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National Survey of Burnout and Distress Among Cardiothoracic Surgery Trainees



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Background. Burnout has been linked to poor job satisfaction and increased medical errors, and is prevalent among health care professionals. We sought to characterize burnout and distress among US cardiothoracic surgery (CTS) trainees.

Methods. A 19-question survey was sent to CTS trainees in collaboration with the Thoracic Surgery Residents Association. We queried sociodemographic variables, balance/quality of life, and indicators of depression and regret. We included questions along the emotional exhaustion, depersonalization, and personal accomplishment subscales of the Maslach Burnout Inventory.

Results. The survey was sent to 531 CTS trainees across 76 institutions and there were 108 responses (20.3%). More than 50% of respondents expressed dissatisfaction with balance in their professional life and more than 40% screened positively for signs of depression. More than 25% of respondents (n = 28) would not complete CTS

training again, given a choice. More than half met criteria for burnout on emotional exhaustion and depersonalization subscales. The CTS residents with children were more likely to express regret toward pursuing CTS training. A greater proportion of women than men reported poor levels of balance/quality of life during training as measured by missed health appointments, negative impact on relationships, and self-perception. Similarly, those in the final 3 years of training were more likely to report poor levels of balance/quality of life.

Conclusions. High rates of burnout, regret, and depression are present among US CTS trainees. Efforts to promote trainee well-being and implement interventions that support those at high risk for burnout are warranted, to benefit trainees as well as the patients they serve.

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Many physicians have likely counseled a colleague or patient in the following manner: “You have to take care of yourself before you can take care of others.” Numerous studies on burnout and distress among physicians, however, would suggest that their own ability to heed this counsel remains lacking.¹⁻⁵ Burnout is commonly described as a complex syndrome marked by emotional exhaustion, depersonalization, and cynicism, coupled with a diminished sense of personal accomplishment.^{1,6} Among health care workers, it has been associated with increased medical errors,⁷⁻⁹ poor job satisfaction, increased rates of attrition, and a negative impact on relationships.^{1,10,11} Trainees may be particularly vulnerable to burnout for a number of reasons: first, their workload and schedule is expected to be rigorous;

second, there is stigma associated with asking for help or admitting to feeling overwhelmed; third, systems that allow for harassment or discrimination can be present—in many cases, having been perpetuated through generations of teachers and trainees; and fourth, trainees are regularly evaluated with standardized tests and milestones that have bearing on their future success. Moreover, all of these professional stressors need to be managed on top of any personal, familial, or financial stresses that trainees may encounter outside the hospital.

A recent survey of US general surgery residents showed a high prevalence (69%) of burnout.³ To date, there has not been an evaluation of burnout among cardiothoracic surgery (CTS) trainees. Furthermore, other markers of wellness including depression, balance/quality of life (QOL), and regret toward pursuing training has not been studied in this group. In this study, we set out to

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characterize the prevalence and severity of burnout, distress, and wellness among CTS trainees.

Material and Methods

An email invitation to complete an anonymous 19-question survey was sent to CTS trainees in collaboration with the Thoracic Surgery Residents Association in March 2019 (Appendix). The mailing list included all trainees from every Accreditation Council for Graduate Medical Education-accredited thoracic surgery program (traditional, integrated, and 4+3 programs). The survey was accessed through a link in the email describing the research and purpose of the questionnaire. A reminder invitation was sent 2 weeks after the initial request. The survey consisted of four sociodemographic questions, four questions focused on work-life balance and QOL, two questions as a screen for depression, two questions evaluating regrets toward pursuing CTS training, six questions along emotional exhaustion, depersonalization, and personal accomplishment subscales of the Maslach Burnout Inventory (MBI), and one question on awareness of wellness-related resources.

The balance/QOL questions were based on the linear analog self-assessment scale, which has been validated across numerous populations and used widely in QOL research.^{12,13} They also included questions used in prior research on work-life balance.^{4,5,10,12} The four balance/QOL questions were given a combined score (0 = worst, 16 = best balance/QOL) and a good degree of work-life balance/QOL was attributed to those with a score of 12 or higher. Two questions were included that have been used as a screen for depression, which has also been used in other survey studies.^{14,15} Both of these were binary, and respondents were counted as screening positive for depression if they answered positively to both questions. The two questions screening for regret were based on other published surveys that also included questions to assess potential resident attrition.^{3,11} Regret was attributed to respondents who indicated they have considered leaving their training program once a month or more often, and responding “no” to whether they would choose to complete training again.

Questions assessing the various domains of burnout were included, and were derived from the MBI.^{2,6,16,17} The responses were separated into the three subscales of emotional exhaustion (four questions), depersonalization (one question), and personal accomplishment (one question), and were also analyzed together with burnout being attributed to respondents with a high score in at least one subscale. There were no missing items or responses as survey respondents were prompted by the survey platform if questions were left blank. Pearson’s χ^2 tests were used to evaluate associations between socio-demographic variables and the outcomes of interest. We wanted the sample to be representative of all cardiothoracic surgery trainees. According to the Thoracic Surgery Residents Association, there were 531 CTS residents at the time of survey. With a confidence interval of 95% and

a 20.3% response rate (n = 108), our margin of error (MOE) is $\pm 8.4\%$. The MOE calculation is as follows:

$$\begin{aligned} MOE &= z - score * \sqrt{\frac{p(1-p)}{n}} * \sqrt{\frac{(N-n)}{(N-1)}} \\ &= 1.96 * \sqrt{\frac{0.50(1-0.50)}{108}} * \sqrt{\frac{(531-108)}{(531-1)}} \\ &= 0.084 \end{aligned}$$

This study was approved by the Institutional Review Board (#2018P000347) of the principal investigator’s institution.

Results

The survey was sent to 531 CTS trainees across 76 institutions and there were 108 responses (20.3%). Seventy-seven responses were received after the first email over the first 11 days, and an additional 31 responses were received after the second email over 8 days. The baseline

Table 1. Demographics of Survey Respondents

Demographics	n (%)
Program track	
Traditional cardiac	32 (30)
Traditional thoracic	15 (14)
Integrated cardiac	41 (38)
Integrated thoracic	12 (11)
4+3 cardiac	3 (3)
4+3 thoracic	3 (3)
Undecided	2 (2)
Sex	
Male	76 (70)
Female	32 (30)
Age, y	
20-25	1 (1)
26-30	20 (19)
31-35	61 (56)
36-40	24 (22)
41+	2 (2)
Last 3 years of training ^a	
Yes	77 (71)
No	31 (29)
Nonclinical year	
No	97 (90)
Yes	11 (10)
Marital status	
Married or domestic partner	67 (62)
Separated or divorced	5 (5)
Single, never married ^b	36 (33)
Children	
Yes	39 (36)
No	69 (64)

^aLast 4 years for 6 trainees enrolled in 4+3 programs; ^bIncludes one person who reported being “engaged.”

demographic data of the trainees who responded are shown in [Table 1](#). The distribution of training paradigms among respondents was 30% (n = 32) traditional cardiac, 14% (n = 15) traditional thoracic, 38% (n = 41) integrated cardiac track, 11% (n = 12) integrated thoracic track, and 6% (n = 6) in 4+3 programs. Marital status was reported as single (33%), married or domestic partnership (27%), married or domestic partnership with children (35%).

More than 75% of respondents indicated training had a negative impact on their marriage or relationships at least sometimes, with more than 40% reporting often or very often, and more than half reported training often negatively impacted their personal health care (eg, by causing missed health appointments or unintended weight gain/loss). These responses demonstrate how CTS training very significantly disrupts life for the clear majority of trainees outside of the hospital setting. More than 50% were dissatisfied with their professional work-life balance ([Figure 1](#)), and nearly 50% screened positive on the two questions for depression. More than 25% would not complete CTS training again, given a choice.

Along the MBI subscales, emotional exhaustion and depersonalization was prevalent with more than 50% of respondents reporting high levels of both, and meeting criteria for burnout in those subscales. Scoring along the personal accomplishment subscale was more positive, with most trainees reporting at least some sense of personal achievements at least once a week. Statistical associations between demographic data and the outcomes of interest are outlined in [Table 2](#).

Association Between Parental Status and Regrets Toward Training

The CTS trainees with children were significantly associated with having regrets toward training compared with those without children (31% vs 14%, $\chi^2 = 4.07$, $P = .044$), with regret being counted if they reported they would not select CTS training over again in addition to having thoughts of quitting at least once every month. Having children was the only variable measured within our survey that held an association with demonstrating regrets with respect to CTS training.

Association Between Sex and Regrets Toward Training

A higher proportion of female CTS trainees expressed regret toward pursuing CTS training than their male counterparts, but this association did not reach statistical significance (31% vs 16%, $\chi^2 = 3.32$, $P = .069$).

Association Between Sex and Balance/QOL Measures

A composite measure of the four questions focused on balance/QOL revealed female CTS trainees were far less likely to report positive measures of QOL and work-life balance compared with their male counterparts (0% vs 17%, $\chi^2 = 6.22$, $P = .013$). This was not individually driven by a specific one of the four questions but was instead an aggregated result of all four.

Association Between Seniority in Training Program and Balance/QOL Measures

Similarly, CTS residents in the last 3 years of their training (last 4 years for the 6 trainees enrolled in a 4+3 program) were far less likely to report positive ratings for balance/QOL, compared with residents in the more junior years of their training (6% vs 26% $\chi^2 = 7.79$, $P = .0053$).

Trainee Awareness of Resources to Optimize Performance, Nutrition, Exercise

Most trainees (46%) were at least somewhat aware of resources available to optimize performance, nutrition, and exercise, but there were still 13% (n = 14) who reported they were not at all aware of and had not received these supportive resources.

Comment

This study identified high rates of burnout, regret, and depression among US CTS trainees. These findings corroborate a growing body of literature on the mental distress faced by surgery trainees, practicing surgeons and those in other surgery subspecialties.^{2-4,10,12,17,18} It may come as no surprise that cardiothoracic surgery trainees report high degrees of burnout and regret, but its predictability should not lessen its impact. Burnout has not only been linked to medical errors, but also has profound impacts on the interpersonal relationships of the distressed individual and carries the potential risk of physician suicide. With more than 400 physician suicides a year in the United States, more than double the rate of the general public, there is no room for dismissing these issues among CTS trainees.

In response to our survey, CTS trainees showed a high prevalence of burnout on the emotional exhaustion and depersonalization subscales, whereas a majority (nearly 80%) maintained positive levels of personal accomplishment. This discrepancy among burnout subscales was also noted among general surgery residents,³ among whom only 16% were reported to have poor levels of personal accomplishment. This finding suggests to us that while the impact of the work is burdensome and exhausting to the trainee, most trainees still feel a sense of purpose and fulfillment from their work. Efforts to decrease burnout among trainees should leverage this drive toward accomplishment and improvement that is undoubtedly shared by most CTS trainees. Mentors and educators are in an ideal position to trend trainee progress and to encourage recognition of their development and accomplishments.

Several studies have identified differences in burnout rates according to sex,^{5,19} and a recent study by Hu and colleagues²⁰ demonstrated that the difference may be accounted for by an increased prevalence of mistreatment (discrimination, verbal and physical abuse, and sexual harassment) encountered by female trainees. Although we did not identify differences in burnout according to sex, our survey did identify sex-related differences in

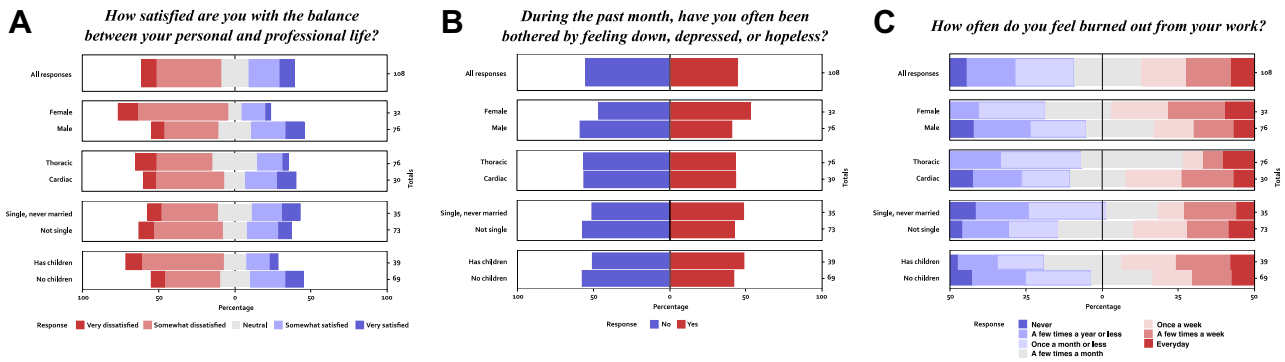


Figure 1. Response distribution for questions 8, 9, and 13: (A) personal and professional balance; (B) depression; and (C) burnout. (Red indicates more dissatisfied/depressed/more burnout; blue indicates more satisfied/not depressed/less burnout.)

reported QOL and self-perceived work-life balance, with female CTS trainees reporting more negative levels of balance/QOL.

Our study found trainees in the latter years of their training reported significantly lower levels of balance/QOL. This finding may reflect a tendency for staff surgeons to lean more heavily on senior-level trainees as they become more capable and trustworthy in their clinical decision-making. Other studies on general surgery trainees have noted differences in the way in which duty hours, work, and balance are perceived between the junior and senior years of training,²¹ but perhaps the more important consideration is whether our training programs may be setting the stage for unhealthy habits of balance and QOL among cardiothoracic surgeons as they enter practice. Ultimately, whether we are evaluating duty hours, work-life balance, sexual harassment,²² or other potential contributors to burnout, our goal should be to encourage healthier environments where we can each perform our tasks—training, teaching, and operating—in a more effective manner.

Two national surveys have reported that general surgery residents with children are less likely to pursue cardiothoracic surgery, as it has been associated with a low QOL.^{23,24} Expanding along the same line as those reports, our survey found that among those who have already selected to pursue CTS training, trainees with children are more likely to express regret toward having selected this subspecialty. Across the entire group of respondents, more than a quarter reported they would not choose to complete CTS training again, which should be disconcerting for those who are dedicated to helping train the next generation of cardiothoracic surgeons.

Our study found that most CTS trainees are at least somewhat aware of resources on performance optimization, but that there remains more than 10% who are either not at all aware of the availability of these resources or have not received them in any form. Resources are already delivered electronically to trainees as they enter CTS training programs, and program directors and faculty should clearly incorporate some routine wellness checks (eg, during trainee milestone reviews or informal meetings) to identify potential burnout or other warning

signs of distress. As a continued extension from their prior work with burnout and duty hours for general surgery residents, Hu and colleagues²⁰ and Bilimoria and associates²⁵ are currently engaged in the Surgical Education Culture Optimization Through Targeted Interventions Based on National Comparative Data (SECOND) trial (NCT03739723), which aims to test the implementation of a programmatic toolkit intended to mitigate resident mistreatment, and optimize program culture and resident wellness. Future efforts to improve CTS trainee wellness might be able to build upon similar interventions. Sexual harassment has been identified as a key contributor to burnout, and needs to be prohibited.^{20,22} Anecdotally, many trainees point to the importance of consistent mentorship from faculty as a source of considerable support during the rigorous training experience. Simply having a venue to discuss challenges faced with respect to balance and the training experience can be invaluable.

There are limitations of this study inherent in its design. The first limitation is the possibility of nonresponse bias. We decided it was important to keep the survey voluntary, accepting that this would lower the number of responses and limit the generalizability of the results, since systematic differences could exist between respondents and non-respondents. Importantly, the distribution of survey respondents between traditional, integrated, and 4+3 CTS programs was nearly equal to the distribution of all potential respondents ($\chi^2 = 0.79, P = .67$), suggesting that an acceptable representation of CTS trainees was obtained. Several studies have coupled similar questionnaires with in-training examinations,^{20,24} which dramatically increases response rates, but also introduces other potential confounders. As with most surveys, the findings present a single snapshot in time for the respondent, and so recall bias can also be present. Admittedly, our results lend limited insight into the causative factors of burnout and distress among cardiothoracic trainees. Other studies have associated duty hour violations, mistreatment, harassment, and lack of personal or institutional support as potential causative factors of burnout.^{20,26} Because we surmised a lengthy survey would result in a lower response rate, we did not include all the questions

Table 2. Analysis of Demographic Associations With Burnout and Wellness Outcomes

Demographic	Depressed ^a n (%)	χ ²	P Value	Regrets ^b n (%)	χ ²	P Value	Good QOL ^c n (%)	χ ²	P Value	Burnout ^d n (%)	χ ²	P Value
Cardiac (n = 76)	27 (75)	0.046	.83	15 (20)	0.0009	.98	10 (13)	0.20	.66	30 (39)	0.13	.72
Thoracic (n = 30)	10 (33)			6 (20)			3 (10)			13 (43)		
Male (n = 76)	24 (32)	1.5	.23	12 (16)	3.3	.069	13 (17)	6.2	.01	27 (36)	2.0	.16
Female (n = 32)	14 (44)			10 (31)			0 (0)			16 (50)		
Last 3 years (n = 77)	28 (36)	0.16	.69	16 (21)	0.50	.20	5 (6)	7.8	.005	34 (44)	2.1	.15
Junior (n = 31)	10 (32)			6 (19)			8 (26)			9 (29)		
Children (n = 39)	14 (36)	0.0004	.85	12 (31)	4.1	.044	3 (8)	1.1	.30	17 (44)	0.36	.55
No children (n = 69)	24 (35)			10 (14)			10 (14)			26 (38)		

^aDepression attributed to responding affirmatively to both screening questions; ^bRegret attributed to reporting thoughts of quitting at least once per month and indicating the respondent would not complete cardiothoracic training again; ^cGood quality of life (QOL), a composite score derived from responses to four questions on balance and QOL; ^dBurnout attributed to responses demonstrating signs of burnout in any of the three subscales.

traditionally included in a full MBI, which includes numerous variations of similar questions to provide increased internal validity. Although other groups have also truncated and modified the traditional MBI in other survey studies, our identification of burnout could differ from an evaluation using the full MBI. Finally, a type II statistical error among subgroups of respondents and individual domain assessments cannot be excluded.

Ultimately, a balance needs to be continually maintained when it comes to training future generations of cardiothoracic surgeons; in a very short period—with work hour regulations and other externally imposed pressures—we need to imbue CTS trainees with the foundational skills they will need to be safe and to build upon throughout their career. If our programs are not rigorous enough, trainees may be ill-equipped and struggle excessively when left without support, and could endanger the general public. If too rigorous or improperly focused, trainees may burn out or find themselves emotionally or physically unwell. Currently, during the daunting challenges of the COVID-19 pandemic, we should appreciate the reminder that cardiothoracic surgeons and trainees are an incredibly versatile and resilient group. Just as many of us have found ourselves temporarily repurposed as intensivists, general surgeons, and other nontraditional roles, we should be prepared to adjust our traditional training systems to reflect a commitment to optimizing trainee well-being and growth.

In summary, this study represents the first national survey across cardiothoracic surgery trainees that objectively demonstrates and documents what many of us have known intuitively for years: a high prevalence of burnout, depression, and poor levels of balance and QOL. Although we hope that displaying the rather negative view trainees have of their programs might diminish the stigma associated with burnout and distress, our broader aim is to improve the training paradigm. The authors humbly suggest that as a surgery society and as educators, the measures we take from here should target three main priorities: (1) improve cardiothoracic surgery culture by ending sexual harassment and other forms of discrimination; (2) nurture trainee resilience and accomplishment by providing consistent mentorship, and (3) identify ways to provide increased flexibility to CTS trainees to balance their responsibilities and interests outside of the hospital. If we can do this effectively, it will be to the benefit of our trainees, our societies as they join our ranks, and the patients we serve together.

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