Strategies against Burnout and Anxiety in Medical Education – Implementation and Evaluation of a New Course on Relaxation Techniques (Relacs) for Medical Students

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Abstract

Burnout and stress-related mental disorders (depression, anxiety) occur in medical students and physicians with a significantly higher prevalence than in the general population. At the same time, the learning of coping mechanisms against stress is still not an integral part of medical education. In this pilot study we developed an elective course for learning relaxation techniques and examined the condition of the students before and after the course. 42 students participated in the semester courses in 2012 and 2013 as well as in a survey at the start and end of each course. The students were instructed in autogenic training (AT) and progressive muscle relaxation according to Jacobsen (PMR) with the goal of independent and regular exercising. At the beginning and the end of the semester/course the students were interviewed using standardized, validated questionnaires on burnout (BOSS-II) and anxiety (STAI-G), depression (BDI), quality of life (SF-12) and sense of coherence (SOC-L9). We compared the results of our students participating in Relacs with results from eight semester medical students (n=88), assessed with the same questionnaires at similar points of time within their semester. Participating students showed a significant decline in cognitive and emotional burnout stress and in trait anxiety. Furthermore, they showed a reduction in state anxiety and a conspicuous decrease in mean depression. The sense of coherence increased at the same time. A comparative cohort of medical students of 8th semester students, showed lower values for the specified measurement parameters at the beginning, but showed no progressive changes. Our course introducing AT and PMR led to a significant reduction of burnout and anxiety within the participating group of medical students.
students. Even the course attendance for just one semester resulted in significant improvements in the evaluated parameters in contrast to those students who did not attend the course.

Introduction

Compared with the average population, clinical physicians and medical students already suffer with significantly greater frequency from stress-associated mental disorders such as depression and anxiety disorders [1]. In a current survey of medical students in the preclinical semesters (n=530), we found 40.8% students with an increase in anxiety and rates of elevated depressive symptoms as early as the fourth semester cohort. In 16.9% of the participating students this symptom showed clinically relevant severity [2]. The comparison of medical students at the beginning of the first semester and before the first state examination after only two years of study (4th semester) also showed a dramatic increase in cognitive and emotional burnout symptoms and a loss of mental quality of life as well as sense of coherence [2, 3]. This cannot be regarded as a local phenomenon, since similar changes have been observed in other national and international surveys as well [4–6]. In a recent review Ishak et al. stated that at least half of the medical students experience burnout in their time at university [7]. A progressive deterioration of these mental symptoms and disorders can also been found in study data from Switzerland, where among surveyed medical students of higher semesters and young doctors in training about 30% showed manifest depression and about 15% anxiety disorders [8–10].

In our opinion, one reason for the high number of existing mental illnesses and stress syndromes is insufficient formulation and teaching, or rather learning, of strategies for dealing with the day-to-day stress inherent in the medical profession. Medical students with active coping strategies basically deal with these difficulties more successfully [11]. On the other hand, work habits change over the course of a medical education and burnout risk behavior is more frequent with longer duration of medical education [12].

The incidence of stress-induced burnout increases the longer the student is in the medical education process and continues to increase in the medical assistant phase. Distress due to mental impairment increases the risk of medically incorrect decisions. Warnecke et al. postulate in their article of 2011 that it is necessary for the safety of physicians and patients for medical students to develop intervention strategies to counter these negative factors early on. "In a university medical degree course in which students are taught about managing the health of others, there is an imperative to provide them with effective, evidence-based ways to manage their own stress.‘‘ [13].

For all the reasons mentioned, anchoring of stress management as an integral part of medical training strategies is therefore all the more necessary [14]. The
efficacy of relaxation techniques to counter stress, anxiety and depression in
general, and among medical students in particular, has been clearly established:
techniques used in the care of psychiatric patients, such as mindfulness exercises,
have already been successfully used on medical students and led to a reduction of
anxiety and stress perception among the participants. This effect remained
persistent even after the intervention was finished [13]. Even self-hypnosis, as a
further relaxation technique, reduced the sense of distress among medical students
and promoted positive effects [15]. Observation of students in different subjects
revealed a positive impact of progressive muscle relaxation on anxiety and quality
of life of those practicing the technique [16]. Relaxation and stress management
techniques thus provide satisfactory alleviation of the massive mental stress
encountered during medical education and decrease the risks of burnout,
depersonalization, anxiety and stress among medical students [12, 17].

Against this background, we developed and offered our medical students a new
elective course in autogenic training (AT) and progressive muscle relaxation
(PMR) starting with the summer semester of 2012. We intended to test our
hypothesis whether it is possible to integrate a successful, well accepted and
effective course offer for medical students in order to improve their mental health.
The course name Relacs is an acronym for "recreation and success in learning
through applied concentrative self-relaxation". The data obtained on the
participating students for burnout and anxiety were evaluated and analyzed and
are presented in this paper.

Material and Methods

A total of 39 medical students (classical curriculum, clinical section, 5th to 8th
semester) and three psychology students (6th semester) participated in Relacs
during the 2012 summer term and 2012/2013 winter term. The course took place
in small groups (max. 12 students) during one semester and with one session (2h)
per week and group. AT and PMR were taught in theory and practice. In addition
to these sessions, independent practice units are required twice daily covering the
contents of the course as taught and elaborated with relaxation exercises in AT or
PMR. Psychometric data were collected from 11 students at one point in time and
from 31 students at two points. Two participants in the first survey (summer term
2012) did not fully complete their questionnaires, so that not all parameters were
analyzed for them. A total of 37 female and 5 male students aged 22–39 years
(mean = 24.93 ± 4.42 years) participated in Relacs. For the second point of time in
the survey, winter term 2012/13, 27 female and 4 male participants aged 20–33
years were interviewed (mean 24.44 ± 3.14 years). Methods included proper
consent and approval, complied with the declaration of Helsinki, and were
approved by the ethic committee of the Friedrich-Alexander University (FAU),
Erlangen, Germany. Further consent of the student participants was not given or
necessary, because all data of this study were analyzed anonymously. All
participants gave written consent to data collection and analysis of their test
results. The statistical analysis was performed using the statistical software IBM SPSS Statistics.

Students were interviewed using standardized and validated psychological questionnaires on burnout (burnout screening scales; BOSS-II), anxiety (State and Trait Anxiety Inventory; STAI-G) and other parameters (depression, sense of coherence, work-related behavior and experience patterns). The surveys were collected at the same time for all students before and after the course, i.e. before the exam dates for other subjects at the end of the semester.

The burnout symptom scales (BOSS-II) are a self-assessment method for detection of subjective mental and physical symptoms that typically occur in the context of a burnout syndrome. Two independently applicable questionnaires with 30 items each are available. BOSS-II consists of three scales (physical, cognitive and emotional symptoms), each with ten items, covering an assessment period of seven days. This questionnaire can be used for both dimensional diagnostics (quantification of symptoms) and categorical diagnostics (diagnosis of burnout syndrome) [18].

The STAI-G is based on the distinction between anxiety as a state and anxiety as a trait [19]. The two scales of the STAI, with 20 items each, are used to collect anxiety state and trait data, respectively. The trait model of anxiety in the design of the STAI has been expanded to include the aspect of anxiety as a temporary emotional state of varying intensity as to time and situation (state anxiety). By contrast, anxiety as a relatively constant personality trait (trait anxiety), refers to individual differences in the tendency to anxiety reactions.

At the beginning of the semester, the students were interviewed concerning their work-related behavior and experience pattern (short form AVEM-44) [20], resulting in a classification into four types for this student cohort. Two of these behavior and experience types reflect a protective pattern, the other two a risk pattern with an increased risk for development of burnout and stress-related mental illness. For the assessment of depression and sense of coherence, two other mental parameters of interest, the Beck’s Depression Inventory II [21] and the short form of the Sense of Coherence Scale SOC-L9 [22] were used. The corresponding results are covered respectively.

To generate a control group for the students participating in the Relacs course, other 8th-semester medical students were surveyed. To establish comparability of data acquisition times with the Relacs group, these assessments were held at the beginning (first week) of the semester and at the end of the semester (one week before final exams). The assessments were conducted with the same psychological questionnaires as listed above. In this control group, 61 female and 22 male students aged 22–40 years (mean =24.29 ± 2.79) participated in the interviews.

**Results**

Regarding participant age in the control and Relacs groups, no significant difference was found using the student’s t-test for independent samples.
The analysis of work-related behavior and experience patterns data revealed in the Relacs and control groups revealed comparable constellations. Of the Relacs students, 61.3% showed a protective behavior and experience pattern (patterns S or G). In the control group, 57.8% of the students showed one of the two protective patterns. Patterns A and B, which are associated with an increased risk for stress-related disorders and/or burnout, were determined in 38.7% of the Relacs students, but in only 31.8% of the control group. 9.5% of the control group participants did not complete their questionnaires and were therefore excluded from analysis. The two groups thus appeared readily comparable with respect to work-related behavior and experience.

We found improved development in all Relacs students across all scales. The average depression level decreased, situational anxiety and basic anxiety decreased, the sense of coherence increased and burnout symptoms decreased in all three subscales considered (physical, cognitive and emotional; Table 1).

Moreover, the reduction of trait anxiety as well as the decreases on the cognitive and emotional burnout scale were statistically significant (Table 2; Figs. 1, 2). Within the control group, on the other hand, no significant changes were determined in any of the parameters measured (Table 3).

Discussion

The results of our Relacs study as presented show for many parameters a significant effect of relaxation techniques in terms of reduction of burnout-associated discomfort and anxiety in participating students, most of whom were in the clinical segment of their medical education. Similarly collected data for a control group of medical students from the same period and at comparable time points showed no significant changes in the surveyed parameters.

It is noteworthy that, within the Relacs group, both trait and state anxiety had decreased by the second assessment. Although the reduction in state anxiety, i.e. situation-related anxiety, did not reach statistical significance (p=0.20). This development should be seen within the time context of the semester – despite the upcoming exams at the end of the semester, both the students’ basic anxiety levels and situational anxiety levels were reduced. This was not true of the medical students in the control group (8th semester), who did not learn or apply relaxation techniques.

It proved possible to counteract clinical and subclinical burnout complaints from the emotional and cognitive range at the same time effectively. A slight, although not statistically significant, reduction was determined for physical complaints.

In general, the mental state of the Relacs students improved significantly during the course of the study. The results obtained in this pilot project are a clear indication for high efficacy of the learned relaxation techniques, especially in terms of effective burnout prevention, which can even be quickly learned parallel
to regular clinical work. Such techniques are already established, and have proven effective, in many collectives [23]

We are aware of the limitations of the study population selection method used in this study due to the elective nature of the Relacs course without randomized participant selection. However, the study was not designed to provide general proof of efficacy of AT and PMR.

In their almost 100-year history, both techniques have been successfully used in various therapeutic regimens to treat somatic disorders, depression, anxiety and pain [24–26]. Based on the burnout prevention and anxiety reducing effects demonstrated in our study we contend that the students interested in learning stress management techniques (in our case AT and PMR) benefitted significantly from the Relacs course content.

Mandatory inclusion of relaxation techniques in an existing curriculum of basic medical studies cannot be advocated based on the study results alone. This would require a larger number of participants and a higher-grade study design with matched case control groups.

### Table 1. Comparison of values from the psychological questionnaires at the start and end of the semester.

|                                      | MV     | SD   | SEM  |
|--------------------------------------|--------|------|------|
| State-Anxiety start                  | 45.40  | 5.04 | 0.92 |
| State-Anxiety end                    | 44.30  | 6.01 | 1.10 |
| Trait-Anxiety start                  | 45.10  | 5.71 | 1.04 |
| Trait-Anxiety end                    | 42.30  | 5.06 | 0.92 |
| BOSS-II physical start               | 1.27   | 1.85 | 0.33 |
| BOSS-II physical end                 | 0.83   | 0.60 | 0.11 |
| BOSS-II cognitive start              | 1.25   | 0.87 | 0.16 |
| BOSS-II cognitive end                | 0.92   | 0.72 | 0.13 |
| BOSS-II emotional start              | 0.91   | 0.79 | 0.14 |
| BOSS-II emotional end                | 0.68   | 0.64 | 0.11 |

MV = mean value; SD = standard deviation; SEM = standard error of mean

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### Table 2. Composite t-test for the BOSS-II subscales and state and trait anxiety in the Relacs group, significant difference at p<0.05.

| Paired differences  | MV     | SD   | SEM  | 95% confidence interval for difference | t     | p    |
|---------------------|--------|------|------|---------------------------------------|-------|------|
|                      | Upper  | Lower|      |                                       |       |      |
| State-Anxiety start-end | 1.1   | 4.61 | 0.84 | −0.62                                 | 2.82  | 1.31 | 0.20 |
| Trait-Anxiety start-end  | 2.80  | 5.14 | 0.94 | 0.88                                 | 4.72  | 2.99 | 0.01** |
| BOSS-II physical start-end  | 0.45  | 1.86 | 0.33 | −0.24                                 | 1.13  | 1.34 | 0.19 |
| BOSS-II cognitive start-end  | 0.34  | 0.81 | 0.15 | 0.04                                 | 0.63  | 2.31 | 0.03* |
| BOSS-II emotional start-end  | 0.23  | 0.53 | 0.10 | 0.03                                 | 0.42  | 2.40 | 0.02* |

MV = mean value; SD = standard deviation; SEM = standard error of mean; * =p<0.05; ** =p<0.01

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The fact, however, that in a given number of persons from a high-risk collective for development of stress-related mental disorders - and medical students can be considered to be in this category based on international survey results [27, 28] - such a clear effect was observable after only a one-semester accompanying course is remarkable and should be taken into account when establishing medical curricula. Within our cohort of 42 students positive effects were observed and the psychological parameters analyzed revealed coherent results, clearly demonstrating the high potential of the applied relaxation techniques.

Integration of protective technique training in medical studies has been advocated by other authors within the context of the increased mental workload in medical education [13, 17]. Ishak [7, 29] stresses the importance of burnout as a crucial factor in medical students due to its high prevalence. The continuation of burnout symptoms beyond medical school is real and the consequences for medical professionals and subsequently their patients can be severe, resulting in psychiatric disorders like depressions and problematic patient care [30, 31].
Of course there are several factors to be accounted for in order to work against the development of burnout in medical professionals, like personal support, work satisfaction [32].

Fig. 2. Comparison of values for state and trait anxiety in the course group at times of data collection start and end of semester. ** = p<0.01

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Table 3. Composite t-test for the BOSS-II subscales and state and trait anxiety in the control group, significant difference at p<0.05.

| Paired differences | MV | SD  | SEM | 95% confidence interval for difference | t   | p    |
|--------------------|----|-----|-----|--------------------------------------|-----|------|
|                    |    |     |     | Upper | Lower |
| State-Anxiety      |    |     |     |     |       |
| start-end          | 0.50| 6.06| 1.15| −1.85 | 2.85  |
| Trait-Anxiety      |    |     |     |     |       |
| start-end          | 0.93| 4.48| 0.86| −0.85 | 2.70  |
| BOSS-II physical   |    |     |     |     |       |
| start-end          | 0.09| 0.43| 0.08| −0.08 | 0.25  |
| BOSS-II cognitive  |    |     |     |     |       |
| start-end          | 0.35| 1.75| 0.33| −0.33 | 1.03  |
| BOSS-II emotional  |    |     |     |     |       |
| start-end          | −0.08| 0.54| 0.10| −0.28 | 0.13  |

MV = mean value; SD = standard deviation; SEM = standard error of mean

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There is still not enough awareness on the educators’ side for a necessity to integrate the care for the medical student’s own personal, mental health within the curriculum at medical schools [7] and thus prevent burnout and subsequent manifest psychiatric disorders.

The data presented shows one opportunity to approach the goal of preventing mental disorders and their development among medical students. Provision of opportunities - at least firstly for motivated students - to learn protective relaxation techniques integrated in the medical curriculum should be a future prerequisite for medical faculties. The participating Relacs students gained a certain level of awareness and reflection regarding the stressful and challenging character of their studies and the task of a professional physician that awaits them. At the same time they were (and are) motivated to address these issues more actively and achieved very good results by participating in Relacs.

In addition to the state of improvements as reported, the Relacs students gave this elective excellent grades (overall course evaluation according to the German school grading system (5 fail to 1 best) was 1.229 = very good). In the evaluation process, the participants were very open-minded and motivated to learn protective relaxation techniques for their professional life, regardless of levels of interest and pre-educational training with respect to the course content (Table 4). Without exception, the students reported a strong belief in having learned something important and helpful.

Twice previously, prior to the Relacs course reported on here, training in relaxation techniques (AT, PMR) were offered as a voluntary elective course to medical students in the higher clinical semesters. These courses were also given consistently positive evaluations by the students, whereby a subjective sense of success for the individual participant was always emphasized. This empirical impression has now been underlined and confirmed by the Relacs evaluation and data analysis.

Since AT and PMR are regularly used, established relaxation techniques in psychiatry at many locations worldwide, inclusion of adequate courses in medical curricular on a broad basis should be an easy matter. In addition to the positive effects already mentioned (burnout prevention, etc.), students were also taught didactically significant aspects of relevant treatment methods in the early stages of their medical training. The Relacs course was based on maximized use of communicative teaching opportunities, a particularly motivating aspect for the participants. The focus on the pursuit of learning and continuous exercising during the lessons also reflects the demand for more practice-oriented teaching in medical curricula.

Students are particularly receptive to the interdisciplinary practical knowledge imparted by the course due to the emphasis on the self-awareness aspect. They see the experience as stimulating and valuable for their medical studies as a whole (see details in Table 4).

In sum, the transfer of our concept to other universities would appears to be a simple matter. Relacs is cost effective and could be readily integrated into training settings to assist students to cope with stress. This is important as the structures of
curricula differ extensively between universities and a course offer like ours is widely adaptable and should be integrated easily without financial or organizational problems.

Follow-up surveys of the participating Relacs students – in particular regarding sustainability of the positive effect – are pending and will be conducted in the coming semesters within the context of an advanced course as requested by the students.

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Author Contributions
Conceived and designed the experiments: KW MS PHMB AR LB FP. Performed the experiments: KW PHMB. Analyzed the data: MS PHMB AR FP. Contributed reagents/materials/analysis tools: MS KW LB FP PHMB. Wrote the paper: MS KW PHMB.

References
1. Busch MA, Maske UE, Ryl L, Schlack R, Hapke U (2013) [Prevalence of depressive symptoms and diagnosed depression among adults in Germany: results of the German Health Interview and Examination Survey for Adults (DEGS1)]. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz 56: 733–739.

2. Burger PHM, Tektas OY, Paulsen F, Scholz M (2014) [Increase of depressive disorders and decline in sense of coherence and mental quality of life in medical students on the way to the first "Staatsexamen"]. Psychother Psychosom Med Psychol. in press.

3. Scholz M, Neumann C, Steinmann C, Hammer CM, Schroder A, et al. (2014) [Development and Correlation of Work-related Behavior and Experience Patterns, Burnout and Quality of Life in Medical Students from their Freshmanship to the First State Examination]. Psychother Psychosom Med Psychol.
4. Jurkat HB, Richter L, Cramer M, Vetter A, Bedau S, et al. (2011) [Depression and stress management in medical students. A comparative study between freshman and advanced medical students]. Nervenarzt 82: 646–652.

5. Bailie J, Schwarz D, Witthoft M, Stubinger C, Rist F (2008) [Prevalence of mental disorders among college students at a German university]. Psychotherapie, Psychosomatik, medizinische Psychologie 58: 423–429.

6. Dahlin ME, Runeson B (2007) Burnout and psychiatric morbidity among medical students entering clinical training: a three year prospective questionnaire and interview-based study. BMC Med Educ 7: 6.

7. Ishak W, Nikravesh R, Lederer S, Perry R, Ogunyemi D, et al. (2013) Burnout in medical students: a systematic review. Clin Teach 10: 242–245.

8. Buddeberg-Fischer B, Stamm M, Buddeberg C, Klugerhofer R (2009) [Anxiety and depression in residents - results of a Swiss longitudinal study]. Z Psychosom Med Psychother 55: 37–50.

9. Arigoni F, Bovier PA, Mermillod B, Waltz P, Sappino AP (2009) Prevalence of burnout among Swiss cancer clinicians, paediatricians and general practitioners: who are most at risk? Support Care Cancer 17: 75–81.

10. Arigoni F, Bovier PA, Sappino AP (2010) Trend of burnout among Swiss doctors. Swiss Med Wkly 140: w13070.

11. Park CL, Adler NE (2003) Coping style as a predictor of health and well-being across the first year of medical school. Health Psychol 22: 627–631.

12. Voltmer E, Rosta J, Aasland OG, Spahn C (2010) Study-related health and behavior patterns of medical students: A longitudinal study. Med Teach 32: e422–428.

13. Warnecke E, Quinn S, Ogden K, Towle N, Nelson MR (2011) A randomised controlled trial of the effects of mindfulness practice on medical student stress levels. Med Educ 45: 381–388.

14. Jurkat H, Vetter A., Raskin K (2007) Lebensqualität von berufstätigen Medizinern mit und ohne Substanzabhängigkeit – Implikationen für die Ausbildung von Medizinstudierenden. Nervenarzt (Suppl 2): 162.

15. Whitehouse WG, Dingess DF, Orne EC, Keller SE, Bates BL, et al. (1996) Psychosocial and immune effects of self-hypnosis training for stress management throughout the first semester of medical school. Psychosom Med 58: 249–263.

16. Dehghan-Nayeri N, Adib-Hajbaghery M (2011) Effects of progressive relaxation on anxiety and quality of life in female students: a non-randomized controlled trial. Complement Ther Med 19: 194–200.

17. Prinz P, Hertrich K, Hirschfelder U, de Zwaan M (2012) Burnout, depression and depersonalization—psychological factors and coping strategies in dental and medical students. GMS Z Med Ausbild 29: Doc10.

18. Hagemann W GK (2009) BOSS - Burnout-Screening-Skalen Hogrefe Verlag Göttingen.

19. Laux L, Glanzmann P, Schaffner P, Spielberger CD (1970) Das State-Trait-Angst-Inventar Manual. Beltz Test.

20. Saarschmidt UF, Fischer AW (2008) AVEM Arbeitsbezogenes Verhaltens- und Erlebensmuster. Pearson Assessment & Information GmbH, Frankfurt am Main 3. Auflage: 31–36.

21. Beck AT, Steer RA, Brown GK, Hautzinger M, Keller F, Kühner C (2009) BDI-II Beck Depressions Inventar Revision Manual. Harcourt Test Services GmbH 2. Auflage.

22. Singer S, Brähler E (2007) Die “Sense of Coherence Scale” Testhandbuch zur deutschen Version: Vandenhoeck & Ruprecht GmbH & Co KG Göttingen.

23. Stetter F, Kupper S (2002) Autogenic training: a meta-analysis of clinical outcome studies. Appl Psychophysiol Biofeedback 27: 45–98.

24. Blanchard EB, Nicholson NL, Taylor AE, Steffek BD, Radnitz CL, et al. (1991) The role of regular home practice in the relaxation treatment of tension headache. J Consult Clin Psychol 59: 467–470.

25. Thomas K (2006) Praxis des Autogenen Trainings Selbsthypnose nach I.H. Schultz: Grundstufe/Formelhafte Vorsätze/Oberstufe. TRIAS-Verlag.

26. Song QH, Xu RM, Zhang QH, Ma M, Zhao XP (2013) Relaxation training during chemotherapy for breast cancer improves mental health and lessens adverse events. Int J Clin Exp Med 6: 979–984.
27. Dyrbye LN, Thomas MR, Harper W, Massie FS, Jr., Power DV, et al. (2009) The learning environment and medical student burnout: a multicentre study. Med Educ 43: 274–282.

28. Dyrbye LN, Thomas MR, Shanafelt TD (2005) Medical student distress: causes, consequences, and proposed solutions. Mayo Clin Proc 80: 1613–1622.

29. Ishak WW, Lederer S, Mandili C, Nikravesh R, Seligman L, et al. (2009) Burnout during residency training: a literature review. J Grad Med Educ 1: 236–242.

30. Thomas NK (2004) Resident burnout. JAMA 292: 2880–2889.

31. Shanafelt TD, Bradley KA, Wipf JE, Back AL (2002) Burnout and self-reported patient care in an internal medicine residency program. Ann Intern Med 136: 358–367.

32. Hyman SA, Michaels DR, Berry JM, Schildcrout JS, Mercaido ND, et al. (2011) Risk of burnout in perioperative clinicians: a survey study and literature review. Anesthesiology 114: 194–204.