (35.3)	1,004 (64.7)	
Missing, no.	81	183	
PA, ^b median score	36	36	.17
High PA: ≥ 40, no. (%)	394 (31.5)	855 (68.5)	.45
Medium PA: 34–39, no. (%)	417 (32.1)	881 (67.9)	
Low PA: ≤ 33, no. (%)	485 (34.3)	930 (65.7)	
Missing, no.	115	277	
Burned out, no. (%)^c	810 (34.3)	1,552 (65.7)	.01
Depression screen positive, no. (%)	866 (34.3)	1,662 (65.7)	.01
Suicidal ideation in the last 12 months, no. (%)	147 (35.8)	264 (64.2)	.19
Quality of life, mean (SD)			
Overall	6.9 (1.8)	7.0 (1.9)	.16
Mental	6.4 (2.1)	6.6 (2.1)	.04
Physical	6.0 (2.2)	6.0 (2.2)	.85
Emotional	6.1 (2.1)	6.3 (2.2)	.02
Fatigue			
Mean score (SD) ^d	5.0 (2.2)	5.0 (2.3)	.54
High fatigue, no. (%)	823 (32.8)	1,688 (67.2)	.57

Abbreviations: EE indicates emotional exhaustion; DP, depersonalization; PA, personal accomplishment.

^aMeasured using the full Maslach Burnout Inventory. Scores within individual burnout domains were categorized into low, intermediate, and high.

^bLower scores on the personal accomplishment subscale represent lower levels of personal accomplishment (i.e., lower scores indicate higher burnout).

^cHigh score on the emotional exhaustion or depersonalization subscale of the Maslach Burnout Inventory (see Method section of this report for full details).

^dLower mean score represents worsened (higher) fatigue.

^eControlled for age, sex, and marital status.

higher educational debt. Younger age and single relationship status are both known risk factors for problematic alcohol use among medical students⁵ as well as in the general population.^{2,25} To our knowledge, no previous studies have evaluated the relationship between alcohol abuse/dependence and educational debt for medical students, although greater debt has been previously associated with an increased risk of alcohol abuse/dependence among the general

population.^{27,28} Our findings suggesting that educational debt may increase the risk of alcohol abuse/dependence are particularly concerning considering that medical educational debt has risen sharply over the past several decades. From 1995 to 2014, the average cost of attendance at private medical schools increased by 209%, while the cost at public medical schools increased 286% over the same time period.²⁹ In 2014, the average medical student graduated

with \$180,000 of debt.³⁰ The escalating cost of medical school needs to be more effectively addressed, especially if health care reform and reimbursement changes lead to reduced earning potential in some specialty areas. If educational debt continues to rise in the face of lower earnings, the psychological toll of educational debt may become even more severe.

The prevalence of suicidal ideation in this cohort (9.4%) was similar to that found in a previous multi-institutional study of medical students¹⁰ and higher than individuals of similar age in the general U.S. population (5.7% among 18- to 29-year-olds).³¹ Suicidal ideation was not more commonly endorsed by those with alcohol abuse/dependence. Alcohol, however, increases impulsivity and the risk of completed suicide^{32–34} as well as other self-injurious impulsive behaviors.^{35,36} In this study, 35.8% (147/411) of those students with suicidal ideation had coexistent alcohol abuse/dependence—a dangerous combination.

Our study provides further evidence that distress among medical students warrants serious attention. A multifaceted approach to reducing alcohol use, ameliorating burnout, and reducing the cost of medical education is needed. Schools should put into place student wellness curricula to help students understand the prevalence and consequences of mental health problems among physicians in-training and in-practice, self-assess their well-being, develop strategies to enhance their resilience, manage educational debt, and seek help when needed. Mindfulness programming and facilitated small-group discussions are among approaches shown to be helpful.^{37,38} In addition to such training, medical schools should work to identify and remediate factors within the learning environment contributing to high levels of stress and burnout.^{39–44} Also, schools need to address barriers to students seeking care for substance abuse and mental health services.^{19,45} Interventions undertaken should be rigorously evaluated and disseminated to facilitate amelioration of distress among medical students. In addition, national efforts are needed to curb the dramatic increase in the cost of medical school, including consideration of state and federal expansion of financing for medical education.^{46,47} Loan repayment deferment, low-interest loans, and innovative debt

Table 3

Factors Independently Associated With Alcohol Abuse/Dependence for 4,354 Medical Students, From a National Study Comparing Alcohol Abuse/Dependence and Other Distress Factors, 2012

Response	Independent predictor	Odds ratio (95% CI)	P value
Alcohol abuse/dependence	Unmarried (versus married)	1.89 (1.57–2.27)	< .001
	Age (for every five years younger)	1.15 (1.02–1.28)	.01
	\$50,000–\$100,000 debt (versus < \$50,000)	1.21 (1.02–1.44)	.03
	> \$100,000 debt (versus < \$50,000)	1.27 (1.08–1.48)	< .01
	Burned out ^a (versus not)	1.20 (1.05–1.37)	< .01

^aHigh score on the emotional exhaustion or depersonalization subscale of the Maslach Burnout Inventory (see Method section of this report for full details).

reconciliation or forgiveness programs have also been suggested.⁴⁸

Limitations

Our study has a number of limitations. First, our response rate was 35.2%. Students who responded to our survey may have had more or less burnout or alcohol use compared with nonresponders. However, the rate of burnout seen in our sample was similar to rates seen in previous studies, suggesting that it is representative.^{9,10,49} Our response rate is also typical of national survey samples of physicians and medical students.^{8,49,50} Also, our sample included fewer males than those listed in the PMF. All other demographic variables were similar. This slight difference in sex is unlikely to have accounted for any systematic differences, as the relationship between burnout and alcohol abuse/dependence persisted on multivariate analysis after controlling for sex.

A second limitation is the cross-sectional design. We cannot determine causality or directionality of the relationships among our variables. Although the associations were statistically significant, we do not know whether alcohol abuse/dependence causes burnout or vice versa. A longitudinal study is needed to provide a more definitive answer to the question about causation and directionality. Third, we chose to use the AUDIT-C for our screening instrument for alcohol abuse/dependence and used a cutoff score of ≥ 3 for females (sensitivity 0.66, specificity 0.94) and ≥ 4 for males (sensitivity 0.86, specificity 0.72). If we had used higher cutoff scores, our sensitivity would have increased, but at a cost to specificity. Fourth, time frames for our measures

differed. For example, symptoms of depression were elicited over the month prior to survey completion, whereas quality-of-life measures were asked over the week prior. Finally, we depended on self-reported educational debt and included a limited set of personal variables.

Conclusions

The rate of alcohol abuse/dependence in this cohort of U.S. medical students was higher than for similarly aged peers not attending medical school. Alcohol abuse/dependence among medical students was strongly associated with burnout, higher educational debt, and personal characteristics (i.e., younger age and single relationship status). A multifaceted approach to address alcohol use, ameliorate burnout, and reduce the cost of medical education is needed.

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References

- National Institute on Alcohol Abuse and Alcoholism. Alcohol facts and statistics. <http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-facts-and-statistics>. Accessed January 7, 2016.
- Hasin DS, Stinson FS, Ogburn E, Grant BF. Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Arch Gen Psychiatry*. 2007;64:830–842.
- Oreskovich MR, Shanafelt T, Dyrbye LN, et al. The prevalence of substance use disorders in American physicians. *Am J Addict*. 2015;24:30–38.
- Frank E, Elon L, Naimi T, Brewer R. Alcohol consumption and alcohol counselling behaviour among US medical students: Cohort study. *BMJ*. 2008;337:a2155.
- Shah AA, Bazargan-Hejazi S, Lindstrom RW, Wolf KE. Prevalence of at-risk drinking among a national sample of medical students. *Subst Abus*. 2009;30:141–149.
- Ball S, Bax A. Self-care in medical education: Effectiveness of health-habits interventions for first-year medical students. *Acad Med*. 2002;77:911–917.
- Baldwin DC Jr, Hughes PH, Conard SE, Storr CL, Sheehan DV. Substance use among senior medical students. A survey of 23 medical schools. *JAMA*. 1991;265:2074–2078.
- Oreskovich MR, Kaups KL, Balch CM, et al. Prevalence of alcohol use disorders among American surgeons. *Arch Surg*. 2012;147:168–174.
- Dyrbye LN, West CP, Satele D, et al. Burnout among U.S. medical students, residents, and early career physicians relative to the general U.S. population. *Acad Med*. 2014;89:443–451.
- Dyrbye LN, Thomas MR, Massie FS, et al. Burnout and suicidal ideation among U.S. medical students. *Ann Intern Med*. 2008;149:334–341.
- American Association for Public Opinion Research. Standard definitions: Final dispositions of case codes and outcome rates for surveys. http://www.aapor.org/AAPORKentico/AAPOR_Main/media/publications/Standard-Definitions2015_8t_heditionwithchanges_April2015_logo.pdf. Accessed January 9, 2016.
- Harris SK, Louis-Jacques J, Knight JR. Screening and brief intervention for alcohol and other abuse. *Adolesc Med State Art Rev*. 2014;25:126–156.
- Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption—II. *Addiction*. 1993;88:791–804.
- Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol use disorders identification test. *Arch Intern Med*. 1998;158:1789–1795.
- Rafferty JB, Lemkau JP, Purdy RR, Rudisill JR. Validity of the Maslach burnout inventory

- for family practice physicians. *J Clin Psychol*. 1986;42:488–492.
- 16 Maslach C, Jackson SE, Leiter MP. *Maslach Burnout Inventory Manual*. 3rd ed. Palo Alto, Calif: Consulting Psychologists Press Inc.; 1996.
 - 17 Whooley MA, Avins AL, Miranda J, Browner WS. Case-finding instruments for depression. Two questions are as good as many. *J Gen Intern Med*. 1997;12:439–445.
 - 18 Spitzer RL, Williams JB, Kroenke K, et al. Utility of a new procedure for diagnosing mental disorders in primary care. The PRIME-MD 1000 study. *JAMA*. 1994;272:1749–1756.
 - 19 Schwenk TL, Davis L, Wimsatt LA. Depression, stigma, and suicidal ideation in medical students. *JAMA*. 2010;304:1181–1190.
 - 20 Oreskovich MR, Shanafelt T, Dyrbye LN, et al. The prevalence of substance use disorders in American physicians. *Am J Addict*. 2015;24:30–38.
 - 21 West CP, Shanafelt TD, Kolars JC. Quality of life, burnout, educational debt, and medical knowledge among internal medicine residents. *JAMA*. 2011;306:952–960.
 - 22 Spitzer WO, Dobson AJ, Hall J, et al. Measuring the quality of life of cancer patients: A concise QL-index for use by physicians. *J Chronic Dis*. 1981;34:585–597.
 - 23 Rummans TA, Clark MM, Sloan JA, et al. Impacting quality of life for patients with advanced cancer with a structured multidisciplinary intervention: A randomized controlled trial. *J Clin Oncol*. 2006;24:635–642.
 - 24 Gudex C, Dolan P, Kind P, Williams A. Health state valuations from the general public using the visual analogue scale. *Qual Life Res*. 1996;5:521–531.
 - 25 Substance Abuse and Mental Health Services Administration. Results from the 2012 National Survey on Drug Use and Health: Summary of national findings. <http://www.samhsa.gov/data/NSDUH/2012SummNatFindDetTables/NationalFindings/NSDUHresults2012.htm>. Accessed January 7, 2016.
 - 26 Dawson DA, Grant BF, Stinson FS, Zhou Y. Effectiveness of the derived alcohol use disorders identification test (AUDIT-C) in screening for alcohol use disorders and risk drinking in the US general population. *Alcohol Clin Exp Res*. 2005;29:844–854.
 - 27 Adams T, Moore M. High-risk health and credit behavior among 18- to 25-year-old college students. *J Am Coll Health*. 2007;56:101–108.
 - 28 Jenkins R, Bhugra D, Bebbington P, et al. Debt, income and mental disorder in the general population. *Psychol Med*. 2008;38:1485–1493.
 - 29 Association of American Medical Colleges. Tuition and student fee reports. <https://services.aamc.org/tsfreports/index.cfm>. Accessed January 7, 2016.
 - 30 Association of American Medical Colleges. Medical student education: Debt, costs, and loan repayment fact card. <https://www.aamc.org/download/152968/data/debtfactcard.pdf>. Accessed January 7, 2016.
 - 31 Crosby AE, Han B, Ortega LA, Parks SE, Gfroerer J; Centers for Disease Control and Prevention (CDC). Suicidal thoughts and behaviors among adults aged ≥18 years—United States, 2008–2009. *MMWR Surveill Summ*. 2011;60:1–22.
 - 32 Larkin C, Di Blasi Z, Arensman E. Risk factors for repetition of self-harm: A systematic review of prospective hospital-based studies. *PLoS One*. 2014;9:e84282.
 - 33 Ohberg A, Vuori E, Ojanperä I, Lonngvist J. Alcohol and drugs in suicides. *Br J Psychiatry*. 1996;169:75–80.
 - 34 Yaldizli O, Kuhl HC, Graf M, Wiesbeck GA, Wurst FM. Risk factors for suicide attempts in patients with alcohol dependence or abuse and a history of depressive symptoms: A subgroup analysis from the WHO/ISBRA study. *Drug Alcohol Rev*. 2010;29:64–74.
 - 35 Chen LH, Baker SP, Li G. Drinking history and risk of fatal injury: Comparison among specific injury causes. *Accid Anal Prev*. 2005;37:245–251.
 - 36 Hingson R, Heeren T, Winter M, Wechsler H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18–24: Changes from 1998 to 2001. *Annu Rev Public Health*. 2005;26:259–279.
 - 37 Warnecke E, Quinn S, Ogden K, Towle N, Nelson MR. A randomised controlled trial of the effects of mindfulness practice on medical student stress levels. *Med Educ*. 2011;45:381–388.
 - 38 West CP, Dyrbye LN, Rabatin JT, et al. Intervention to promote physician well-being, job satisfaction, and professionalism: A randomized clinical trial. *JAMA Intern Med*. 2014;174:527–533.
 - 39 Dyrbye LN, Thomas MR, Harper W, et al. The learning environment and medical student burnout: A multicentre study. *Med Educ*. 2009;43:274–282.
 - 40 Cook AF, Arora VM, Rasinski KA, Curlin FA, Yoon JD. The prevalence of medical student mistreatment and its association with burnout. *Acad Med*. 2014;89:749–754.
 - 41 Dyrbye LN, Thomas MR, Eacker A, et al. Race, ethnicity, and medical student well-being in the United States. *Arch Intern Med*. 2007;167:2103–2109.
 - 42 Reed DA, Shanafelt TD, Satele DW, et al. Relationship of pass/fail grading and curriculum structure with well-being among preclinical medical students: A multi-institutional study. *Acad Med*. 2011;86:1367–1373.
 - 43 Bloodgood RA, Short JG, Jackson JM, Martindale JR. A change to pass/fail grading in the first two years at one medical school results in improved psychological well-being. *Acad Med*. 2009;84:655–662.
 - 44 Haglund ME, aan het Rot M, Cooper NS, et al. Resilience in the third year of medical school: A prospective study of the associations between stressful events occurring during clinical rotations and student well-being. *Acad Med*. 2009;84:258–268.
 - 45 Gentile JP, Roman B. Medical student mental health services: Psychiatrists treating medical students. *Psychiatry (Edgmont)*. 2009;6:38–45.
 - 46 Greysen SR, Chen C, Mullan F. A history of medical student debt: Observations and implications for the future of medical education. *Acad Med*. 2011;86:840–845.
 - 47 Bach PB, Kocher R. Why medical school should be free. *NY Times*. May 28, 2011. <http://www.nytimes.com/2011/05/29/opinion/29bach.html>. Accessed January 7, 2016.
 - 48 Mareiniss DP. Decreasing GME training stress to foster residents' professionalism. *Acad Med*. 2004;79:825–831.
 - 49 Shanafelt TD, Balch CM, Bechamps GJ, et al. Burnout and career satisfaction among American surgeons. *Ann Surg*. 2009;250:463–471.
 - 50 Dyrbye LN, West CP, Satele D, Boone S, Sloan J, Shanafelt TD. A national study of medical students' attitudes toward self-prescribing and responsibility to report impaired colleagues. *Acad Med*. 2015;90:485–493.