

Burnout and attrition in surgical trainees: what can be done to prevent it?

Mary Gibby¹

Judy McKimm²

Author details can be found at the end of this article

Correspondence to:

Mary Gibby;

Mary.gibby@wales.nhs.uk

Abstract

Burnout, mental health disorders and suicide are more common among doctors than the general population. Burnt-out doctors self-report increased rates of medical errors and the provision of suboptimal patient care. Surgeons in training are particularly at risk of burnout and are also less likely to seek professional support. Female surgical trainees have especially high rates of attrition, potentially because of issues surrounding childcare and motherhood. Several strategies to reduce burnout and promote resilience have been trialled among doctors. Schwartz rounds and mindfulness training have been shown to be effective, but only in those motivated to participate. A reduction in working hours has conflicting results, particularly among surgical trainees, which may be linked to the subsequent reduction in training opportunities, such as operative time and the ability to complete assessments. Early identification and targeted support of at-risk individuals is a potentially effective strategy that requires further research.

Key words: Attrition; Burnout; Resilience; Surgical trainees

Received: 18 February 2021; accepted following double-blind peer review: 22 February 2021

Introduction

Doctors are subject to high levels of responsibility, emotional strain and long hours which, for many, can lead to significant work-related stress and mental health issues (Kinman and Teoh, 2018). A systematic review of 22 studies between 1994 and 2012 found that between 17 and 52% of doctors in the UK experience common mental health disorders, compared to 19% of the general population (Goodwin et al, 2013). The suicide rate among practising doctors is also twice that of the general population (Department of Health, 2008). In addition to personal trauma, the loss of doctors from the healthcare workforce is very costly. In the UK, it is estimated to cost over £230 000 to train a newly qualified doctor and at least £435 000 by the time they reach higher surgical training (Curtis, 2013). The loss of skilled staff has huge implications for patient safety, waiting times and mortality and morbidity outcomes.

This article discusses the findings of a literature review that explored key issues around doctor burnout and attrition and strategies for helping to prevent this in surgical doctors in training.

Background and context

Life as a doctor in training is stressful, particularly at times of transition when they are suddenly placed in a highly responsible job with little support, long hours, shift work and an inability to commit to outside social and personal activities. The combination of high levels of responsibility, role ambiguity and low levels of decision latitude leaves doctors in training at particular risk of burnout (Prins et al, 2007). A study of 4110 Australasian junior doctors found that 71% of participants were concerned for their own health, 71% had low job satisfaction, 69% experienced burnout and 54% had compassion fatigue (Markwell and Wainer, 2009).

Surgery is considered the most time consuming and competitive of all medical specialties (McNally, 2012), so surgical training is a particularly stressful and gruelling time. Job insecurity and high-stakes interviews are combined with difficult examinations; operations are themselves stressful, coupled with having to routinely cope with ill and dying patients. Trauma exposure is a specific risk factor for many psychiatric disorders, particularly anxiety, depression, post-traumatic stress disorder and self-harm (Pietrzak et al, 2011).

How to cite this article:

Gibby M, McKimm J. Burnout and attrition in surgical trainees: what can be done to prevent it? *Br J Hosp Med.* 2021. <https://doi.org/10.12968/hmed.2021.0110>

Table 1. Definitions of burnout, resilience and grit

Term	Definitions and evidence of its effect
Burnout	<ul style="list-style-type: none"> ■ Described as when 'energy turns into exhaustion, involvement turns into cynicism, and efficacy turns into ineffectiveness' (Maslach et al, 2001) ■ Is associated with professions with intense involvement with people, such as doctors, and a commonly used marker of mental health within the medical profession (Kinman and Teoh, 2018) ■ Is provoked by chronic emotional and interpersonal stressors at work, characterised by emotional exhaustion, depersonalisation and reduced personal accomplishment
Resilience	<ul style="list-style-type: none"> ■ Is defined as the ability to thrive and respond positively in the face of adversity and significant stress ■ Is influenced by personality traits including positive attitudes, optimism, the ability to regulate emotions and the ability to see failure as a form of beneficial feedback (Tugade et al, 2004) ■ Is fostered by environmental factors, particularly social support (Ozbay et al, 2008)
Grit	<ul style="list-style-type: none"> ■ Describes 'perseverance and passion towards long-term goals' in the face of adversity ■ Incorporates resilience, enabling individuals to maintain a sustained effort over a prolonged period ■ Is found to be associated with achievement in multiple groups ■ Is an independent predictor of achievement, even when previous measures, such as intelligence quotient (IQ) and grade point average are taken into account (Duckworth et al, 2007)

Scope of the review

Much of the existing literature focuses on the prevalence of burnout and mental health issues among medical students and doctors, with little research on burnout and attrition among surgical doctors in training and the specific risks for women. No literature was found comparing these issues with a study of interventions for improving resilience and reducing burnout and attrition.

Methodology

A PubMed and Google Scholar search was conducted using the key words: 'burnout', 'resilience', 'grit', 'attrition', and 'stress'. These key words were then combined with 'surgical trainee' 'female physician' 'female doctor' 'surgical registrar' 'burnout intervention' 'resilience intervention' and 'surgical training program' to ensure all available and relevant literature was discovered. In addition, a hand search of the literature using the reference sections of review articles and other publications was conducted. Only papers produced in the UK, USA, Canada or Australia after 1980 and written in English were included.

Results

Burnout, resilience and grit

These terms were found in the initial literature search, and subsequently used in the review (see [Table 1](#) for definitions).

Burnout among the general doctor population

Burnout among doctors has a significant impact on their emotional wellbeing and patient care. A systematic review of fourteen UK studies conducted over 20 years found that 31–54% of doctors were emotionally exhausted, 17–45% reported feelings of depersonalisation and 6–40% feelings of low personal accomplishment (Imo, 2017). High stress levels affect intellect, clinical judgement and technical ability, leading to impaired patient safety and outcomes (Fahrenkopf et al, 2008). Studies found that burnt-out internal medicine physicians self-reported providing suboptimal patient care and burnt-out surgeons self-reported an increased rate of major medical errors than their colleagues (Shanafelt et al, 2002, 2010).

A large international systematic review found that a burnt-out physician was almost twice as likely to be involved in a patient safety incident and three times more likely to receive low satisfaction ratings from patients (Panagioti et al, 2018). Burnout also has a significant impact on the individual, with burnt-out doctors being more likely to be involved

in a motor vehicle accident (West et al, 2012), and more likely to engage in maladaptive coping strategies, such as substance abuse (McCain et al, 2018). A doctor's risk of burnout and psychological morbidity may be related to their resilience – a study of GPs found an association between high resilience and low burnout (Cooke et al, 2013).

Understanding the relationships between physician burnout, resilience and coping strategies is therefore critical to maintaining surgical trainees' welfare and patient safety.

Burnout and attrition among surgical trainees

Burnout and feelings of emotional exhaustion are common among surgical trainees. An anonymous online study of 74 core surgical trainees across the London deanery measured burnout using the Oldenburg Burnout Inventory. Minor psychiatric illness and wellbeing were also assessed using the General Health Questionnaire. Of those surveyed, 83% demonstrated disengagement, 87% showed exhaustion and 82% exhibited signs of mild psychiatric illness (Kadhun et al, 2020).

A potential explanation for these high rates of burnout could be the training programme. In the General Medical Council national training survey, completed by all UK doctors in training, the surgical training pathway consistently has one of the lowest average scores for satisfaction across all specialties since 2016, when this was last asked. Trainees also feel the least supported (General Medical Council, 2016). In other healthcare systems, surgery also appears to have higher rates of burnout than other specialties, and this is rising (Shanafelt et al, 2010). In a study of 665 American general surgery residents, 69% met the criteria for burnout on at least one of the Maslach Burnout Inventory subscales (Elmore et al, 2016).

Compounding this, surgery is particularly underrepresented among doctors who have sought professional support. Dr Gerada, the NHS Practitioner Health Programme's director, feels this is because:

'the very qualities which help surgeons to succeed, such as commitment, self-sacrifice and perfectionism, may also put them at increased risk of mental health problems or burnout, partly because they may feel they are invincible and will go the extra mile' (Gerada, 2019).

Attrition and female surgical trainees

Female doctors are more at risk of burnout than their male colleagues. In the Medscape Physician Lifestyle and Happiness Report 2020, an online anonymous survey of 15 000 physicians globally, 50% of women reported burnout compared to 39% of men. Although women are more likely to admit to psychological issues than their male counterparts, this is still a substantial disparity (Kane, 2019).

In 2018, despite 54% of newly qualified UK doctors being female, only 31% of surgical registrars and 15% of surgical consultants were women (NHS Digital, 2018). It may be argued that this is because women leave training to have children. In an online survey of 81 women working in surgical specialities, 50% stated motherhood and childcare commitments as the greatest barrier to surgical training (Bellini et al, 2019). However, as Peters et al (2014) highlight, this is not an excuse for surgical training programmes, as women are well-represented in general practice and paediatrics at all levels of training. In the General Medical Council (2017) survey, surgery had the lowest percentage of less than full time trainees of all specialties. Most concerning, and particularly for female trainees, trainee surgeons were also most likely to feel that they would not be supported in becoming less than full time trainees. This research suggests both that surgical training programmes need to vastly improve their accessibility to those with families, and that female recruitment to and attrition from surgical training is more complex than simply being attributed to motherhood.

A regional comparison of the attrition rates in UK female surgical trainees between 2008 and 2012 showed huge variation, ranging from 22–75%. Although the reasons for this were not studied, the authors attributed it to varying levels of satisfaction with the training experienced by the different genders, the type of support offered and its availability (Hampton et al, 2016).

Female attrition is a particular issue as several studies have demonstrated that patients treated by female physicians may have preferential outcomes. A retrospective cohort study of 100 000 surgical patients in Canada found that patients operated on by a female surgeon had lower mortality, readmission and complication rates (Wallis et al, 2017). Another large observational study of 1.5 million patients aged over 65 years admitted to hospital in the USA demonstrated that those treated by female physician had statistically significant lower 30-day mortality and readmission rates (Tsugawa et al, 2017). If these studies apply on a wider scale, it would suggest that patient care is also being affected by the loss of these female surgeons.

Increasing resilience and reducing burnout

Individuals who are happier have been shown to be more successful (Lyubomirsky et al, 2005). Having an acceptable work–life balance is a protective factor in surgical trainee attrition (Hampton et al, 2016); therefore, if happiness and coping strategies could be fostered, the rates of burnout and attrition may reduce. Burnout increases as students progress through medical school and on to higher training (Santen et al, 2010), which suggests that curriculum design and delivery may be a factor. More junior trainees who appear to be most at risk of burnout may be a perfect target group for intervention, before they progress to higher training. However, interventions to reduce burnout and promote resilience have been trialled at both organisational and individual levels with varying results.

Mindfulness

Mindfulness is a form of mental training and an extension of reflective practice, aiming to prevent compassion fatigue and promote clear thinking and self-awareness. The overall goal is to recognise unhelpful habitual thoughts and behaviours and allow new and creative ways of responding (Fortney et al, 2013).

A literature review of fourteen medical schools that incorporated mindfulness into their curriculum found that mindfulness reduced negative emotions and stress, and enhanced empathy and self-compassion, with one school demonstrating that their mindfulness programme significantly reduced psychological stress during the examination season (Hassed et al, 2009).

Mindfulness has also been introduced as an intervention to address burnout among primary care physicians. A 12-month mindfulness education programme for 70 American primary care physicians demonstrated an improvement in conscientiousness and emotional stability, reductions in total mood disturbance and reduced burnout. These findings persisted during the 3-month follow-up period, although other improvements such as compassionate care and physician tension returned to their baseline levels. While 871 primary care physicians were invited to take part in the study only 70 attended, suggesting a significant selection bias for physicians open to mindfulness (Krasner et al, 2009).

A randomised controlled trial of doctors, nurses, social workers, physical therapists and psychologists randomised 36 participants into a mindfulness group or a wait-list control group, receiving their mindfulness training following the study. Those who received mindfulness training noted a mean reduction (3% vs 22%) in perceived stress, a greater satisfaction with life (19% vs 0%) and decreased job burnout (10% vs 4%). However, of the sixteen participants in the mindfulness group only half completed the course, which they attributed to health issues and insufficient time (Shapiro et al, 2005).

Schwartz rounds

Schwartz rounds are low cost, low resource sessions that provide a safe space for healthcare professionals to share and reflect on the social, emotional and ethical challenges of their work. They are usually 1 hour long and held on a monthly basis. It is hoped that these sessions allow staff to feel supported, care with compassion and improve the patient experience while maintaining their wellbeing (Schwartz, 2012).

A retrospective survey across six sites in the USA providing Schwartz rounds for over 3 years found that participants reported a significant decrease in perceived stress and improved abilities to cope with the psychosocial demands of their work. Furthermore, they reported positive changes in institutional culture (Lown and Manning, 2010).

Now held in over 150 healthcare organisations across the UK, a national evaluation by Maben et al (2017) found that healthcare workers who attended the meetings reported their poor psychological wellbeing halved (from 25% to 12%) while non-attenders reported little change (from 37% to 34%). However, non-attenders identified practical barriers to attendance such as lunch availability and lack of control of their work schedule, suggesting more should be done to increase accessibility. Some rounds were also not successfully implemented because of issues with staff attendance, and the workload and resources required to sustain the rounds.

Reduction in working hours

Working long hours and night shifts plays a significant role in burnout (Australian Medical Association, 2008) so it might be assumed that reducing working hours would reduce burnout. However, the literature on the implementation of work hour limits at an organisational level and its correlation with burnout is conflicting.

In 2003, the USA instituted a national 80-hour work week restriction for residents, providing an excellent opportunity to assess rates of burnout pre- and post-intervention, but the results were conflicting. A study of interns and residents across all specialities at a university hospital found a positive change, particularly among first-year residents (Martini et al, 2006). Following the 80-hour limitation, 43% of respondents reported burnout, compared to 77% before the limitation. Across all residents there was also a linear positive correlation between number of hours worked per week and burnout. However, there was no correlation between burnout and number of nights on call, or between physician characteristics including gender, marital status, presence of children, recent family stress and country of training. A similar study assessed the effect of the 80-hour week restriction on orthopaedic trainees. The reduction resulted in improved scores on the 'personal accomplishment' aspect of the Maslach Burnout Inventory but did not impact on burnout (Barrack et al, 2006). A similar study of surgical residents before and after the restriction also used the Maslach Burnout Inventory, finding lower 'emotional exhaustion' but no effect on 'depersonalisation' or 'career satisfaction' (Gelfand et al, 2004).

However, a meta-analysis of twenty large scale American studies found that implementation of a national working hour reduction for all physicians, irrespective of specialty, reduced burnout (from 62% to 50%), exhaustion (37% to 25%) and depersonalisation (54% to 48%) (West et al, 2016).

Similar conflicting findings were also demonstrated in the UK when the European Working Time Directive was introduced in 2009. Fewer medical errors and improved patient care were reported but doctors reported greater fatigue as a result of more shift work, badly designed rotas and the reduced hours increasing the work intensity (McIntyre et al, 2010).

Identification of at-risk individuals

A study by Salles et al (2014) assessed if levels of grit could be used as a predictor of burnout or psychological distress. Questionnaires were sent to 141 American surgical trainees in a single centre across all surgical specialities. Using the Short Grit Scale to assess the level of grit among trainees, the Maslach Burnout Inventory to assess burnout, and the Dupuy Psychological General Well-Being Scale to assess psychological wellbeing they scored individual responses at the time of questioning and 6 months later. Those with more grit at the initial testing point had significantly lower rates of burnout, emotional exhaustion and depersonalisation 6 months later, but their grit score was unchanged. This reflects Duckworth et al's (2007) findings that grit is a stable 'personality trait'. Respondents also experienced significantly higher levels of psychological wellbeing at 6-month follow up. It was found that senior trainees had lower levels of burnout than more junior trainees. They concluded that a trainee's level of grit could be measured at admission to surgical training, or even earlier, to provide additional support during training to those with a low score (Salles et al, 2014).

The interventions that can be used to reduce burnout and promote resilience are summarised in [Table 2](#).

Table 2. Summary of interventions to reduce burnout and promote resilience

Intervention	Principles	Positives	Negatives
Mindfulness	<ul style="list-style-type: none"> ■ In person or remote sessions ■ Reflective practice ■ Cognitive reframing ■ No set duration or session plan 	<ul style="list-style-type: none"> ■ Reduction in stress and negative emotions ■ Enhanced empathy and compassion 	<ul style="list-style-type: none"> ■ High dropout rate ■ Voluntary and requires motivation ■ Some benefits not long term
Schwartz rounds	<ul style="list-style-type: none"> ■ Hour long monthly sessions ■ Long term ■ Multidisciplinary team share social, ethical and emotional demands of work ■ Can participate or observe 	<ul style="list-style-type: none"> ■ Decreased stress ■ Increased ability to cope with emotional demands ■ Improved psychological wellbeing 	<ul style="list-style-type: none"> ■ Difficult to fit into work schedules ■ Missed breaks or meals ■ Demanding for organisers
Reduction in working hours	<ul style="list-style-type: none"> ■ Shift work and long working weeks contribute to burnout ■ Reduction in the working week should therefore reduce burnout 	<ul style="list-style-type: none"> ■ Reduced burnout across all specialties ■ Reduced medical errors ■ Improved patient care ■ Lower emotional exhaustion in surgeons 	<ul style="list-style-type: none"> ■ Conflicting results in surgical specialties ■ ? reduced operating time and increased training stress ■ Increased work intensity and rota issues
Identification of at-risk individuals	<ul style="list-style-type: none"> ■ Grit protects against burnout ■ Assess grit in trainees and support those with low scores more closely 	<ul style="list-style-type: none"> ■ Simple and cheap survey ■ Can provide targeted help to reduce burnout 	<ul style="list-style-type: none"> ■ Poor evidence base ■ Not clear what support to offer ■ May make trainees feel victimised or neglected

Conclusions

The high rate of burnout among doctors is not acceptable, given the high organisational and personal costs that result, including on doctors' health and wellbeing, and in particular their suicide risk. Patients deserve to be cared for by doctors who are fully invested in their care, not distracted by their personal lives and poor mental health. Surgeons appear to be at particular risk of burnout and poor mental health.

It is striking that changes at organisational level (such as a reduction in working hours) lead to more conflicting findings than simpler interventions that can be performed on an individual level, such as mindfulness. Considering burnout is so closely related to feelings of fatigue and being overworked, this is surprising. However, working life is far more complex than simply the hours worked. A reduced working week for surgical trainees reduces operating time and training opportunities, potentially affecting their development as a surgeon. It also creates fewer opportunities for completion of the assessments and portfolio work required for progression, leading to increased stress. Furthermore, if all doctors work less but the overall workforce is not increased, the hours they are work will be busier and more stressful.

All interventions studied (aside from a reduction in working hours) require emotional input, time commitment and buy-in from participants. However, studies tend to focus only on those who choose to attend mindfulness courses, and no examples of a study considering compulsory mindfulness were found. This creates a selection bias, with those who chose to attend being possibly more open to mindfulness than their peers. Furthermore, many of the courses had a significant time commitment, up to a year in some cases. This also applies to Schwartz rounds, as in all studies these were voluntary sessions.

Ultimately, burnout among surgeons, and indeed all doctors, is a significant issue with no evidence of improvement. This article shows that methods of reducing burnout and promoting resilience exist, but they are not widely promulgated, and, although much research exists on the prevalence of burnout, little is known about the success of potential interventions, particularly on a large scale. Given the high costs of training and the huge contribution of women doctors to healthcare, this is highly topical. Far more research into these interventions and methods of identifying at-risk individuals is required, including research into why surgeons, and particularly female surgeons, appear at higher risk of burnout and attrition.

Key points

- Burnout, mental health disorders and suicide are more common among doctors than the general population.
- Surgeons in training, particularly trainees, have especially high rates of attrition and burnout.
- Schwartz rounds and mindfulness training have been shown to be effective in promoting coping strategies and reducing stress, but only in those motivated to participate.
- A reduction in working hours has conflicting results, which may be linked to the resultant reduction in training opportunities.
- Early identification and targeted support of at-risk individuals is a potentially effective strategy.

Conflicts of interest

The authors declare that they have no conflicts of interest.

References

- Australian Medical Association. AMA survey report on junior doctor health and wellbeing. 2008. https://ama.com.au/sites/default/files/documents/JDHS_report_FINAL_0.pdf (accessed 6 May 2021)
- Barrack RL, Miller LS, Sotile WM, Sotile MO, Rubash HE. Effect of duty hour standards on burnout among orthopaedic surgery residents. *Clin Orthop Rel Res.* 2006;449:134–137. <https://doi.org/10.1097/01.blo.0000224030.78108.58>
- Bellini MI, Graham Y, Hayes C et al. A woman's place is in theatre: women's perceptions and experiences of working in surgery from the Association of Surgeons of Great Britain and Ireland women in surgery working group. *BMJ Open.* 2019;9(1):e024349. <https://doi.org/10.1136/bmjopen-2018-024349>
- Cooke GP, Doust JA, Steele MC. A survey of resilience, burnout, and tolerance of uncertainty in Australian general practice registrars. *BMC Med Educ.* 2013;13(1):2. <https://doi.org/10.1186/1472-6920-13-2>
- Curtis L. Unit costs of health and social care 2013. Canterbury: Personal Social Services Research Unit;2013:110
- Department of Health. Mental health and ill health in doctors. London: The Stationery Office; 2008
- Duckworth AL, Peterson C, Matthews MD et al. Grit: perseverance and passion for long-term goals. *J Pers Soc Psychol.* 2007;92(6):1087–1101. <https://doi.org/10.1037/0022-3514.92.6.1087>
- Elmore LC, Jeffe DB, Jin L, Awad MM, Turnbull IR. National survey of burnout among US general surgery residents. *J Am Coll Surg.* 2016;223(3):440–451. <https://doi.org/10.1016/j.jamcollsurg.2016.05.014>
- Fahrenkopf A, Sectish T, Barger L et al. Rates of medication errors among depressed and burn out residents: prospective cohort study. *BMJ.* 2008;336(7642):488–491. <https://doi.org/10.1136/bmj.39469.763218.BE>
- Fortney L, Luchterhand C, Zakletskaia L, Zgierska A, Rakel D. Abbreviated mindfulness intervention for job satisfaction, quality of life, and compassion in primary care clinicians: a pilot study. *Ann Fam Med.* 2013;11(5):412–420. <https://doi.org/10.1370/afm.1511>
- Gelfand DV, Podnos YD, Carmichael JC et al. Effect of the 80-hour workweek on resident burnout. *Arch Surg.* 2004;139(9):933–940. <https://doi.org/10.1001/archsurg.139.9.933>
- General Medical Council. National training survey 2016. Manchester: General Medical Council; 2016
- General Medical Council. National training survey 2017. Manchester: General Medical Council; 2017
- Gerada C. How to avoid burnout in the NHS – learning to pull your own oxygen mask down first. 2019. <https://www.rcseng.ac.uk/news-and-events/blog/avoiding-burnout-in-the-nhs/> (accessed 23 April 2021)
- Goodwin L, Ben-Zion I, Fear NT et al. Are reports of psychological stress higher in occupational studies? *Syst Rev Occup Population Based Stud.* 2013;8(11). <https://doi.org/10.1371/journal.pone.0078693>
- Hampton T, Greenhalgh R, Ryan D et al. Female surgical trainee attrition. *Bulletin.* 2016;98(3):134–137. <https://doi.org/10.1308/rcsbull.2016.134>
- Hassed C, de Lisle S, Sullivan G, Pier C. Enhancing the health of medical students: outcomes of an integrated mindfulness and lifestyle programme. *Adv Health Sci Educ.* 2009;14(3):387–398. <https://doi.org/10.1007/s10459-008-9125-3>

- Imo UO. Burnout and psychiatric morbidity among doctors in the UK: a systematic literature review of prevalence and associated factors. *BJPsych Bull.* 2017;41(4):197–204. <https://doi.org/10.1192/pb.bp.116.054247>
- Kadhun M, Farrell S, Hussain R, Molodynski A. Mental wellbeing and burnout in surgical trainees: implications for the post-COVID-19 era. *Br J Surg.* 2020;107(8):e264–e264. <https://doi.org/10.1002/bjs.11726>
- Kane L. Medscape national physician burnout and depression report 2019. 2019. <https://www.medscape.com/slideshow/2019-lifestyle-burnout-depression-6011056#2> (accessed 23 April 2021)
- Kinman G, Teoh K. What could make a difference to the mental health of UK doctors? 2018. https://www.som.org.uk/sites/som.org.uk/files/What_could_make_a_difference_to_the_mental_health_of_UK_doctors_LTF_SOM.pdf (accessed 5 May 2021)
- Krasner MS, Epstein RM, Beckman H et al. Association of an educational program in mindful communication with burnout, empathy, and attitudes among primary care physicians. *JAMA.* 2009;302(12):1284–1293. <https://doi.org/10.1001/jama.2009.1384>
- Lown B, Manning C. The Schwartz center rounds: evaluation of an interdisciplinary approach to enhancing patient-centered communication, teamwork and provider support. *Acad Med.* 2010;85(6):1073–1081. <https://doi.org/10.1097/ACM.0b013e3181dbf741>
- Lyubomirsky S, King L, Diener E. The benefits of frequent positive affect: does happiness lead to success? *Psychol Bull.* 2005;131(6):803–855. <https://doi.org/10.1037/0033-2909.131.6.803>
- Maben J, Taylor C, Dawson J et al. A realist informed mixed methods evaluation of Schwartz Center Rounds in England. Southampton (UK): NIHR Journals Library; 2018
- Markwell A, Wainer Z. The health and wellbeing of junior doctors: insights from a national survey. *Med J Aust.* 2009;191(8):441–444. <https://doi.org/10.5694/j.1326-5377.2009.tb02880.x>
- Martini S, Arfken CL, Balon R. Comparison of burnout among medical residents before and after the implementation of work hours limits. *Acad Psychiatr.* 2006;30(4):352–355. <https://doi.org/10.1176/appi.ap.30.4.352>
- Maslach C, Schaufeli WB, Leiter MP. Job burnout. *Annu Rev Psychol.* 2001;52(1):397–422. <https://doi.org/10.1146/annurev.psych.52.1.397>
- McCain RS, McKinley N, Dempster M et al. A study of the relationship between resilience, burnout and coping strategies in doctors. *Postgrad Med J.* 2018;94(1107):43–47. <https://doi.org/10.1136/postgradmedj-2016-134683>
- McIntyre HF, Winfield S, Te HS, Crook D. Implementation of the European Working Time Directive in an NHS trust: impact on patient care and junior doctor welfare. *Clin Med.* 2010;10(2):134–137. <https://doi.org/10.7861/clinmedicine.10-2-134>
- McNally SA. Surgical training: still highly competitive but still very male. *Bulletin.* 2012;94(2):53–55. <https://doi.org/10.1308/147363512X13189526438675>
- NHS Digital. Surgeons by gender, specialty and grade. 2018. <https://digital.nhs.uk/data-and-information/find-data-and-publications/supplementary-information/2018-supplementary-information-files/staff-numbers/consultants-and-doctors/surgeons-by-gender---speciality-and-grade> (accessed 5 May 2021)
- Ozday F, Fitterling H, Charney D et al. Social support and resilience to stress across the life span: a neurobiologic framework. *Curr Psychiatr Rep.* 2008;10(4):304–310. <https://doi.org/10.1007/s11920-008-0049-7>
- Panagioti M, Geraghty K, Johnson J et al. Association between physician burnout and patient safety, professionalism, and patient satisfaction: a systematic review and meta-analysis. *JAMA Intern Med.* 2018;178(10):1317–1331. <https://doi.org/10.1001/jamainternmed.2018.3713>
- Peters K, Ryan MK, Fernandes H. Evidence that male dominated workplaces may undermine women's occupational identification. Presented at: Annual Conference of the British Psychological Society's Division of Occupational Psychology. Brighton; 2014
- Pietrzak RH, Goldstein RB, Southwick SM et al. Prevalence and axis I comorbidity of full and partial posttraumatic stress disorder in the United States: results from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. *J Anxiety Disord.* 2011;25(3):456–465. <https://doi.org/10.1016/j.janxdis.2010.11.010>
- Prins J, Gazendam-Donofrio S, Tubben B et al. Burnout in medical residents: a review. *Med Educ.* 2007;41(8):788–800. <https://doi.org/10.1111/j.1365-2923.2007.02797.x>
- Salles A, Cohen GL, Mueller CM. The relationship between grit and resident well-being. *Am J Surg.* 2014;207(2):251–254. <https://doi.org/10.1016/j.amjsurg.2013.09.006>
- Santen SA, Holt DB, Kemp JD, Hemphill RR. Burnout in medical students: examining the prevalence and associated factors. *Southern Med J.* 2010;103(8):758–763

- Schwartz KB. A patient's story. 2012. <https://www.bostonglobe.com/magazine/1995/07/16/patient-story/q8ihHg8LfyinPA25Tg5JRN/story.html> (accessed 5 May 2021)
- Shanafelt T, Bradley K, Wipf J et al. Burnout and self-reported patient care in an internal medicine residency program. *Ann Intern Med.* 2002;136(5):358–367. <https://doi.org/10.7326/0003-4819-136-5-200203050-00008>
- Shanafelt T, Balch C, Bechamps G et al. Burnout and medical errors among American surgeons. *Ann Surg.* 2010;251(6):995–1000. <https://doi.org/10.1097/SLA.0b013e3181bfdab3>
- Shapiro SL, Astin JA, Bishop SR, Cordova M. Mindfulness-based stress reduction for health care professionals: results from a randomized trial. *Int J Stress Manag.* 2005;12(2):164–176. <https://doi.org/10.1037/1072-5245.12.2.164>
- Tsugawa Y, Jena AB, Figueroa JF et al. Comparison of hospital mortality and readmission rates for medicare patients treated by male vs female physicians. *JAMA Intern Med.* 2017;177(2):206–213. <https://doi.org/10.1001/jamainternmed.2016.7875>
- Tugade MM, Fredrickson BL, Barret L. Psychological resilience and positive emotional granularity. *J Personal.* 2004;72(6):1161–1190. <https://doi.org/10.1111/j.1467-6494.2004.00294.x>
- Wallis CJ, Ravi B, Coburn N et al. Comparison of postoperative outcomes among patients treated by male and female surgeons: a population based matched cohort study. *BMJ.* 2017;359:j4366. <https://doi.org/10.1136/bmj.j4366>
- West CP, Tan AD, Shanafelt TD. Association of resident fatigue and distress with occupational blood and body fluid exposures and motor vehicle incidents. *Mayo Clin Proc.* 2012;87(12):1138–1144. <https://doi.org/10.1016/j.mayocp.2012.07.021>
- West CP, Dyrbye LN, Erwin PJ, Shanafelt TD. Interventions to prevent and reduce physician burnout: A systematic review and meta-analysis. *Lancet.* 2016;6736(16). [https://doi.org/10.1016/S0140-6736\(16\)31279-X](https://doi.org/10.1016/S0140-6736(16)31279-X)