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ORIGINAL RESEARCH

What Makes Anesthesiology Residency So Stressful? A 30-Day Snapshot

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Introduction

Stress encountered during residency features heavily in research on burnout, posttraumatic stress disorder, and suicide risk among trainee physicians.^{1,2} Most research on stress in residency reviews the combined stresses of training, workload, and nonclinical responsibilities, often using scoring systems such as the Maslach Burnout Index.3 A more thorough understanding of specific types of stressful events during medical training could present an opportunity to explore the impacts of these events on long-term physician well-being and to design interventions to lessen the frequency and negative consequences of stressful events.

Among anesthesiologists, a notable contributor to stress and distress is experiencing adverse clinical events.^{4,5} The American Society of Anesthesiologists' (ASA) statement in 2022 described these issues, emphasizing the importance of peer support.6 Unsurprisingly, the experience of a clinical catastrophe is typical during a career in anesthesiology, and many anesthesiologists still think about such events years later with long-lasting impacts including guilt and questioning one's career choice.7 Qualitative studies and personal accounts describe isolation, changing environments, and faculty conflict as key stressors during residency.8-11 However, literature on anesthesiology training offers few concrete examples of how residents define their experience of stressful events

in the context of their daily training. Event classification systems typically focus on either clinical outcome for the patient,7 or psychosocial outcomes for the physician.¹² A stressful event severity categorization system to systematically identify potential stressful event exposures is lacking in its ability to simply describe the types of events that are stressful. Whereas it does not itself identify exposures, such a tool can support researchers and residency leaders in understanding the types of events residents find stressful and how frequently those types occur. This, in turn, can inform the design of educational programs and support interventions though it is not intended to directly reduce the emotional impact of events. To that end, this study aims to discover and analyze stressful events through the lens of residents. Using real-life examples, our goal is the identification of type, frequency, and intensity of stressful events:

- Study aim 1: Sample anesthesiology residents' experiences of self-identified stressful events in the operating room.
- Study aim 2: Develop a categorization system to classify the severity of each event.
- Study aim 3: Describe themes of perceived stressful events, using thematic analysis.

MATERIALS AND METHODS

This cross-sectional survey-based study was conducted at a large anesthesiology

residency program with all 96 clinical anesthesia residents in postgraduate years 2-4. (See Figure 1 for overall organization of study.) Reporting of this study adheres to the Strengthening the Reporting of Observational Studies in Epidemiology guideline and was deemed exempt from further review by the University of Michigan Institutional Review Board. The survey questions were selected by the authors to achieve the study aims, and there was no pilot of the survey. To achieve study aim 1, examples of stressful events were collected through a volunteer survey of all clinical anesthesiology residents at a single program between the fall of 2018 and the spring of 2019. Residents were invited to take part by faculty (EMP and LZ) via an email from an administrator. They were offered an electronic link to the online survey using Qualtrics (https:// www.qualtrics.com, Qualtrics, Utah). Nonresponders were contacted 1 further time via email; following this, any remaining nonresponders were mailed a paper copy of the survey. The survey was anonymous, but a unique number, assigned by an administrator and not visible to the study team, was applied to each survey to enable follow-up of nonresponders.

The survey comprised 2 questions about a stressful situation or mistake in the past 30 days. Questions were intentionally broad to capture examples of each resident's perceived stress:

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- 1. Have you experienced a traumatic event in the operating room or other minor mistakes that have caused stress? Answer options: yes/no/maybe.
- 2. Briefly describe one of these stressful situations. Answer options: free text space.

Study aim 2 was to develop an event categorization system that provided a standardized method for assessing the potential emotional impact of the events described by the survey participants. To accomplish this, we developed a standardized classification system to rate the severity of each event (see Figure 1 for details and timeline). We used a panel of practicing anesthesiologists and residents and a modified Delphi method as described by Hsu and Sandford13 to systematically review and categorize each event, aiming to reach a consensus on the perceived stressfulness of these situations. Although individual stress responses vary based on personal factors such as history and interpersonal dynamics as well as level of experience, this process sought to create a standardized understanding of how most clinicians might experience similar situations. The panel comprised 6 faculty and 5 resident anesthesiologists, not including any of the authors, and none of the residents on the panel took part in the survey as results were analyzed after all those who were surveyed had graduated. These 11 panelists were a convenience sample of clinicians who practiced within the culture studied and, thus, were familiar with the subtle balance of interpersonal and clinical stresses of the role as well as the culture of the institution. This panel was charged with individually reviewing all examples collected and devising their own categorization system for how stressful each example was. Systems at this stage varied from numeric scales to descriptive categories. Two authors (EMP and SH) used a collaborative inductive categorization process. They reviewed all categorization systems suggested by the panelists and proposed a single system (comprising 5 initial categories: none, mild, moderate, severe, fatal). This was shared with the panel for review (completing round 1). Once reviewed by the panel, the following 4

final categories: mild, moderate, severe, and catastrophic were distilled with consensus on the category definitions for the Stress Objectivity Scale (SOS) being reached (completing round 2). These definitions comprised the following: mild indicated a routine case with some stressful factors, a complication without patient harm, a routine interaction; moderate indicated a clinical event without actual patient harm but potential for a poor outcome, such as a close call, or a major case or a sick or unstable patient (such as ASA3 or 4) case causing nerves or anxiety, or a micro or macro aggression; severe indicated a lifethreatening clinical event with or without a poor patient outcome or a distressing interpersonal interaction; and catastrophic indicated a life-threatening clinical event with a poor patient outcome and personal impact. See Table 1 for examples.

A subset of authors (EMP, LRR, LZ, SH) then applied the SOS back to categorize the residents' original examples until consensus on classification of these was reached. There were 4 disagreements on categorization; these were settled by a vote, and the majority categorization was selected. Finally, the original panel then reviewed all classifications to determine if any modifications to categorizations were needed (completing round 3). Only minor grammatical corrections were made.

In line with study aim 3, the authors sought to discern the themes in the examples the residents gave using a focused ethnography technique.14 This qualitative methodology is used when a special topic within a particular participant group is being studied; in this case, focusing on residents' experiences with stressful events. Thematic content analysis used an inductive approach to allow identification of primary themes that emerged from the data rather than relying on preidentified themes or codes. Two authors (EMP and KJS) reviewed each resident example separately and created their own initial codes using Microsoft Excel (Microsoft 365 Apps). Authors developed their own themes based on the initial codes. The 2 authors compared codes and themes in a series of meetings. By incorporating new observations and discussions with a third team member (LZ), the codes and themes were refined. All 3 authors debated and resolved disagreements until consensus was reached, and the final themes were identified. See Table 2. Relevant consolidated criteria for reporting qualitative research standards were incorporated in the reporting of the study results.¹⁵

RESULTS

For study aim 1, descriptions of stressful events were collected. The survey was sent to 96 residents, and 87/96 (91%) residents completed or partially completed the survey. Seventy-two (83%) reported yes to having experienced a stressful event in the past 30 days, and 44 gave examples. Three were excluded due to either illegible or uncategorizable free text (eg, "it's private"). For study aim 2, examples were used to develop the SOS classification system (see Table 1) using the modified Delphi process described above and in Figure 1. The 4 categories agreed upon in this new system were as follows: mild events include routine cases or complications without patient harm; moderate events include close call events, challenging cases, or microaggressions; severe events involve life-threatening events or distressing interactions; and catastrophic events involve life-threatening situations with poor patient outcomes and personal impact on the resident. Residents' examples were then classified using the SOS; see Table 3.

THEMATIC ANALYSIS

In Table 2, we include the thematic analysis of the residents' perceived stressful events from the open-ended questions. Table 4 presents the frequency with which each qualitative theme appeared across the 4 levels of severity as defined by the SOS. This cross-tabulation illustrates how certain themes, such as clinical complications and colleague conflicts, were more commonly associated with higher SOS severity levels, whereas themes such as positive coping and vulnerability/self-criticism were more frequently associated with lower severity events.

Whereas some residents in our study wrote straightforward accounts of their stressful experiences in the perioperative setting, others conveyed the emotional impact these incidents had on them. We categorized residents' description

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of stressful events under the theme of vulnerability and self-criticism when terms such as "frustrating" and "embarrassing" were used. One resident's detailed account of a stressful situation in which a patient's blood pressure and oxygen saturation dropped after the attending left exemplifies this theme by highlighting the resident's sense of vulnerability.

Many of the residents' examples focused on either colleague interactions or clinical complications, ranging from minor events, such as hematomas, to more significant adverse outcomes, such as the acute need for extracorporeal membrane oxygenation or patient death. Nine examples specifically described or mentioned patient death or patient coding (cardiac arrest). Conflicts colleagues, particularly involving surgeons or supervising faculty, were also sources of stress. These conflicts included disagreements about patient management ("arguing with surgeon about blood pressure"), perceived difficulties with workflow, and experiences of being yelled at or gossiped about. Many events involved hierarchy, and some pertained to the residents' immediate supervising anesthesiologists. Positive coping mechanisms, such as consciously stopping negative self-talk about the stressful event, were also reported.

Discussion

This study fulfilled the aims by collecting examples of stressful events from anesthesiology residents, developing a categorization system for these, and using thematic analysis to present common themes. Most resident physicians in our anesthesiology training program reported experiencing a stressful event in the prior 30 days, half gave case details, and almost half of these were categorized by the SOS as severe or catastrophic; 9 examples included patient death, which has potential for longer term impact on resident well-being. ^{12,16}

Although the impact on anesthesiology trainees of negative patient outcomes and adverse events, including death, has been described in the literature, it is typically in personal experience essays and editorials.^{17,18} Overall, there is a lack of research on specific event features.

Thus, the second aim of this study, to classify stressful events, achieved an initial categorization system, the SOS, which was used to identify such events by type and frequency. Outside of the scope of this study, a longer term goal is to enhance awareness and understanding of how such events might influence clinical learning and practice and their potential cumulative impact over time. Proactive interventions that contextualize stressful events and address the associated negative emotional outcomes on well-being, including the recent welcome inclusion of well-being into the anesthesiology professional milestones, could be expanded to integrate intentional exploration of professional stress.19 If experienced providers are able to identify what is stressful in early training and then share how they learned to cope with both "minor" mistakes (often deeply shaming in early training) through catastrophic events (such as patient death), this could unlock a new rich dimension of resiliency teaching.

Regarding the final study aim, the exploration of common themes in this study using qualitative analysis revealed meaningful information about how residents perceive specific events, including some that may be expected or common occurrences in an anesthesiology career. We suspect that experienced providers somewhat normalize common events and can apply adaptive coping strategies, acquired over time, to avoid becoming overwhelmed by human suffering inevitable in clinical work. Coping with stress in an emotionally healthy way is the hallmark of a successful clinical career.20 However, it may be at the expense of forgetting the first time; normal for you is not normal for them. Viewing the interpretation of events through the emotional lens of the residents in this way gives a unique perspective. It prompts us to consider the importance of taking time to review events rather than dismissing or minimizing their impact. The SOS tool may assist with creating a shared language and understanding of stressful events, thereby offering new opportunities for both residents and experienced providers to recognize and discuss these events. A commitment to discussing stressful events directly with residents can benefit training and experienced providers alike by reinforcing positive coping skills, colleague connection, and reflection on challenges, thereby promoting growth and insight.²¹ But it cannot be one-sided; residents are already encouraged to seek support following stressful encounters, and they should be empowered to advocate for and initiate postevent debriefing. It is noteworthy that, although there was a preponderance of negative examples, some residents showed an awareness of positive components to stressful events providing meaningful depth and nuance to these experiences and revealing opportunities to emphasize effective coping skills and professional growth.

Limitations to this study include the administration of the survey at a single point in time at a single institution, its reliance on self-reporting, and a lack of corroboration of events. This narrow data set limits the robustness of the SOS categorization system and thematic analysis. To preserve participant anonymity, residents' given examples were analyzed without context or experience level, and events were not corroborated with the medical chart or others' accounts; thus, attributing any given example to a particular category may not reflect its true emotional impact. It is quite possible that the events reported by a junior resident would not have been seen as stressful or reported by a more experienced resident. Despite a strong response rate to the survey, only about half of the residents provided examples; although anonymity and confidentiality were emphasized, applying the unique identifier for followup may have impacted disclosure. Additionally, the phrasing of the question limited thinking to the operating room and may have limited the number of examples residents felt they should share.

In our future research, we hope to establish whether impactful events are as common as this work suggests. We plan to validate our new system of stressful event categorization using a broader sample of examples from other institutions. Future research could quantify the frequency of these categories of stressors over longer periods of training and hopefully lead to the prioritization of impact mitigation. Our long-term goal is to create proactive interventions for individuals facing events likely to have negative emotional outcomes.

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Abstract

Background: Research suggests stress in residency is increasing with burnout and maladaptive coping strategies contributing to negative psychosocial outcomes. However, details on how residents define their experience of stressful events in the context of their daily training are lacking.

Methods: Using a cross-sectional survey design, all clinical anesthesia residents in a large academic program were asked for a stressful event example experienced in the operating room over the past 30 days. Responses were reviewed by a panel, who developed a stress categorization system using a 3-round modified Delphi process. The finalized system was then applied to classify these stressful events reported by the residents. Additionally, thematic analysis was conducted to analyze the examples and identify themes.

Results: Seventy-two of the 96 residents surveyed (83%) reported experiencing a stressful event in the past 30 days. Forty-four residents provided examples, 41 of which were legible and categorizable. A stress categorization system was developed (the Stress Objectivity Scale), comprising 4 categories: *mild, moderate, severe, catastrophic.* Applying this system to the residents' examples, 1/41 (2%) were *mild,* 21/41 (51%) were *moderate,* 11/41 (27%) were *severe,* and 8/41 (20%) were *catastrophic.* Thematic analysis identified several key themes including trainee vulnerability, clinical complications, colleague conflicts, and positive coping strategies.

Conclusion: This research contributes to the limited literature on what constitutes a stressful event in anesthesiology residency by providing concrete examples and developing a severity-based classification system. The findings revealed a relatively high incidence of severe and catastrophic events within a 30-day period. Future research will focus on determining the impact of stressors over longer periods of training and on interventions designed to lessen negative consequences.

Keywords: Burnout, resiliency, stress, training, wellness

Figure

Figure 1. Modified Delphi process used to create a categorization system for stressful events.

Data collection Survey conducted of all clinical anesthesia residents in the program^a Fall 2018 - Spring 2019

Completed online with Qualtrics / paper follow-up (x2 opportunities) for non-responders



Categorization Development Spring 2023

Communication via email, video conferencing, and direct communication

- Selection of Panel: representatives from both residency and faculty.
- Resident survey of "stressful situation" examples shared anonymously with panel members.
- ROUND 1: Panel member independently categorized each example.
- Any grading method / language / system was allowed.
 - Examples included: 1-10 numeric scales; free text descriptors such as: "disturbing" or "every day;" and quantifying descriptors, such as: "minor, somewhat, severe."
- Categorizations reviewed by authors (EMP & SH).
- A single categorization system distilled, comprising the following categories: None, Mild, Moderate, Severe, Fatal. System shared back with all panel members for review.
- **ROUND 2:** Final categorization system: the Stress Objectivity Scale (SOS) agreed by panel:
 - Mild
 - Moderate
 - Severe
 - Catastrophic
- · Definitions of categories refined, and consensus reached on categories for SOS. See Table 1.



Classification using SOS and check back Summer / Fall 2023

Communication via email, video conferencing and direct communication

- Author subgroup (EMP, SH, LRR and LZ) classified each resident's original examples of "stressful situations" using the SOS.
- **ROUND 3:** Original Panel members performed final review and reached consensus on the classification of these examples.

^a Cheng A, Kessler D, Mackinnon R, et al. Reporting guidelines for health care simulation research: extensions to the CONSORT and STROBE statements. *Adv Simul*. 2016;1(1):1-13

Tables

Table 1. The Stress Objectivity Scale: A New System for Categorizing Stressful Events

Classification	Definition	Example	
Mild	A routine case with some stressful factors, a	An awake craniotomy	
	complication without patient harm, a routine interaction	Near miss drug dose error	
		Working with certain clinicians	
Moderate	A clinical event without actual patient harm but	Wrong drug given in the OR	
	potential for poor outcome, such as a close call or a major case or a sick or unstable patient (such as ASA3 or 4) case causing nerves or anxiety, or a micro or macro aggression	Severe bronchospasm at induction	
		A Stat GA caesarean section	
		Arguing with surgeon about blood	
		pressure	
Severe	A life-threatening clinical event with or without a poor patient outcome or a distressing interpersonal	Severe hypotension unresponsive to treatment	
	interaction	Code in the OR	
		Surgeons behaving aggressively	
		Overhearing one's own case gossiped about	
Catastrophic	A life-threatening clinical event with a poor patient	Crashing a 3-day-old onto ECMO	
	outcome and personal impact	A long slow code in the ICU where we were basically coding a dead patient	
		Patient vomited and aspirated and had to go to PICU—I felt it was my fault	

Abbreviations: ASA, American Society of Anesthesiologists (physical status classification); ECMO, extra corporeal membrane oxygenation; GA, general anesthesia; ICU, intensive care unit; OR, operating room, PICU, pediatric intensive care unit.

Tables continued

Table 2. Thematic Content Analysis of Residents' Examples of a Stressful Situation in the Past 30 Days

Theme	Verbatim Examples		
Vulnerability/self-criticism	"[I was] taking over a case, as soon as the attending and other resident leave, the patient's BP drops to \sim 70/30. I tried all the usual things without improvement, and meanwhile SpO $_2$ dropped to 88 or 87%. I called for staff to come urgently but no one came. I finally got the pressure up as staff arrived after 2nd page."		
	"I recently had a syringe swap. Very frustrating, embarrassing, and easy to be mad at myself."		
Clinical complication	"Wet tap"		
	"IV hematoma"		
Subcategories:			
Significant adverse outcome	"Crashing a 3-day old onto ECMO"		
Patient death	"Coding patient"		
	"Patients died on cardiac ICU every week last month"		
Colleague conflicts	"[A faculty] yelled at me in the room and gossiped about me with another faculty"		
	"[That day there was] a difficulty with workflowa lot of stress came from the supervising attending. No major mistakes or poor outcomes resulted, but I felt negatively about my routine skills"		
	"Arguing with surgeon about blood pressure"		
Positive coping	"Ijust remember thinking to stop any negative self-talk"		

Abbreviations: BP, blood pressure; ECMO, extra corporeal membrane oxygenation; ICU, intensive care unit; SpO_2 = oxygen saturation of peripheral blood using photoplethysmography; Wet tap = spinal tap.

Tables continued

Table 3. Application of the SOS Using Residents' Examples

Severity		$N = 41^a$	%
1	<i>Mild</i> , such as a routine case with some stressful factors; a complication without patient harm; a routine interaction	1	2
2	Moderate, such as a clinical event without actual patient harm but potential for poor outcome, such as a close call, or a major case or a sick or unstable patient (such as ASA3 or 4) case causing nerves or anxiety, or a micro or macro aggression	21	51
3	Severe, such as a life-threatening clinical event with or without a poor patient outcome or a distressing interpersonal interaction	11	27
4	Catastrophic, such as a life-threatening clinical event with a poor patient outcome and personal impact	8	20

 $^{^{\}mathrm{a}}$ Forty-four residents shared a free text example. Of these, 41 were legible and/or categorizable responses.

 Table 4. Frequency of Theme Demonstration by Stress Objectivity Scale Categorization

Themes	Stress Objectivity Scale			
Themes	Mild	Moderate	Severe	Catastrophic
Positive coping	2	_	_	_
Mistakes	1	2	3	_
Vulnerability/Self-criticism	3	_	_	_
Colleague conflicts	1	4	4	_
Clinical complication	5	5	9	13