Emergency Medicine Shift Factors Causing the Most Stress Among Emergency Medicine Residents

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ABSTRACT

Introduction: Past studies demonstrate that stress and anxiety affect emergency medicine physicians, but the causal factors identified are usually from sources outside the work shift. We attempt to show the relationship between intrinsic factors of a work shift and anxiety perceived by residents, while also examining differing gender responses.

Methods: In 2018, a cross-sectional survey of emergency medicine residents in the United States was distributed anonymously through the Emergency Medicine Residents Association. The survey consisted of demographic questions, novel questions identifying intrinsic factors, and the Generalized Anxiety Disorder 7-item (GAD-7) scale. Spearman correlation, independent t-test, and multivariate analysis of variance were performed.

Results: Data from 573 residents found several stressful factors: working with a nurse perceived to be inefficient, working with no inpatient beds available, and working with a colleague perceived to be inefficient. The majority of respondents reported some general anxiety on the GAD-7 assessment. There was no difference on anxiety level as a function of year of residency (p > .05). There was a significant gender difference on anxiety level as a function of year of residency (t(571) = -4.8689, p < .05), where male residents reported lower anxiety levels (mean=5.15) as compared to female residents (mean=7.02). Lastly, post-hoc analyses revealed that male and female respondents reported differing levels of stress in response to several intrinsic stress factors.

Conclusion: We identified several intrinsic factors during a shift that contribute to resident anxiety and analyzed differing gender responses to these factors; this may provide a framework for residency programs to minimize stressors in the future.

INTRODUCTION

Wellness among emergency medicine (EM) physicians has been a popular topic recently, with a plethora of research discussing attending physician wellness. EM physicians have increased risk for chronic stress, possibly due to increased encounters with workplace violence, emotional exhaustion, and exposure to traumatic injuries and child/adolescent mortality. Research has demonstrated that EM physicians are at higher risk for post-traumatic stress disorder (PTSD) as compared to other specialties due to exposure to violence, trauma, and death beginning in residency [1-4]. Therefore, EM physicians leave their specialty at higher rates than other physicians possibly due to the high stress of the field [5]. The Coronavirus Disease 2019 pandemic has affected frontline workers [6]. EM physicians expressed increased anxiety and depression disproportionately, with concerns related to personal health, exposing family members, and social isolation [7, 8]. However, a majority of EM physicians reported that their symptoms of burnout began prior to the pandemic [9]. Despite extensive research regarding attending physician wellness, research regarding wellness specifically of resident emergency physicians has only recently begun to be explored, and there is no standardized approach to improve wellness in resident education [10, 11].

Another crucial topic in the discussion of EM physician wellness is burnout, which describes a state of emotional exhaustion, depersonalization, and low personal accomplishment [12]. Burnout is prevalent among EM attending and resident physicians, is positively correlated with medical errors, and poses great danger to patients [12-16]. Studies have also demonstrated that some EM residents turn to alcohol and other maladaptive strategies to cope with their high level of stress [1, 17]. The process leading to increased burnout may begin in medical school, with overall burnout being more widespread among medical students and residents than population control samples [18]. Changes must occur in the training of EM residents, as burnout remains prevalent with...
67.1% of surveyed EM residents meeting burnout criteria compared to 45% of residents nationally reporting at least one symptom of burnout [19-21].

A recent study examined stressful events occurring outside of and during an EM work shift and how perceptions have changed over time [22]. “Feeling overwhelmed at work” complicates the relationship between work and burnout [23]. In the same context, the current study investigated factors occurring during EM work shifts and their relationship to stress by identifying specific stressful events during a work shift and evaluating the overall level of anxiety among EM residents.

METHODS
Setting and Participants
We conducted an anonymous survey study of emergency medicine resident physicians (PGY-1 to PGY-4) training in the United States. The invitation to participate in the study was sent via email with the assistance of the Emergency Medicine Residents’ Association (EMRA) to their membership list. Exclusion criteria included: a) physicians in other medical specialties, b) EM attendings, c) medical students, and d) all other hospital staff. A pilot study was conducted in a local EM residency program to prove the validity of the survey and determine the estimated completion time. This study was approved by the University of Toledo Biomedical Institutional Review Board, #202154.

Outcomes Measured
The primary outcome of this study was to quantify the level of stress associated with each of the identified intrinsic factors of a work shift in the emergency department (ED). The secondary outcome of this study was to examine differences in stress responses and anxiety levels as a function of residents’ gender and years in residency. The survey utilized the General Anxiety Disorder 7 (GAD-7) assessment, a widely used tool to detect anxiety in people [24-26], along with novel questions regarding intrinsic factors of a shift in the ED. These questions were presented as a 4-point Likert-type scale, with options ranging from the factor causing no stress/anxiety (score of 0) up to the factor causing severe stress/anxiety (score of 3). In addition, demographic information was collected for age, gender, year of residency, and location of residency.

Data Analysis
Independent t-test, analysis of variance (ANOVA), and multivariate analysis of variance (MANOVA) were used to examine differences with anxiety level and perceived stress from intrinsic factors based on gender or years in residency. Additionally, Spearman correlation was used to evaluate the linear relationships among anxiety level and stress responses to intrinsic factors. Statistical significance level was set at α = .05, two-tailed. Bonferroni correction was applied for multiple comparisons. All data analyses were performed with the statistical software R [27].

RESULTS
Characteristics of Study Participants
An email containing a link to complete the survey was sent to 6059 addresses. Of the emails sent, 2960 emails were opened, and 617 surveys were returned (response rate = 20.84%). Additionally, data from 44 respondents were further excluded due to missing values in variables of interest, leaving data from 573 respondents in the analyses. Demographic information of survey respondents is presented in Table 1. Respondents consisted of 57% male (n=327) and 43% female (n=246), with a mean age of 30.66 ± 3.95 years, and represented 44 out of 50 states. Post-Graduate Year 1 to 3 residents comprised the majority of respondents (90%).

Table 1: Demographic Information of Survey Respondents

| Gender   | N   | %     |
|----------|-----|-------|
| Male     | 327 | 57.07 |
| Female   | 246 | 42.93 |

| Age       | N   | %     |
|-----------|-----|-------|
| 25-29     | 251 | 43.80 |
| 30-34     | 253 | 44.15 |
| 35-39     | 52  | 9.08  |
| 40-44     | 11  | 1.92  |
| 45 and over | 5  | 0.88  |
| Not provided | 1  | 0.17  |

| Year of Residency | N   | %     |
|-------------------|-----|-------|
| PGY1              | 208 | 36.30 |
| PGY2              | 164 | 28.62 |
| PGY3              | 143 | 24.96 |
| PGY4              | 50  | 8.73  |
| Not provided      | 8   | 1.39  |

General Anxiety Among EM Residents
More than half of respondents reported anxiety based on the GAD-7 assessment. Specifically, 33.51% (n=192), 13.81% (n=78), and 6.63% (n=38) of respondents reported mild, moderate, and severe anxiety, respectively. Additionally, there was a significant gender difference on anxiety level, t(571) = -4.8689, p < .05. Male EM residents reported lower anxiety levels (mean=5.15) as compared to female EM residents (mean=7.02). There was no difference on anxiety level as a function of year of residency (p > .05).

Stress Responses to Work-Shift-Related Factors
With regard to intrinsic stress factors, MANOVA showed a statistically significant effect of gender on intrinsic stress factors F(15,571)=1.92, p < .05, Pillai’s Trace=0.06). Table 2 provides mean values of stress responses for each factor broken down by male, female, and all respondents and denotes significant gender differences.
Correlations Between General Anxiety and Stress Responses to Work Shift-Related Factors

Correlation analyses showed that general anxiety level was significantly associated with all intrinsic stress factors ($r$ range between 0.17 and 0.32, $ps < .05$, Bonferroni-corrected) except pharmacy phone calls interrupting workflow and personal cell phone texts, calls, and alerts ($ps > .05$, Bonferroni-corrected). Table 3 presents correlations among general anxiety level and intrinsic stress factors for male, female, and overall respondents.

Gender-specific correlation analysis showed different correlation patterns (Table 3). For male residents, general anxiety level was significantly associated with patients to be seen in the waiting room ($r = .23, p < .05$, Bonferroni-corrected), working with a colleague who you perceive to be inefficient ($r = .20, p < .05$, Bonferroni-corrected), providing care to high acuity patients ($r = .23, p < .01$, Bonferroni-corrected), managing agitated patients ($r = .25, p < .01$, Bonferroni-corrected), shift that begins in the morning ($r = .23, p < .01$, Bonferroni-corrected), shift that begins in the afternoon ($r = .34, p < .01$, Bonferroni-corrected), and managing agitated patients ($r = .25, p < .01$, Bonferroni-corrected), working with a nurse who you perceive to be inefficient ($r = .30, p < .01$, Bonferroni-corrected), managing agitated patients ($r = .25, p < .01$, Bonferroni-corrected), and evaluating patients in the hallway ($r = .24, p < .05$, Bonferroni-corrected).

For female residents, general anxiety level was significantly associated with providing care to low acuity patients ($r = .28, p < .01$, Bonferroni-corrected), working with a colleague who you perceive to be inefficient ($r = .30, p < .01$, Bonferroni-corrected), managing agitated patients ($r = .25, p < .01$, Bonferroni-corrected), shift that begins in the afternoon ($r = .31, p < .01$, Bonferroni-corrected), working in a setting with no open inpatient beds available ($r = .27, p < .01$, Bonferroni-corrected), and evaluating patients in the hallway ($r = .24, p < .05$, Bonferroni-corrected).

As seen in Table 2, post-hoc analyses revealed that female residents reported higher stress than male residents on: EMS phone interruptions ($F(1,571)=5.83, p < .05$), working with a colleague who you perceive to be inefficient ($F(1,571)=5.04, p < .05$), working with a nurse who you perceive to be inefficient ($F(1,571)=8.17, p < .01$), providing care to high acuity patients ($F(1,571)=6.44, p < .05$), working in a setting with no open inpatient beds available ($F(1,571)=3.94, p < .05$), and evaluating patients in the hallway ($F(1,571)=4.86, p < .05$).

### Table 2: Stress Response of Males, Females, and Overall to Each Intrinsic Factor

| Intrinsic Stress Factor | Stress Response Score | Male | Female | Overall |
|-------------------------|-----------------------|------|--------|---------|
| EMS phone interruptions |                       | 0.61 | 0.76   | 0.68    |
| Patients to be seen in the waiting room |           | 1.30 | 1.41   | 1.35    |
| Working with a colleague who you perceive to be inefficient |           | 1.31 | 1.46   | 1.38    |
| Working with a nurse who you perceive to be inefficient |           | 1.59 | 1.77   | 1.67    |
| Providing care to high acuity patients |           | 1.26 | 1.44   | 1.34    |
| Providing care to low acuity patients |           | 0.82 | 0.73   | 0.78    |
| Managing agitated patients |           | 1.15 | 1.27   | 1.20    |
| Shift that begins in the morning |           | 0.49 | 0.60   | 0.54    |
| Shift that begins in the afternoon |           | 0.66 | 0.73   | 0.69    |
| Shift that begins at night |           | 0.76 | 0.88   | 0.81    |
| Working in a setting with no open inpatient beds available |           | 1.42 | 1.57   | 1.48    |
| Using an electronic medical record system |           | 0.76 | 0.71   | 0.74    |
| Evaluating patients in the hallway |           | 0.86 | 1.01   | 0.92    |
| The practice of having EKGs interrupt you during a shift |           | 0.63 | 0.72   | 0.67    |
| Pharmacy phone calls interrupting your workflow |           | 0.53 | 0.63   | 0.58    |
| Personal cell phone texts, calls, and alerts |           | 0.25 | 0.29   | 0.27    |
| Teaching while on a standing work shift |           | 0.70 | 0.83   | 0.75    |

*Bold values indicate significant correlation with Bonferroni correction*
DISCUSSION
This study aimed to determine which intrinsic factors of an EM work shift cause subjective stress in EM residents. Responses from 573 EM residents were analyzed, resulting in identification of six critical factors that cause higher reported stress responses: managing agitated patients, caring for high acuity patients, working with many patients waiting to be seen, working with a colleague who is perceived to be inefficient, working with no inpatient beds available for patient admission, and working with a nurse who is perceived to be inefficient.

Threats to efficiency, such as working with a nurse or colleague who is perceived to be inefficient, produced high reported stress response scores in this study. When working in a busy ED, residents may feel burdened or slowed down by inefficient coworkers, leading to poor job satisfaction, which is correlated with burnout [14, 28]. Team-based models (i.e., physicians, nurses, and techs working together) have been shown to decrease self-reported burnout, demonstrating that staff cohesiveness is essential for reducing stress [29].

Job satisfaction can also be negatively affected by resource scarcity, such as access to ED beds [30]. Although scarcity of inpatient beds was not found to impact job satisfaction in EM physicians in a previous study, working with no inpatient beds available was the second most stressful intrinsic factor measured in this study [30]. This discrepancy suggests an area for future research regarding EM physicians faced with a shortage of hospital beds for admission. Additionally, boarding patients in the ED while waiting for inpatient beds to become available has been an increasing concern among EM residents over the past ten years [22]. The drive for efficiency can also impact patients as some are seen as “bed blockers” or admitted with less diagnostic testing in extreme examples [30, 31]. These previous studies in conjunction with our data point to the need for increased attention to hospital resources, with ED and inpatient beds being critically important to mediate physician stress.

The fourth and fifth most stressful factors in this study related directly to patients. These factors were: working while there are patients waiting to be seen in the waiting room and caring for high acuity patients. This finding relates to a previous study that found a connection between increased workload, as would be seen with a full waiting room and complex patient cases, and burnout [32]. A large percentage of EM physicians experience feelings of depersonalization when working with patients, both as a defense mechanism and due to the nature of EM affecting the ability to form long-term relationships with patients [33]. The high reported stress response to providing care to high acuity patients can also be viewed in conjunction with a previous study that showed that residents who cared for a greater number of patients with trauma had more self-reported near misses in patient care [34]. Caring for complex patients cannot be avoided in EM, but improvements must be made. A possible solution would be to use a tiered approach to increase the number of high acuity patients seen in a shift as residents progress through each year of training. With this approach, residents would still be supported by attending physicians while learning to manage more complex patients, and they would be adequately prepared to work independently following residency.

Many of the factors described above have been shown to cause increased medical errors or near-misses. While this is certainly a concern for patient safety, it is essential to also consider the impact these medical errors have on residents themselves. Second victim syndrome was first described in 2000 and characterizes the negative cognitive, psychological, and physical reactions in health care providers who were part of a serious adverse event. They become the second victim of a medical error, with the patient being the first victim [35, 36].

Various factors intrinsic to an ED shift have been identified as causing increased stress, leading to future avenues of research and possibilities for programs to improve the wellness of their residents. Performing a more comprehensive screen for generalized anxiety disorder in EM residents, with additional information on previous mental health diagnoses of each respondent, would help elucidate whether stressors during residency were the causal factor of any positive anxiety screens or if students with past mental health diagnoses are simply more likely to choose an EM residency.

LIMITATIONS
Despite identifying multiple promising findings useful for improving EM resident stress, some limitations should be noted. First, our results rely on subjective answers inherent in survey-based research. Due to the nature of using an optional survey to collect data, bias may be introduced. For example, residents who chose to respond may have intrinsic differences when compared to the target population of all US EM residents. It was determined that a survey would be used for data collection to include as many EM residents as possible.

Another limitation is the suboptimal response rate achieved in this study. Not utilizing stratification to determine which users were active versus dormant when sending the survey via the EMRA listserv may have contributed to a low response rate. Many residents on the listserv may automatically have emails from EMRA sent to a spam folder or ignored. The overwhelming number of emails and surveys EM residents receive could be another factor affecting this number. Sending the survey out to active EMRA members only would help to achieve a higher response rate.

This survey had a completion rate of 73.9% (835 participants accessed the survey, 617 completed the survey). Some residents did not complete the survey once starting it, possibly due to the length of the survey. Future survey-based research on this topic could be improved by focusing on fewer intrinsic factors. This would achieve a larger completion rate as the survey would be shorter.

The difference in number of male (57.07%) versus female (42.93%) respondents could be due to a variety of factors, including general differences in behaviors regarding surveys and gender disparity in EM residencies across the country [37]. These percentages are similar to results from a study in 2017 which found that out of 143 residency programs analyzed, 38% of residents were female [38].

Although non-ED related stress factors such as issues with family, financial stress, and overall health status are outside the
scope of the current study, these factors could influence general anxiety and stress level of residents. Future studies incorporating this information are warranted.

CONCLUSION

The results of this survey demonstrate the high prevalence of stress and anxiety among US EM residents and the specific intrinsic factors of a shift, particularly interpersonal concerns and resource scarcity, that contribute to this. Female residents reported a significantly higher score on the Generalized Anxiety Disorder-7 assessment and reported higher stress response scores to several intrinsic shift factors compared to male residents, suggesting a need to consider gender when addressing anxiety in EM residents. As many risk factors for anxiety and burnout are intrinsic to medicine and the speciality of EM in particular, the topic of EM resident wellness should receive further exploration to provide programs with data to realistically address this issue in their own departments.

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