



REVIEW ARTICLE

Medical Student and Resident Burnout: A Review of Causes, Effects, and Prevention

Amir Mian^{1*}, Dahye Kim², Duane Chen³ and Wendy L Ward⁴

¹Department of Pediatrics, University of Arkansas for Medical Sciences, College of Medicine, USA

²Furman University, USA

³Episcopal Collegiate School, USA

⁴University of Arkansas for Medical Sciences, College of Medicine, USA

*Corresponding author: Amir Mian, Department of Pediatrics, University of Arkansas for Medical Sciences, College of Medicine, 1 Children's Way, Mail slot 512-10 LR AR 72202, USA, Tel: 501-364-1494



Abstract

Professional burnout is a multi-dimensional phenomenon, which may result from prolonged unhealthy occupational stress. Symptoms in burnout cluster in three domains: emotional exhaustion, feeling isolated, and low work satisfaction. Medical students and residents are at particular risk because of their dual student pressures and in-training clinical care responsibilities. Common sources of personal and professional stressors include lack of time for leisure activities, inordinate workloads and sleep deprivation, emotional drain stemming from sick and dying patients, and training coinciding with major events of life. Symptoms of burnout include distress and depression, anxiety/worry, dropping out, substance abuse, and suicidality. If not managed appropriately, burnout can result in a lowered quality of life, negative impacts on patient care, and in extreme cases, professional impairment. The literature not only provides guidance regarding structural components and preventive programs that are effective in reducing burnout risk in medical students and residents but also summarizes the leading sources of professional stress amongst medical trainees, their impact on professional performance and personal lives as well as potential impact of interventional programs. In this manuscript, we performed a narrative review that considers the causes and effects of burnout, protective factors against burnout, and eventual prevention of burnout. Through analysis of the literature, implementation of widespread monitoring of burnout levels, prevention programs, and the consideration of changes in the structural components of the medical student and residency curriculum is recommended across medical schools.

Keywords

Behavioral science, Burnout, Health care reform, Medical culture

Introduction

Burnout is a multi-dimensional condition that includes emotional and physical exhaustion, a sense of depersonalization, and low levels of perceived accomplishment [1-4]. Burnout is often the result of prolonged occupational and personal stresses, and students may be at particular risk [1-3,5,6]. To be successful during medical school and residency training, medical students and residents must balance a variety of demands including pressures to constantly learn new material, maintaining hectic training schedules, increasing demands for clinical performance, and the accumulation of large student loans. In addition, for a select cohort, there may be added responsibilities of family and personal concerns. Learning skills to successfully manage stressors during these periods may prevent burnout during this stressful time and additionally may have long-term effects on both personal and professional growth. For those professionals already with symptoms, effective intervention programs are needed. This manuscript seeks to build upon past studies of burnout and resident burnout by analyzing literature extending beyond just resiliency skills training, and furthering discussion on the root causes of burnout, symptoms and effects of burnout, and ultimate prevention of burnout in residents.

Sources of Stress

Over the last two decades, an abundance of

Table 1: Common causes of personal and professional stresses among medical students and residents in training.

Common personal/professional stressors	Common effects of stressors
1. Sleep deprivation	1. Distress and depression
2. Lack of time for personal/family lives	2. Professional dissatisfaction
3. Emotional drain of dealing with sickness and pain	3. Marital discord
4. Dislocation from family and friends	4. Professional impairment
5. Financial Strains	5. Alcohol and drug abuse
6. Residency coinciding with major events of life	6. Unhealthy attitude about own needs
	7. Suicide

literature has been published suggesting an association between professional and personal stressors and burnout [5,7]. As a result, educators, medical schools, and residency training programs have an increased awareness regarding the potential harmful effects of stressors during training. There is now a responsibility on the part of educators to identify and address those harmful effects and professional stressors. This section reviews the leading sources of stressors as reported by the medical students and residents and its associated effects (See Table 1 for Summary).

Over work and sleep deprivation

High clinical loads create high work demands on top of student tests, clinical performance simulations, and other assessments. These problems may become compounded in the presence of additional issues such as non-supportive staff or an uncondusive work environment [8]. However, the adverse effects of negative clinical environments may generally be offset by positive learning opportunities for residents and medical students [9].

Sleep deprivation is a universal concern across level of learner [10]. Numerous studies have associated chronic sleep deprivation to fatigue, burnout, and increased risk of serious medical errors [7]. It is interesting to note that a cross-sectional study of internal medicine residents reported that majority of trainees believed that they “had to learn to tolerate sleep deprivation” and that it is “an expected part of training” [10]. One additional study showed a clear linkage between sleep deprivation and negative moods [11].

Emotional drain as a result of dealing with sick and dying patients

Medical students and residents must learn to deal with the demands of caring for ill and, in some cases, dying patients which are an inherent part of medical practice. For the majority of residents and medical students, learning to cope with this emotional drain is one of the unspoken challenges. Even though it is rarely “taught”, residents and medical students are expected to “learn” this important aspect of medical practice. A study shows that Emotional Intelligence (EI) “(an individual’s ability to perceive, process, and regulate one’s own emotions and the emotions of others)” is a strong predictor of physicians’ well-being [10].^(p.353)

Additional sources of stress during clinical rotations include interfacing with patients with infectious diseases such as HIV, diseases that create longstanding periods of slow decline, and patients making difficult decisions in the context of palliative care, and working with “difficult” family members, and their own personal perspective on ethical issues which may be contrary to their patients’ perspectives [4,12-14].

Lack of time for personal lives outside of training

Medical students’ and residents’ ability to utilize available coping resources should be an important aspect emphasized in education and training. Several studies report that stress perceived by house officers relates more to lack of time and adequate coping resources than to occupational stresses themselves [7,15-17]. It is widely accepted that a lack of clear understanding regarding how to balance the demands of professional and personal lives can hinder the pursuit of a healthy personal life outside the world of the health care. Thus, personal stressors contribute to the cumulative stress for students and residents. In particular, for married residents and medical students, the family responsibilities may also be a drain on time and energy as well as financial stress which cannot be underestimated. International medical graduates, who comprise nearly one-fifth of the physician population in the US, embody as a group, the ultimate in isolation from loved ones, who may reside half way across the globe [15,18]. This group faces additional stress of training in foreign surroundings, which may be further confounded by unfortunate encounters with racial and ethnic discrimination.

Training years coincide with major events of life

Training years occur during a unique time period in the development of a physician, when several important milestones in a person’s life may commence at a given time. Life milestones such as marriage, child birth, and exploring and starting a new job rank among the top ten most stressful events in any person’s life [19-21]. For program directors and mentoring faculty, it is critical to understand that being at this personal cross-road, residents and medical students may find it difficult to deal with stressors of training. Furthermore, or select residents and medical students with family obligations, debt stemming from medical school coupled with the high cost of living may be enormous [20,22]. As a result,

conflicts between residents' and medical students' educational demands and their financial needs may put undue pressure on career choices and force some residents and medical students to work against their natural aptitudes [22]. Occasionally residents may halt further training such as fellowships or additional research because of their financial demands to start earning early so as to be able to meet their obligations [23,24].

Summary

Burnout among medical students and residents is closely associated with personal and professional stressors that they encounter during the intense time of training. These stressors are identified as a lack of time for personal/family lives, overwork and sleep deprivation, emotional drain from dealing with sickness and death, and common personal stressors such as dislocation from family and friends and financial strain as educational debt accumulates. It is important to note that many of these studies have major limitations such as being cross-sectional, single institutional, and based on self-report volunteer respondents. We found no well-designed, randomized controlled study analyzing any of these associations among residents or medical students. Future research should include a comprehensive look at the sources of stress for medical students and residents.

The Effects

These stressors can cause distress, burnout, and/or mood disorders, and in some cases can lead to functional limitations in residents and medical students. The emotional state of students is of central concern to educators, but also the potential for negatively impacting patient care must be considered.

Clinical signs of distress and depression

It is intuitive that inadequately managed stress among medical students and residents could lead to emotional distress and depression. Prevalence of distress and depression is estimated to be 7%-to-8.6% incidence of depressive symptoms among first year residents [25,26].

Some investigators report an association between resident's depression and marital discord. It is estimated that 30-40% of residents have marital and relationship problems, and most attribute this to the stresses of residency training [13,22,27]. Further, it has been estimated that 1.4% of all interns and nearly 1% of all residents take leave from training annually for various emotional reasons [19]. Of this group of trainees, 12% were psychiatrically hospitalized, 2% were treated for drug or alcohol problems, and 3% attempted suicide. The frequency of such incidents is greatest during the first postgraduate year and least during the third year [20,28].

There are gender differences in how professional

stress is perceived. In one study, male residents reported significantly higher levels of satisfaction during their first year of training than female residents [29-31]. Further, more than one third of all female physicians may experience some degree of depression during their lifetime [20,31]. In fact, female residents report increased distress related to conflicts such as competing demands of home, family and work, concerns about child bearing, and their physician status as a hindrance in development of social relationships with non-physician men. One study showed that only 10 percent of women in the study agreed that child rearing responsibilities were shared equally [32]. Further, underrepresented minority medical students do have unique stressors and may be at heightened risk [33]. Some studies attribute these higher risks of burnout to lack of specialized support that offer unique help to meet their needs [33].

Professional impairment

In a large cross-sectional study of medical students, it is estimated that between 4 and 18% of students show signs of impairment [22,33]. When asked if they would voluntarily seek professional help, a vast majority reported being afraid to seek help. It is difficult to establish a clear association of distress and depression with professional impairment suggesting impairment in professional decision-making and skill may be a separate symptom of stress. Several studies report a higher level of stress among their trainees who also have some degree of performance impairment during the first postgraduate year [1-3,5,8,15,16]. Based on several studies, house officers (leaders of the student groups) have been labeled by the American Medical Association as a group "at risk" for becoming impaired due to additional job responsibilities and stress [34]. Estimates of impairment among all physicians in the US range from 10-12% [30,35,36].

Drop out

Difficulty dealing with the stresses of medical education and residency training may lead to reconsideration of the chosen occupation. In one study more than 50% of interns who reported feeling overwhelmed with no apparent source of help had "seriously considered leaving their training program [10]". Precipitant reasons cited include unhappiness with medicine, their program, and other personal stressors. Thoughts of leaving the program significantly decrease as residents progressed through residency training coinciding with the reduction in distress during this time period noted above. Professional dissatisfaction is cited as a major contributor to the problem of professional dropout among medical professionals [12].

Drug, alcohol and substance abuse

Drug addiction is estimated to be 30-100 times more common among physicians than the general population [36]. It is estimated that 5-15% of physicians worldwide

may have some form of drug or alcohol addiction; however, only 1-2% come to formal attention [36]. A comparison study demonstrated that heavy drug use, including use of alcohol, was 1.6 times more prevalent among physicians than comparable non-physicians [27]. Professional dissatisfaction and stress are cited as a major contributor to the problem of abuse of drugs and alcohol [12]. Within a group of physicians with addiction, it is estimated that nearly 10% of these attempts or commit suicide [37]. It has been estimated that 1.4% of all trainees and nearly 1% of all residents take leave from training annually for various emotional reasons of this group of trainees, 2% were treated for drug or alcohol problems [27].

Smoking and alcohol are reported to be positively associated with level of stress among residents [28]. A survey of resident's report that tranquilizers are frequently or infrequently used by nearly 11% of trainees, opiates by 9%, and alcohol, marijuana, and other drugs by unknown numbers [12,13,35,36]. A confidential survey of residents revealed that many began using benzodiazepines and prescription opiates once they received prescribing privileges, and they rationalized the use as self-treatment for stress and lack of adequate sleep [38]. In fact, a few studies report subspecialties such as anesthesiology and psychiatry as high risk for substance abuse [38,39]. However, a recently published follow up study among residents and practicing anesthesiologists did not show any association between type of specialty and risk for addiction for its trainees [40].

Suicidality

Premature, self-inflicted death is the most tragic of all events. Previous studies have estimated that suicide kills more physicians than diabetes, pulmonary diseases, liver disease, and homicide individually [41]. The estimated suicide rate among physicians is thought to be almost two and a half times the rate in the general population [42,43]. Suicide rates among medical students reported to be nearly 3 times the rate of their general population cohorts, and suicide is the second leading cause of death of medical students after automobile accidents [17,44,42]. Various studies conducted by confidential surveys showed that almost 1/3 to 1/2 of intern's report symptoms compatible with severe depression. Of these, almost 25% also reported having suicidal ideation at some point in time. Tragically, each year the medical community loses equivalent of 1-2 medical students per senior class to suicide [12,36,45]. Professional dissatisfaction and stress is cited as a major contributor to attempted suicide among medical professionals. For trainees who take leave during training for emotional reasons, 3% attempted suicide [20].

Summary

Due to occupational stress and emerging burnout, medical students and residents are at risk for clinical sign of depression, professional impairment, drop out,

alcohol and drug abuse, and suicide during their training years and thereafter.

Protective Factors

There are some factors that are associated with greater resiliency to burnout in residents and medical students. Studies delineate the following protective factors which reduce the effects of stressors during training:

Close family and friends

During the training years, peers are the main source of support for residents and medical students [46]. Spouse and family also provide a valuable source of comfort, support to residents and medical students. Several researchers report that being married and possessing strong social contacts are associated with lower levels of perceived stress by residents and medical students-in-training [10,17,46-48]. This buffering effect may be lost for those separated due to geography or to lack of available quality time.

Positive and encouraging learning conditions

While the residents and medical students are training, they are not just providing care for patients but also, they are in an academic facility designed to nurture and challenge them to learn and develop into physicians. Several studies report that positive, satisfying learning environments during training significantly reduces the level of physical and emotional stress as perceived by residents [46]. Instances of workplace shaming has had positive correlations with depression [49]. Mistreatment of the residents and medical students can lead to long term stress, may discourage them from being motivated to learn, and additionally have an impact on performance scores [50].

Satisfaction with residency has been conceptualized as the ratio of positive learning to negative work experiences that is, a reward/punishment ratio [50]. If the learning is high enough, residents are willing to tolerate a certain level of excessive strain from the environment. However, if the level of strain is overwhelming, or if the amount of learning declines, satisfaction wanes and frustrations rise [50]. The same may be true for medical students.

Summary

There are multiple protective factors that can combat stress and prevent burnout. Residents with positive home and work settings benefit from reduced impacts of stressors from training (Table 2).

Effective Prevention

While residents and medical students are expected to learn how to cope with their stress, the fact that burnout prevalence is so high suggests the need for intentional, targeted prevention programs that

Table 2: Protective Factors and Prevention against Burnout.

Protective Factors
1. Close network of family and friends
2. Positive and encouraging learning environment
Prevention
1. Professional development centered around stress management
2. Social events and connectedness
3. Developing time management skills
Structural Elements of Programs
1. Reducing resident work hours and follow guideline of a maximum 80 hour/wk
2. Financial wellness education
3. Professional and peer support networks
4. Free and anonymous EAP services (Employee assistance programs)
5. Mentorship Programs

teach stress management skills as well as considering structural changes to the training programs and institutional culture changes that can reduce stressors.

Prevention programs

Prevention programs are critical for teaching stress management strategies to medical students and residents and may help buffer the effects of stress during training. Brennan and colleagues designed active learning sessions that would help the individual learn the skills that they can use to feel supported and less stressed, incorporating reflection, practicing coping skills to be used during times of stress, identifying personal strengths, and connecting with what (to them) gives meaning in their work, time management, preventative emotional self-care, and developing and maintaining social connections in and outside of medicine to support resident well-being [51]. Some programs encourage relaxation skills, mindful meditation, and on-duty napping to reduce burnout risk [52-54]. Other programs engage families and/or support social connections among students which can buffer against stress and reduce risk of burnout. For example, annual medical student picnics, socials, birthday celebrations, and other social events can contribute to reduced stress and enhanced social support. Also, residency retreats create more social connectedness with coworkers which leads to better working environment. The rapport and mutual interest kindled during the retreat have help them work more effectively with chief residents. As the retreats bring value of interdepartmental communication among the residents [53].

Other programs are conducted to empower and encourage trainees such as mentoring programs. In a recent literature review, the mentoring programs reported in 14 papers aim to provide career counseling, develop professionalism, increase students' interest in research, and support them in both their personal and career growth [55]. Effective programs also provide aid to the residents and medical students to sustain mindfulness in medicine and empathy.

Empathic connection with patients contributes to work satisfaction and finding meaning in your work and is valued by patients in their health care experiences. Without empathy, burnout prevalence increases in terms of emotional exhaustion, depersonalization and diminution of personal accomplishment [56-58]. As these mentoring programs build inner strength, confidence, empathy, and meaning in their work, risk of stress and burnout decreases [55,57].

Summary

Preventive programs can have an incredible effect on trainees in terms of building stress management skills. By utilizing these skills, residents can effectively develop a buffer to burnout and stress related disorders [52,53].

Structural Changes to the Training Curriculum

In some medical schools, the professional wellness or mentoring programs are embedded the formal training curriculum and were linked to increases in self-kindness and compassion and reductions in burnout symptoms [53].

First, programs should give careful consideration of clinical loads, studying demands, and other workload demands to avoid overload and reduce risk of burnout. Despite the 2003 the Accreditation Council for Graduate Medical Education (ACGME) requirement that reduced resident work hours to 80 per week, medical students and residents continue to report being overworked, stressed, and without enough time to adequately sleep [58]. While these guidelines were drawn with the aim to decrease resident stress, limit fatigue and improve resident performance and patient safety [53,58], it is possible that continued consideration of the overall workload including both patient care and studying demands need to be considered. In addition, offering financial wellness educational seminars and access to loan repayment options as part of orientation or throughout training can be helpful in mitigating financial stress from debt accumulation.

Training problems can also capitalize on protective factors. For instance, designing informal events like picnics, dinners, and other social events that are inclusive of spouses and children can engage the support network in the training years [59]. Further, monitoring the culture of the learning environment and intervening as necessary with attendings whose behavior is not reflective of a respectful, positive, engaging learning environment is critical. Further, attendings who model how to cope with the intense patient issues including the death of patients, as well as attendings who model work/life balance and healthy behaviors can be instrumental in guiding medical students and residents toward those positive coping behaviors [60]. Reflection Rounds, Balint rounds, Shwartz rounds, or other forums that actively discuss coping with stress, processing difficult patient circumstances, and creating a culture of peer

support can also be helpful [61-63]. Emails from human resources that encourage faculty and students to take their time off to renew and re-energize can be helpful in encouraging all employees to take their time, including medical students and residents. Offering low cost, on-site daycare and fitness center memberships can also be helpful, the former can reduce parenting distress over the cost and availability of high-quality care and the latter providing the impetus for physical fitness which can reduce stress [64]. Having fresh fruits and other healthy snacks available in the call room can lead to increased consumption of nutritional foods [12].

Programs should have a free and confidential EAP or other counseling program that can assist as well as having a crisis intervention service for emergencies. Making sure medical students and residents are aware of these services (not once but periodically throughout the training years) and finding ways to reduce stigma regarding seeking services by sharing de-identified stories of how these resources have been helpful for others is important. Using screening tools such as the Maslach Burnout Inventory (multiple versions are available including a 1-item screener) can be helpful in increasing self-awareness and/or identifying those in need of services [1-3].

Summary

The critical need for programs that teach resiliency skills to residents and medical students cannot be underestimated. Further, structural changes to the curriculum and changes in institutional benefits can have a positive impact on burnout rates.

Conclusions

Personal and professional stressors are increasingly recognized as sources of burnout and impairment. A healthy approach to stress management is critical for trainees facing high clinical and educational demands along with fatigue and isolation from life outside the hospital.

Trainees and their respective institutions should be well equipped with information regarding key symptoms of burnout, but also be well organized in programs and services that quickly and effectively combat the problem. Further well-designed interventional studies with clearly defined outcome measures are needed to develop successful strategies to improve wellbeing of medical students, residents-in-training and practicing physicians.

Acknowledgements

This manuscript received no outside funding. All authors contributed adequately to be named for authorship and report no conflicts of interest. No assistance from medical writing experts.

References

- Maslach C, Jackson SE, Leiter MP, Schaufeli WB, Schwab RL (1997) Maslach Burnout Inventory. Evaluating Stress: A Book of Resources. (3rd edn), Rowman & Littlefield Publishers Inc.
- Ball S, Bax A (2002) Self-care in medical education. Effectiveness of health habits intervention for first year medical students. *Acad Med* 77: 911-917.
- Mitchell RE, Matthews JR, Grandy TG, Lupo JV (1983) The question of stress among first-year medical students. *J Med Educ* 58: 367-372.
- Bianchi R, Schonfeld IS, Laurent E (2015) Burnout-depression overlap: a review. *Clin Psychol Rev* 36: 28-41.
- (1988) Stress and impairment during residency training: Strategies for reduction, identification and management. Resident's services committee, Association of Directors in Internal Medicine. Adopted by the Council of Association of Program Directors in Internal Medicine. *Ann Intern Med* 109: 154-161.
- Rotbart HA, Nelson WL, Krantz J, Doughty RA (1985) The developmental process of residency education. Issues of stress and happiness. *Am J Dis Child* 139: 762-765.
- Asken MJ, Raham DC (1983) Resident performance and sleep deprivation: a review. *J Med Educ* 58: 382-388.
- Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH (2002) Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *JAMA* 288: 1987-1993.
- Dyrbye LN, Thomas MR, Harper W, Massie FS Jr, Power DV (2009) The learning environment and medical student burnout: a multicentre study. *Med Educ* 43: 274-282.
- Lin DT, Liebert CA, Tran J, Lau JN, Salles A (2016) Emotional Intelligence as a Predictor of Resident Well-Being. *J Am Coll Surg* 223: 352-358.
- Kalmbach DA, Fang Y, Arnedt JT, Cochran AL, Deldin PJ, et al. (2018) Effects of Sleep, Physical Activity, and Shift Work on Daily Mood: a Prospective Mobile Monitoring Study of Medical Interns. *J Gen Intern Med* 33: 914-920.
- [No authors listed] (1987) Results and implications of the AMA-APA Physician Mortality Project. Stage II. Council on Scientific Affairs. *JAMA* 257: 2949-2953.
- Ziegler JL, Strull WM, Larsen RC, Martin AR, Coates TJ (1985) Stress and medical training. *West J Med* 142: 814-819.
- Schwartz AJ, Black ER, Goldstein MG, Jozefowicz RF, Emmings FG (1987) Levels and causes of stress among residents. *J Med Educ* 62: 744-753.
- Flynn TC (1986) What makes internship so bad--and so good. *Pharos Alpha Omega Alpha Honor Med Soc* 49: 7-8.
- Halenar JF (1981) Doctors do not have to burn out. *Med Econ* 58: 148-161.
- Brent RL, Brent LH (1978) Medicine an excuse from living. *Res Staff Physician* 24: 61-65.
- Butterfield PS (1988) The stress of residency. A review of the literature. *Arch Intern Med* 148: 1428-1435.
- Borus JF (1997) Recognizing and managing residents' problems and problem residents. *Acad Radiol* 4: 527-533.
- Goebert D, Thompson D, Takeshita J, Beach C, Bryson P, et al. (2009) Depressive Symptoms in Medical Students and Residents: A Multischool Study. *Acad Med* 84: 236-241.
- Mushin IC, Matteson MT, Lynch EC (1993) Developing a

- resident assistance program. Beyond the support group model. *Arch Intern Med* 153: 729-733.
22. Mayers MF (1997) Management of medical student's health problems. *Advances in Psychiatric Treatment* 3: 259-266.
23. Grimm LJ, Lowell DA, Cater SW, Yoon SC (2017) Differential Motivations for Pursuing Diagnostic Radiology by Gender. *Acad Radiol* 24: 1312-1317.
24. Young TP, Brown MM, Reibling ET, Ghassemzadeh S, Gordon DM, et al. (2016) Effect of Educational Debt on Emergency Medicine Residents: A Qualitative Study Using Individual Interviews. *Ann Emerg Med* 68: 409-418.
25. Kirsling RA, Kochar MS, Chan CH (1989) An evaluation of mood states among first-year residents. *Psychol Rep* 65: 355-366.
26. Clark DC, Salazar-Gruoso E, Grabler P, Fawcett J (1984) Predictors of depression during the first 6 months of internship. *Am J Psychiatry* 141: 1095-1098.
27. Gordon GH, Hubbell FA, Wyle FA, Charter RA (1986) Stress during internship: a prospective study of mood states. *J Gen Intern Med* 1: 228-231.
28. Young EH (1987) Relationship of residents' emotional problems, coping behaviors, and gender. *Journal of Medical Education* 62: 642-650.
29. Ziegler JL, Kanas N, Strull WM, Bennet NE (1984) A stress discussion group for medical interns. *J Med Educ* 59: 205-207.
30. Heim E (1991) Job stressors and coping in health professions. *Psychother Psychosom* 55: 90-99.
31. Cohen JS, Patten S (2005) Well-being in residency training: a survey examining resident physician satisfaction both within and outside of residency training and mental health in Alberta. *BMC Med Educ* 5: 21.
32. Sanfey H, Fromson JA, Mellinger J, Rakinic J, Williams M, et al. (2015) Residents in distress: an exploration of assistance-seeking and reporting behaviors. *Am J Surg* 210: 678-684.
33. Primack BA, Dilmore TC, Switzer GE, Bryce CL, Seltzer DL, et al. (2010) Brief Report: Burnout Among Early Career Clinical Investigators. *Clin Transl Sci* 3: 186-188.
34. Dickstein LJ, Stephenson JJ, Hinz LD (1990) Psychiatric impairment in medical students. *Acad Med* 65: 588-593.
35. Weinstein HM (1983) A committee on well-being of medical students and house staff. *J Med Educ* 58: 373-381.
36. Keeve JP (1984) Physicians at risk. Some epidemiologic considerations of alcoholism, drug abuse, and suicide. *J Occup Med* 26: 503-508.
37. Mata DA, Ramos MA, Bansal N, Khan R, Guille C, et al. (2015) Prevalence of Depression and Depressive Symptoms Among Resident Physicians: A Systematic Review and Meta-analysis. *JAMA* 314: 2373-2383.
38. Hughes PH, Baldwin DC Jr, Sheehan DV, Conard S, Storr CL (1992) Resident physician substance use, by specialty. *Am J Psychiatry* 149: 1348-1354.
39. Aach RD, Girard DE, Humphrey H, McCue JD, Reuben DB, et al. (1992) Alcohol and other substance abuse and impairment among physicians in residency training. *Ann Intern Med* 116: 245-254.
40. Bryson EO, Silverstein JH (2008) Addiction and substance abuse in anesthesiology. *Anesthesiology* 109: 905-917.
41. Yaghmour NA, Brigham TP, Richter T, Miller RS, Philibert I, et al. (2017) Causes of Death of Residents in ACGME-Accredited Programs 2000 Through 2014: Implications for the Learning Environment. *Acad Med* 92: 976-983.
42. McCue JD, Sachs CL (1991) A stress management workshop improves residents' coping skills. *Arch Intern Med* 151: 2273-2277.
43. Lindeman S, Läärä E, Vuori E, Lönnqvist J (1997) Suicide among physicians, engineers and teachers. The prevalence of reported depression, admissions to hospital and contributory causes of death. *Acta Psychiatr Scand* 96: 69-71.
44. Johnston C (1996) Suicide totals for MDs sad reminder of stresses facing medicine, conference told. *CMAJ* 155: 109-111.
45. McCue JD (1982) The effects of stress on physicians and their medical practice. *N Engl J Med* 306: 458-463.
46. Brown J, Chapman T, Graham D (2007) Becoming a new doctor: a learning or survival exercise? *Med Educ* 41: 653-660.
47. Rosen IM, Bellini LM, Shea JA (2004) Sleep behaviors and attitudes among internal medicine house staff in a U.S. university based residency program. *Acad Med* 79: 407-416.
48. Alfandre D, Rhodes R (2009) Improving ethics education during residency training. *Med Teach* 31: 513-517.
49. Shapiro MC, Rao SR, Dean J, Salama AR (2017) What a Shame: Increased Rates of OMS Resident Burnout May Be Related to the Frequency of Shamed Events During Training. *Journal of Oral and Maxillofacial Surgery* 75: 449-457.
50. Hoff TJ, Pohl H, Bartfield J (2004) Creating a Learning Environment to Produce Competent Residents: The Roles of Culture and Context. *Acad Med* 79: 532-540.
51. Brennan J, McGrady A (2015) Designing and implementing a resiliency program for family medicine residents. *Int J Psychiatry Med* 50: 104-114.
52. Romani M, Ashkar K (2014) Burnout among physicians. *Libyan J Med* 9: 23556.
53. Runyan C, Savageau JA, Potts S, Weinreb L (2016) Impact of a family medicine resident wellness curriculum: a feasibility study. *Med Educ Online* 21: 30648.
54. Arora V, Dunphy C, Chang VY, Ahmad F, Humphrey HJ, et al. (2006) The effects of on-duty napping on intern sleep time and fatigue. *Ann Intern Med* 144: 792-798.
55. Frei E, Stamm M, Buddeberg-Fischer B (2010) Mentoring programs for medical students - a review of the PubMed literature 2000 - 2008. *BMC Med Educ* 10: 32.
56. Bursch B, Lloyd J, Mogil C, Wijesekera K, Miotto K, et al. (2017) Adaptation and Evaluation of Military Resilience Skills Training for Pediatric Residents. *J Med Educ Curric Dev* 4.
57. Thirioux B, Birault F, Jaafari N (2016) Empathy Is a Protective Factor of Burnout in Physicians: New Neuro-Phenomenological Hypotheses Regarding Empathy and Sympathy in Care Relationship. *Front Psychol* 7: 763.
58. Bhananker SM, Cullen BF (2003) Resident work hours. *Curr Opin Anaesthesiol* 16: 603-609.
59. Vora RS, Kinney MN (2014) Connectedness, Sense of Community, and Academic Satisfaction in a Novel Community Campus Medical Education Model. *Acad Med* 89: 182-187.

60. Hough CL, Hudson LD, Salud A, Lahey T, Curtis JR (2005) Death rounds: end-of-life discussions among medical residents in the intensive care unit. *J Crit Care* 20: 20-25.
61. Wen LS, Baca JT, O'Malley P, Bhatia K, Peak D, et al. (2013) Implementation of small-group reflection rounds at an emergency medicine residency program. *CJEM* 15: 175-177.
62. Nease DE Jr, Lichtenstein A, Pinho-Costa L, Hoedebecke K (2018) Balint 2.0: A virtual Balint group for doctors around the world. *Int J Psychiatry Med* 53: 115-125.
63. Gishen F, Whitman S, Gill D, Barker R, Walker S (2016) Schwartz Centre Rounds: a new initiative in the undergraduate curriculum-what do medical students think? *BMC Medical Education* 16: 246.
64. Rimpelä AH, Nurminen MM, Pulkkinen PO, Rimpelä MK, Valkonen T (1987) Mortality of doctors: do doctors benefit from their medical knowledge? *Lancet* 1: 84-86.