

Efficacy of Burnout Interventions in the Medical Education Pipeline

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Efficacy of Burnout Interventions in the Medical Education Pipeline

Daniel Williams · Gian Tricomi · Jay Gupta · Annie Janise

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Abstract

Objective Little is known about the efficacy of current interventions to mitigate burnout among medical students and residents, despite its association with mood disorders, absenteeism, low job satisfaction, and medical errors. This review summarizes the efficacy data of burnout interventions and how each modality is used.

Method OVID-SP Medline, Google Scholar and PsychINFO were searched for combinations of medical subject headings (MeSH) terms: premedical students, medical students, internships, intern, medical graduate, clinical clerkship, and residents in combination with a keyword group of burnout, professional burnout, suicide, attempted suicide, and prevention. Studies with data on the efficacy from burnout prevention programs were included for review.

Results Nineteen studies were selected for inclusion in this review. Eleven different types of interventions and combinations of interventions were used. There were six studies on the impact of the 2003 duty-hour restrictions by the Accreditation Council for Graduate Medical Education on burnout. Other approaches included self-development groups, conversion to a pass-fail grading system and training in mindfulness, communication, and stress management. Half of the intervention approaches had at least one study demonstrating benefit in reducing burnout. Self-development groups, the Respiratory One Method for relaxation, and conversion to a pass-fail grading system appear to reduce burnout. The burnout data on mindfulness training and the 2003 resident duty-hour restrictions are mixed. There were no studies available on

burnout among premedical students or suicide prevention among medical students or residents.

Conclusions There is a growing body of evidence-based interventions to mitigate burnout which can be used in the development of future programs. More research is needed to identify and intervene against burnout earlier in the medical education pipeline, including at the undergraduate level.

Keywords Medical student · Resident · Burnout prevention · Suicide

Interest in the mental health of medical students and resident physicians is increasing in recent decades. Most US medical schools offer some amount of psychological services and education about fatigue and depression. The bulk of the maturing evidence base focuses on mood disorders, though recent evidence suggests growing attention is also being paid to stress affecting the entire medical education pipeline [1].

The authors of this paper focus on burnout, which may be viewed conceptually as an entity existing on a spectrum between stress and formal mood disorders such as major depressive disorder. Burnout is known to increase the risk of depression by a factor of 1.8–2.6, and the treatment of burnout results in less suicidal ideation [2–6]. Thus, focusing on burnout may enable prevention or mitigation for those at risk for more serious conditions. In addition to depression, burnout has been associated with increased medical errors, stress-related health problems, decreased empathy, and low career satisfaction [7, 8].

Combined estimates of burnout prevalence among US medical students and graduate residents range from 40 to 76 % [9–16]. In 2012, Chang and colleagues reported on the prevalence of burnout among 336 medical students during their first through third year [17]. Their cross-sectional design

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detected 55 % of medical students in the high burnout range—higher than previously studied groups [8, 17, 18].

The most common instrument used in the literature to measure burnout is the Maslach Burnout Inventory (MBI), which defines burnout as a syndrome of dysfunction in three domains: emotional exhaustion, depersonalization, and a reduced sense of personal accomplishment [19]. The MBI has been validated in physicians [20]. Other instruments measure similar psychometric properties such as fatigue-inertia, confusion-bewilderment, and vigor-activity, which, respectively, overlap with Maslach's emotional exhaustion, depersonalization, and personal achievement domains. These instruments include the Profile of Mood States (POMS), Perceived Medical Student Stress (PMMS), and more recently the Medical Student Well-Being Index (MSWBI) [21, 22]. This review summarizes the efficacy data of burnout interventions and how each modality is used.

Methods

OVID-SP Medline, Google Scholar, and PsychINFO were searched for combinations of medical subject headings (MeSH) terms: premedical students, medical students, internships, intern, medical graduate, clinical clerkship, and residents in combination with a keyword group of burnout, professional burnout, suicide, attempted suicide, and prevention through November 2013. International studies were included.

Articles were critically reviewed and abstracted independently by two of the authors using a three-stage process (Fig. 1). Stage one screening involved reviewing titles and abstracts, then selecting studies addressing the prevalence of burnout, suicides, and intervention efficacy. Stage two screening used the full text of the articles to further ensure articles were relevant to the research question. In stage three, the bibliographies of each included study were reviewed to identify additional relevant studies that the literature search may have missed. Any study identified by either author as relevant was included.

Inclusion Criteria

Studies with original data, qualitative or quantitative, attempting to measure the effect of an intervention on burnout and suicide prevention were included. Studies could also focus on symptoms, or treatment of symptoms, which overlapped with the Maslach's validated burnout construct [23]. This includes the Maslach Burnout Inventory, Profile of Mood States (POMS), and Perceived Medical Student Stress (PMMS). Studies discussing an intervention's impact on suicide rates were also sought [24]. One study was selected for its exemplary intervention that treated burnout even though the primary outcome measures were depression and suicidal ideation [25].

Exclusion Criteria

We limited our study to burnout and avoided studies that dealt with formal mood disorder, such as depression and anxiety. Therefore, mood and anxiety instruments such as the Hopkins Symptom Check List (SCL-90) were avoided. Some studies were included that assessed both burnout and mood disorders in order to extract the burnout data [26].

Results

A total of 5,171 titles were returned from all database searches (Fig. 1). Stage one screening excluded 4,965 titles and abstracts based upon their population. In stage two, the remaining 206 manuscripts were read and 192 studies were excluded for population exclusion, lack of a true intervention, or lack of efficacy data. This left 14 studies. Stage three added five more for a total of 19 studies. Most (16, 84 %) of these studies took place in the USA, with one each in Norway, Australia, and Belgium. There were 11 (57.9 %) studies published in the graduate medical resident population and 8 (42.1 %) in the medical student population. Eleven different types of

Fig. 1 Study flow diagram



interventions and combinations of interventions were used, and the results are summarized in Table 1. Below is a description of each study.

Duty-Hour Changes

Six manuscripts contained efficacy data on the impact of the 2003 Accreditation Council for Graduate Medical Education (ACGME) duty-hour restrictions on burnout (Table 2) [9, 26–28, 30, 31].

Gelfand et al. administered the MBI to 64 surgical and subspecialty surgical residents and faculty before and 6 months after the 2003 ACGME duty-hour restrictions. There was a significant reduction in home call and educational activities within working hours ($P < 0.05$) [9]. There were no significant decreases in any MBI domain, surgery time, clinic time, or time spent on rounds.

Goitein et al. administered the MBI in 2001 and 2004 to 118 internal medicine residents [31]. The authors controlled for residency year and showed decreased emotional exhaustion ($P = 0.05$) and respondents reported being happier with their career choice than before ($P = 0.02$). Program year 1 (PGY-1) residents/interns had a four times greater chance of liking the duty-hour restrictions compared to other residents. Only 50 % of residents reported using their extra time off for educational activities (i.e., reading medical literature) at least twice per month.

Martini et al. performed a cross-sectional analysis of the prevalence of burnout among 118 residents from multiple specialties and PGY levels after the ACGME duty-hour restrictions were implemented [8]. There was a significantly higher prevalence of burnout in the 11 % of residents still working over 80 h per week (69.2 versus 38.5 %, $P = 0.034$). They did not find a significant difference in burnout prevalence (41 %) among residents reporting compliance with the new policy.

Gopal et al. studied 227 internal medicine residents and showed high initial burnout ($P = 0.05$) and significant decreases in emotional exhaustion (13 %; $P = 0.03$) after the duty-hour limitations [27]. Personal achievement was maintained and overall burnout and depersonalization trended down ($P = 0.06$; $P = 0.13$, respectively). Overall satisfaction with their residency program's education decreased ($P = 0.02$) among third-year residents as the number of morning reports they attended also decreased. The percentage of residents reading medical topics at least 2 h per week increased from 42 to 54 % ($P = 0.06$).

Hutter et al. studied 58 surgical attendings and residents and demonstrated a significant reduction in emotional exhaustion ($P = 0.02$) and a trend downward in depersonalization ($P = 0.09$) [30]. There was no significant change in patient care or the quantity of resident training and education. Quality of patient care was assessed by prospectively gathered, risk-

adjusted data using standard definitions from the National Surgical Quality Improvement Program [30]. This program measures patient care outcomes that include surgical site infections, indwelling catheter infections, and mortality. The attendings reported a lower quality of life after the 2003 ACGME changes.

Barrack et al. surveyed 100 orthopedic surgery attendings and residents in 2002 and 2005 [28]. There was a decrease in emotional exhaustion among residents ($P = 0.056$), but not in attending physicians.

Communication Skills Course

Bragard et al. provided communication skills training to 96 oncology residents to help them learn how to deliver bad news to patients and their families [40]. The primary outcome measure was "self-efficacy," which describes one's own beliefs about their capabilities to produce effects and is related to Maslach's domain of personal achievement [36]. They measured no change in burnout after the intervention compared to a wait-list control group and postulated that a maturation time may be needed for a burnout intervention to have its complete effect.

Mindfulness Meditation

Mindfulness refers to nonjudgmental awareness of one's own moment-to-moment experience, which cultivates concentration and insight, as well as physiologic relaxation [29]. Three studies demonstrated efficacy of mindfulness training on burnout in the medical education pipeline [29, 39, 41].

Rosenzweig et al. administered the Profile of Mood States (POMS) to 302 medical students before and after a 10-week Mindfulness-Based Stress Reduction (MBSR) course [29]. The control group was exposed to a different course on Complementary and Alternative Medicines, which could have confounded the effect of the MBSR intervention group, but students in the MBSR group experienced less burnout ($P < 0.01$).

Finkelstein et al. studied 30 medical students before and after a 10-week Mind-Body Skills Course designed by the Center for Mind-Body Medicine [39, 42]. Investigators administered the Profile of Mood States (POMS), Hopkins Symptoms Check List (SCL-90), 2-Item Depression Index (2-IDI), and the Perceived Stress of Medical School (PSMS). Perceived stress and anxiety decreased, but their POMS scores, which overlap with burnout symptoms, did not ($P = 0.03, 0.01, 0.40$, respectively).

Warnecke et al. studied 66 third- and fourth-year medical students. Participants were randomized and asked to listen to an audio compact disk with guided meditation exercises for 30 min per day for 8 weeks [41]. They used the Perceived Stress Scale (PSS) and changes in subscores of the Depression

Table 1 Demographic and methodological characteristics of burnout intervention studies demonstrating efficacy in resident physicians and medical students

	Number	Year	Sample	Design	Intervention	Scale	Findings
Barrack et al. [27], 2006	100	2002, 2005	Orthopedic surgery residents and faculty at two US programs	Nonrandomized controlled	ACGME duty standards	MBI	Insignificant decrease in EE ($P=0.056$) in residents only
Bragard et al. [28], 2010	96	?	Medical oncology residents in Belgium	Longitudinal randomized controlled	Communication and stress management training	PMHS VAS MBI	No significant changes in burnout
Finkelstein et al. [29], 2007	30	2004	Medical students at U. of Washington, DC	Nonrandomized controlled	10-week mind-body medicine elective	POMS SCL-90 2-IDI PSMS	No change in POMS, less perceived stress and anxiety
Gelfand et al. [9], 2004	64	2003	Residents and faculty of many surgical specialties at U.C. Irvine	Longitudinal nonrandomized uncontrolled	ACGME duty standards	MBI	No significant changes in burnout
Ghetti et al. [7], 2009	17	2005	OB/Gyn residents in Pittsburgh	Longitudinal nonrandomized uncontrolled	Balint training	MBI PMI JSPE	Insignificant decrease in EE, DP, and PA
Goitein et al. [30], 2005	118	2001, 2004	Internal medicine residents in Seattle	Nonrandomized controlled	ACGME duty standards	MBI	Significant reduction in EE and increased career happiness
Gopal et al. [31], 2005	227	2003-2004	Internal medicine residents at U. of Colorado	Longitudinal nonrandomized controlled	ACGME duty standards	MBI PCEMD	Significant reduction in EE
Holm et al. [25], 2010	129	2002	Third-year medical students in Norway	Nonrandomized uncontrolled	Bivariate self-development groups	PMMS BCI SCL-5	Significant stress reduction in the psychiatrist-led group
Hutter et al. [26], 2006	58	2003-2004	Surgical residents, attendings at Mass Gen	Longitudinal, nonrandomized controlled	ACGME duty standards	MBI ABSITE NSQIP	Significant reduction in EE
Martini et al. [8], 2006	118	2004	Residents at Wayne State Univ. School of Med., MI.	Nonrandomized, uncontrolled	ACGME duty standards	MBI	No significant changes in burnout
McCue et al. [10], 1991	43	1991	Internal medicine, pediatric, and med/peds residents in Boston	Nonrandomized controlled	Stress management workshop	MBI LES ESSI	Insignificant decrease in EE, DP, and PA
Milstein et al. [32], 2009	15	2003	Pediatric residents	Randomized controlled	BATHE stress therapy training	MBI	No change in MBI
Ospina-Kammerer et al. [33], 2003	24	?	Family medicine residents from the US Southeast	Nonrandomized controlled	Respiratory One Method	MBI	Significant reduction in EE
Reed et al. [34], 2011	1,192	2007	First- and second-year medical students at seven US schools	Nonrandomized controlled	Pass-fail grading	PSS MBI SF-8	Significant reduction in EE, DP, and stress
Rohe et al. [35], 2006	81	2002-2003	First-year medical students at Mayo Med. School, MN	Nonrandomized controlled	Pass-fail grading	PSS PCS	Significant reduction in stress

Table 1 (continued)

	Number	Year	Sample	Design	Intervention	Scale	Findings
Rosenzweig et al. [36], 2003	302	2001	Medical students from Jefferson Medical College, Philadelphia	Nonrandomized controlled	10-week mindfulness-based stress reduction program	TAI POMS	Significant reduction in total mood disturbance
Sikora et al. [37], 2008	18	?	Emergency medicine residents and faculty at West Virginia U., WV	Randomized controlled	Journaling	MBI	No significant changes in burnout
Thompson et al. [38], 2010	58	2002-2003	Third-year medical school class at U. of Hawaii	Nonrandomized controlled	Burnout intervention	CESDC	Significant decrease in SI and depression
Wamecke et al. [39], 2011	66	2009	Third- and fourth-year medical students in Tasmania, Australia	Randomized controlled, single blinded	Guided mindfulness technique	PSS DASS	Less-perceived stress and anxiety

2-Item Depression Index, ABSITE American Board of Surgery in Training Examination, BATHE Background Affect Troubles Handling Empathetic psychotherapeutic technique, BCI Basic Character Inventory, CESDC Center for Epidemiologic Studies Depression Scale, DASS Depression Anxiety Stress Scale, DP Depersonalization subscale of MBI, ESS/ESSI Stress Systems Inventory, EE Emotional Exhaustion subscale of MBI, JSPE Jefferson Scale of Physician Empathy, LES Life Experience Survey, MBI Maslach Burnout Inventory, NSQIP National Surgical Quality Improvement Program, PA Personal Accomplishment subscale of MBI, PCEMD Primary Care Evaluation of Mental Disorders, PCS Perceived Cohesion Scale, PMHS Parle Maguire Heaven Self-Efficacy Scale, PMI Psychological Medicine Inventory, PMMS Perceived Medical Student Stress, POMS Profile of Mood States, PSMMS Perceived Stress of Medical School, PSS Perceived Stress Scale, SCL-5 Hopkins Symptom Check List-5, SCL-90 Anxiety Subscale, SF-8 Medical Outcomes Study Short Form, SI Suicidal Ideation, TAI-Test Attitude Inventory, VAS Visual Analogue Scale

Anxiety and Stress Scale (DASS). The DASS is a 42-item, self-report instrument designed to measure depression, anxiety, and tension/stress, the latter overlapping with the POMS and burnout construct [34]. They demonstrated decreased perceived stress on the PSS ($P<0.05$) and decreased scores for anxiety and stress on the DASS ($P<0.05$, $P=0.05$, respectively).

Conversion to a Pass-Fail Grading System

Two medical student studies demonstrated the effect of conversion from letter grades to pass-fail grading on burnout [33, 35].

Reed et al. surveyed 1,192 medical students at 7 US medical schools on 12 campuses using the MBI, Perceived Stress Scale, and Medical Outcomes Short Form (SF-8) to measure stress, burnout, and quality of life, respectively [35]. Students in traditional letter grading systems had an increased odds of burnout (OR 1.58, $P=0.0002$). They were also more likely to have considered dropping out of medical school in the past year (OR 1.91, $P=0.001$) and higher levels of perceived stress.

Rohe et al. studied 81 first-year medical school students between 2002 and 2005. A pass-fail grading system was implemented for the first-year medical student cohort of the class of 2006 [33]. Upperclassmen that did not convert to the pass-fail grading system served as a control group. Investigators administered the Perceived Stress Scale (PSS), Profile of Mood States (POMS), Perceived Cohesion Scale (PCS), and Test Anxiety Inventory (TAI) and (after year 2) recorded their United States Medical Licensing Examination step 1 scores [33]. Students graded using the pass-fail system were significantly more cohesive and demonstrated less perceived stress and burnout ($P=0.02$, 0.01 , 0.01 , respectively). There was no difference in test-taking anxiety or USMLE step 1 scores.

Respiratory One Method

The Respiratory One Method (ROM) is a relaxation and meditation technique that relies on verbalizing the word “one” during exhalation and is designed to mitigate the impact of emotional arousal [37]. Ospina-Kammerer and Figley administered the MBI to 24 family medicine residents prior to four, weekly ROM treatment sessions [37]. There was a significant decrease in emotional exhaustion scores, but no change in depersonalization or personal achievement ($P<0.05$).

Balint Groups

Balint groups are a group-training method that helps physicians better understand their role in doctor-patient relationships and improve their interpersonal skills [7].

Table 2 Brief summary of residency restrictions by the Accreditation Council for Graduate Medical Education (ACGME)

Standard	2003 restrictions	2011 restrictions
Duty hours	Less than 80 h per week, averaged over a 4-week period, including all in-house call activities and internal moonlighting All residents can't work more than 24 continuous hours, with no more than 6 additional hours to do didactics or other patient care activities	Expanded to include external moonlighting hours within the 80-h work-week limit PGY-1's can't work more than 16 continuous hours under any circumstances. PGY-2's can't work more than 24 h, except for rare humanistic care for one patient only and on their own initiative
Minimum time off between duty periods	10 h off duty between any type of shift or work day	Expanded to include 14 h off after a 24-h shift

Ghetti et al. administered the MBI and the Jefferson Scale of Physician Empathy to Obstetrics and Gynecology residents before Balint training and at 12-month follow-up ($n=17$) [7]. At baseline, 13 of 17 residents had high burnout scores in the emotional exhaustion subscale, 15 had high scores in the depersonalization subscale, 9 had high scores in the personal accomplishment subscale, and 13 had high burnout scores in more than one subscale. At 1-year follow-up, two residents reported decreased depersonalization and emotional exhaustion, while three residents reported decreases in the burnout subscale for personal accomplishment. However, these changes were not significantly different from baseline.

Journaling

Sikora et al. studied the effect of reflective journaling by emergency medicine residents ($n=18$) on salivary cortisol levels and the MBI [43]. The residents were randomly assigned to one of three groups: control group, topic-guided journaling, or a free form style of unguided journaling. There were no significant differences in cortisol levels or burnout after the intervention for any group. Interestingly, higher depersonalization scores correlated with a negative subjective experience with unguided journaling.

Self-Development Groups

Holm et al. required an entire third-year Norwegian medical school class to participate in either a clinician-led small group or a self-development group led by a psychiatrist trained in group analytical therapy [25]. The comparison group participated in a clinician-led group that focused on science and career knowledge. Holm et al. demonstrated reduction in perceived stress in the self-development group compared to the career development group ($P=0.03$). There was no control group to detect if the career development group alone was beneficial.

Stress Management Training

Stress management training was incorporated into the interventions done by Bragard et al. and Rosenzweig et al.

described above, but McCue et al. conducted a 4-h workshop that isolated stress management training as a singular intervention [10, 29, 40]. The McCue workshop included 63 internal medicine, pediatric, and combined medicine-pediatric residents in Boston. This study is the only one reviewed here that cost the residents money to participate in the intervention (US\$25–50). There were insignificant decreases in all three Maslach burnout domains.

BATHE Psychotherapeutic Technique

The BATHE technique is a psychological screening tool for anxiety, depression, and situational stress [32]. The acronym guides the clinician's history taking and stands for background, affect, troubles, handling of the current situation by the patient, followed by an empathetic response.

Milstein et al. taught seven pediatric residents how to perform this technique on themselves at the same time the 2003 ACGME duty-hour restrictions went into effect [38]. Eight residents were in the control group and the MBI was used to compare the two groups. No significant changes on the MBI occurred though the personal accomplishment domain decreased in the intervention group.

Comprehensive Approach (Counseling, Education, and Awareness Campaigns)

This final study was included because the intervention is an exemplary program designed to treat and prevent burnout, even though the primary outcome measures were depression and suicidal ideation. Thompson et al. launched a comprehensive wellness outreach initiative to third-year medical students at the University of Hawaii [25]. The program included an awareness campaign about the prevalence and treatability of depression and suicidal ideation, awareness of counseling services on campus, and formal didactic sessions about these subjects. There was interdepartmental cooperation with a unified message for student health that sought to change the culture and reduce the stigma of mental illness. Investigators administered the Center for Epidemiological Studies Depression Scale and a question about suicidal ideation. There was a

significant decrease in depressive symptoms and suicidal ideation after the intervention ($P < 0.01$ and < 0.001 , respectively).

Conclusions

Burnout interventions may be helpful for medical students and residents at risk for more serious mood disorders. Current evidence demonstrates that a variety of approaches are used to address burnout in the medical education pipeline. Conversion to a pass-fail grading system in medical school, mindfulness training, the Respiratory One Method of relaxation, self-development groups, and the 2003 ACGME duty-hour limitations all had one or more studies demonstrating benefit in burnout. Stress management training as a singular intervention, Balint groups, journaling, communication skills training, and the BATHE technique had no, or unclear, benefit.

Caution must be used in interpreting these findings. Many of the studies had relatively small sample sizes that could have been under-powered to detect a significant benefit from the interventions. Resident duty-hour studies have mixed results, with three positive and three negative studies. Residents' perceptions of the quantity and quality of their residency program's education may be a multifactorial issue that overlaps with burnout in such a way as to blur the landscape. For example, occurrences of internal medicine residents sent home before morning report and surgical residents with restricted time in the operating room might contribute to attitudinal influences which affect burnout scores. It is possible that specialty-, regional-, or program-specific differences exist that would allow different burnout interventions to help in some environments and not in others. Publication bias may have led to an inflated, perceived impact of these interventions on burnout because some studies with negative findings may not have been published. Finally, some interventions were done exclusively for medical students or residents so the results cannot necessarily be generalizable across the two groups.

Limitations of this study include the fact that there was no hand searching of the literature. Database searches may be limiting our findings, especially for archived documents. More importantly, the definition of burnout and its overlap with both normal stress and even severe mood disorders, combined with the multiple instruments used to measure their common psychometric properties, could obfuscate the topic. Mitigating this possibility is the fact that the Maslach Burnout Inventory has been validated in physicians as essentially a preclinical entity with ties to depression and suicidal ideation. In addition, the other inventories included in this study asked very similar questions. This approach assumes burnout is a separate entity from mood disorders because we would otherwise be interested in combining the interventions for

depression and anxiety in this review. Thus, excluding depression and anxiety studies could limit the scope of interventions that would be helpful for people with burnout.

Larger longitudinal studies would be helpful in determining the extent to which reducing burnout actually contributes to reduced depression, anxiety, and suicide. Outcome research measuring attrition in the medical education pipeline due to preventable factors would benefit students and patients, especially in light of increasing physician shortages and the worsening disproportion of graduating medical students to available residency positions. Research on premedical student burnout and suicide prevention in the education pipeline might help further clarify the extremes of the spectrum of mental health disorders that our future doctors may experience.

Disclosures On behalf of all the authors, the corresponding author states that there is no conflict of interest.

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