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ORIGINAL RESEARCH

Assessing the Impact of Powerful Experiences During Anesthesia Residency Training

JED T. WOLPAW, MD, MEd
LAUREN SCHER, MD

SARAH SMITH, MD
SEAN BERENHOLTZ, MD, MHS

SCOTT WRIGHT, MD
LAUREN E. BENISHEK, PhD

Residency training is emotionally intense; there are daily challenges that are sometimes distressing, other times rewarding. The Accreditation Council for Graduate Medical Education (ACGME) now requires residency programs to focus on and promote resident well-being.¹ Throughout the course of their training, trainees are faced with powerful experiences (formative events) that have deep emotional significance. The ability of residency programs to anticipate and recognize these events will, to some extent, determine their capacity to support and foster the well-being of their trainees. More needs to be known about the specific events that may translate into professional growth and identity formation among trainees. Experiences that are distressing or disappointing also need to be understood so that training programs can offer support to minimize frustration and burnout, which plagues up to 56% of physician trainees.²

Murinson et al³ showed that it is possible to identify key formative events that affect the emotional development of medical students, but this work has not been replicated in a cohort of residents. Anesthesia residency training may be especially stressful in that trainees are widely dispersed in their clinical assignments and thus the residents are isolated when intense experiences happen. The objectives of this study were to determine which specific formative events have the greatest impact on anesthesia residents, how frequently they occur, and what relative degree of impact

they have on trainees' sense of well-being. This work can lay the foundation for future research into the effect of these events on well-being and how residency training programs can support the well-being and professional development of trainees.

METHODS

Participants and Setting

All 80 clinical anesthesia (CA) residents enrolled in the 3 cohorts (nCA1 = 27, nCA2 = 29, nCA3 = 24) at Johns Hopkins Hospital in Baltimore, MD, were invited to participate in the survey in April 2017. Respondents were informed that submission of their survey responses would indicate their consent to participate. The Johns Hopkins University Institutional Review Board approved this project (IRB00113851).

Instrument Development and Data Collection

The project survey was created and revised multiple times between June and August of 2016. We began by reviewing recent publications about clinician well-being, consulting with experts in medical education, conducting semi-structured interviews with recent graduates from our anesthesia residency program, and hosting 2 focus groups with a combined total of 12 current anesthesia residents. Interview and focus group participants were asked open-ended questions about the experiences in residency that impact their personal well-being. Two example prompts from the interview guide were:

“Can you tell me about an event that has happened to you during your residency that really sticks out to you? Why was it so impactful?” and “Are there any highly impactful events (whether positive or negative) that you think are common to the resident experience?” Other prompts explored themes related to dignity and respect, recognition for their contributions at work, and experiencing meaning while on the job. Using an inductive approach, we extracted from these data sources more than 50 events that might affect personal well-being while in residency. We refined our initial list by removing duplicates, thematically organizing the remaining items, and selecting 24 representative events to be included in the final survey. We vetted these items with subject matter experts (ie, recent graduates and educators) to support construct and face validity. Following the final selection, each event was classified as either positive (n = 13) or negative (n = 11) by 2 authors independently (JW, LEB); agreement was absolute.

Survey respondents rated each event on 2 separate scales designed to assess frequency of exposure to the event and perceived impact on well-being. Frequency of exposure was assessed using a 6-point scale. Response options included: (1) I have not experienced this event; and I have experienced this event (2) less than annually; (3) a few times per year; (4) a few times per month, (5) a few times per week; and (6) every day. Perceived impact of each event was measured using a scale adapted from

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Murinson and colleagues.³ Each item had 6 response options that characterized exposure (at any time during residency) and its perceived impact on well-being: (1) I have not experienced this event; and the event had (2) no impact; (3) a little impact; (4) moderate impact; (5) a lot of impact; and (6) tremendous impact on my well-being.

Prospective participants were recruited via email and offered a small monetary incentive. An individualized survey link directed participants to the 24-item survey hosted on Qualtrics (Provo, Utah), an online data collection software platform. Respondents were assured of confidentiality and that data would be reported in aggregate.

Data Analysis

Characteristics of the respondents were analyzed as means and proportions. The event exposure rate was calculated as the percentage of respondents choosing exposure ratings other than *not experienced*. Frequency of exposure was calculated as the percentage of respondents selecting each response option.

Impact was evaluated in 2 ways. First, as the proportion of respondents rating the events as having no impact. Second, a relative impact (RI) score was calculated. The RI score, as described by Murinson et al,³ is used to consider both the *frequency* of the exposure and the *impact*. For this analysis, numerical values were assigned to each response option as follows: 0 = no impact, 1 = a little impact, 2 = moderate impact, 3 = a lot of impact, and 4 = tremendous impact. The sum of these values for each event was then divided by the total number of events experienced. The numerical values for each event were then scaled to 100 by multiplying the result by 25.

We conducted an independent groups *t* test to compare the difference in relative impact scores between positive and negative events. We performed additional independent groups *t* test analyses to compare perceived impact of each event by gender. All analyses were explored using IBM SPSS v24 (IBM Corp, Armonk, NY). Results were considered statistically significant at $P \leq .05$.

RESULTS

Of the 80 residents in the anesthesiology program, 76 (95%) completed the questionnaire. Respondents were 42.1% female, 53.9% white, and averaged 31 years old (Table 1). Approximately half (52.6%) were partnered, and 14.4% had at least 1 child. Respondents were relatively evenly divided among residents in CA years 1 (32.9%), 2 (28.9%), and 3 (25.0%).

Table 2 reports exposure rate (ie, respondents' experience of the event at least once) stratified by gender, the percentage of respondents who experienced each event at least weekly, the percentage of respondents who experienced each event without it impacting their well-being, and the RI score for each event stratified by gender.

Exposure to Formative Events

Overall, exposure rate ranged from 56.6% to 100%. Four events had exposure rates of 100%, and 9 others had exposure rates above 90%. Of the 4 events with 100% exposure rate, 3 were positively valenced. These included being praised by a faculty member for doing a good job (64.5% at least weekly), receiving expressions of gratitude from colleagues (26.3% experienced at least weekly), and leaving work earlier than expected (12.0% experienced at least weekly). The negative event of being assigned an extra case unexpectedly was also experienced by all respondents, with 46.0% experiencing this at least weekly.

Other frequently experienced events include being given responsibility to make critical decisions (60.6% experienced at least weekly), receiving genuine gratitude from a patient (36.9% experienced at least weekly), and being treated more like a resource than a person (35.5% experienced at least weekly).

Impact of Formative Events

Overall, RI ranged from 44.5 to 85.8 out of 100. There was no statistically significant difference noted in RI between positive or negative events ($M_{\text{positive}} = 69.63$ vs $M_{\text{negative}} = 64.02$, $t(22) = 1.67$, $P = .11$). RI does not have an obvious relationship with event exposure; of the top 4 most impactful events, only 1 event (leaving work earlier than expected) had an exposure rate of 100%, and *experiencing a patient death*

had the lowest exposure rate (56.6%) of all 24 items.

Sixteen events had at least one trainee who had the experience and rated it as having *no impact* on their well-being. (Table 2) However, the proportions of respondents experiencing an event without impact were small ($\leq 5\%$ of respondents). Two exceptions were having a surgeon throw things or yell in the operating room (10.0%), and having my attending leave for the day without checking in with me (9.4%).

Impact by gender. RI ranged from 48.1 to 88.7 for females and 38.9 to 79.8 for males. (Table 2) Event frequencies based on RI were similar, but not identical, across males and females. Leaving work earlier than expected was the most impactful event for both males and females ($RI_{\text{female}} = 88.7$ vs $RI_{\text{male}} = 79.8$). However, although a patient expressing gratitude ($RI_{\text{female}} = 80.5$ vs $RI_{\text{male}} = 79.2$) and identifying a faculty role model ($RI_{\text{female}} = 78.2$ vs $RI_{\text{male}} = 72.6$) are among the top most impactful events for both, they rank differently. Among males, they rank second and fifth respectively, as compared to third and fourth for women.

The perceived impact of events on personal well-being varied by gender. (Table 2) Males and females differed significantly in their perceived impact for 4 of the 24 events: Being treated more like a resource than a person ($M_{\text{female}} = 2.87$ vs $M_{\text{male}} = 2.16$, $t(60) = -2.85$, $P < .01$); Having a chance to hear about mistakes made by other residents ($M_{\text{female}} = 2.81$ vs $M_{\text{male}} = 2.27$, $t(59) = 2.67$, $P = .01$); Having an opportunity to discuss a mistake I have made with someone I trust without fear of retaliation ($M_{\text{female}} = 2.97$ vs $M_{\text{male}} = 2.40$, $t(57) = 2.23$, $P = .03$); Learning that others have spoken negatively about me behind my back ($M_{\text{female}} = 3.25$ vs $M_{\text{male}} = 2.5$, $t(38) = 2.19$, $P = .04$). In addition, there was a nonsignificant trend in the perceived impact for an additional 4 events: Having a surgeon throw things or yell in anger in the OR (operating room) ($P = .06$); Leaving work at an earlier than expected hour so that I am not too tired to engage in self-care or other fulfilling activities ($P = .07$); Seeing my attending doesn't stand up for

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me when the surgeon blames me for something that happened ($P = .09$); and Being praised by a faculty member for doing a good job with a case we had together ($P = .09$).

DISCUSSION

The objectives of this project were to identify formative events experienced by anesthesia residents and to assess their frequency and perceived impact on personal well-being. All 24 events surveyed were experienced by the majority of residents and most were judged to have at least moderate impact on their well-being. Our findings are consistent with prior studies suggesting that autonomy, positive feedback, time away from work, and positive relationships with colleagues are valued among medical trainees.⁴⁻⁸

As the ACGME mandates that residency programs proactively support wellness,¹ a few findings may illustrate avenues worth exploring. First, there was no statistically significant difference in relative impact between positive and negative events. This suggests that both types of events contribute to the well-being and professional development of anesthesia residents; none of these experiences should be overlooked. By providing support (eg, discussing mistakes in a safe space; meeting with a respected mentor), affirmation (eg, praise from attendings; gratitude from patients), agency (eg, responsibility for care decisions), renewal (eg, leaving work early; engaging in self-care), and sufficient challenge (eg, publishing, teaching, working on interesting cases), positive events help cultivate a meaningful, engaging, and invigorating learning environment. Furthermore, many negative events are unavoidable (eg workflow disruptions), and some can be invaluable for learning (eg, a patient death); when these are handled appropriately, these experiences can enhance residents' professional skills and hone resilience.⁹ Second, our findings suggest that women may feel the effects of formative events more strongly than men. These patterns are significant with events that present opportunities to learn from experience (eg, mistakes made by themselves or others) or expose them to dehumanizing (eg, being treated like a resource) or dis-

courteous (eg, being the subject of gossip) behavior. Residency program leadership should consider these findings so as to understand that males and females interpret and make sense of powerful experiences differently. Finally, residency program leadership may use a survey like ours to identify events on which to focus wellness interventions tailored to the particular needs of their residents.

Several limitations of this project should be considered. First, data were sourced from a single program at a single institution, limiting generalizability to other anesthesia programs and other specialties with significantly different cultures, resources, and system processes that may identify a different set of formative events. For example, our institution provides 24/7 access to a response team that will debrief providers after stressful events that may not be available elsewhere. Second, it is possible our set of events is nonexhaustive and does not fully capture the complete range of anesthesia experiences, and we did not offer respondents an opportunity to report formative events excluded from our list. Third, response biases such as recall and social desirability may factor into our results. Residents may have difficulty recalling past experiences (especially those with low impact) and impact perceptions may have changed over time. Biases that encourage socially desirable responding may contribute to gender differences. Fourth, differences in experience based on race could not be evaluated because of insufficient numbers of racially diverse residents. Finally, we did not measure well-being directly and so are unable to draw explicit conclusions regarding the actual impact of these events on resident wellness.

We suggest 3 major directions for future research. First, exploration of the differences between male and female work views to more fully understand their response to and impact of formative events. Second, examination of the direct relationship between these formative events and well-being. Third, identification and evaluation of specific interventions focused on increasing the frequency of positive formative events, limiting exposure to negative formative events, and providing adaptive support when unwanted events

transpire. Such interventions could assist with professional identity formation and serve to enhance residents' well-being.

CONCLUSIONS

This is the first project to identify formative events experienced by anesthesia residents and measure their frequency and perceived impact. Findings underscore the importance of personal time for renewal (eg, leaving work on time or early), affirmation (eg, expressions of gratitude and praise), high-quality mentoring (eg, respect, support, and guidance from faculty), agency (eg, deciding care plans), intellectual challenge (eg, publishing), and adaptive responses to negative events (eg, learning from mistakes; addressing psychological needs following a patient death). The results of this work may provide residency program leaders with direction on identifying and prioritizing interventions aimed at improving resident wellness by improving their residency experience.

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The following authors are at Johns Hopkins Department of Anesthesiology and Critical Care Medicine in Baltimore, MD: **Jed T. Wolpaw** is an Assistant Professor and Residency Program Director; **Lauren Scher** and **Sarah Smith** are Resident Physicians. **Sean Berenholtz** is a Professor in the Johns Hopkins Armstrong Institute for Patient Safety and Quality and in the Department of Anesthesiology and Critical Care Medicine, Johns Hopkins University School of Medicine, Baltimore, MD. **Scott Wright** is a Professor of Medicine at Johns Hopkins University School of Medicine, Baltimore, MD. **Lauren E. Benishek** is an Assistant Professor at the Armstrong Institute for Patient Safety and Quality at Johns Hopkins University, Baltimore, MD.

Corresponding author: Jed T. Wolpaw, Johns Hopkins Department of Anesthesiology and Critical Care Medicine, 1800 Orleans Street, Zayed 6222, Baltimore, MD 21287. Telephone (410) 955-9942, Fax (410) 955-9149

Email address: Jed T. Wolpaw: jwolpaw@jhmi.edu

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Abstract

Background: Formative events during training help shape professional identity and may impact well-being. This study sought to identify formative experiences during anesthesia residency and measure their perceived impact on well-being.

Methods: A 24-item survey exploring the frequency and perceived impact of formative events was developed through a rigorous process involving a literature search, consultation with medical education experts, resident focus groups, graduate interviews, and pilot testing. All 80 anesthesiology residents at Johns Hopkins University were invited to participate. We measured the frequency of event exposure and perceived impact on well-being.

Results: Seventy-six residents (95%) completed the survey. Event exposure rate ranged from 56.6% to 100%. Events with greatest relative impact (RI) overall included leaving work earlier than expected (RI_{overall} = 85.8), a patient expresses genuine gratitude (RI_{overall} = 80.2), identifying a faculty role model (RI_{overall} = 75.7), and having a patient die under my care (RI_{overall} = 75.6). There was no statistically significant difference on RI for positive versus negative events. The perceived impact of events on well-being varied by gender.

Conclusions: This work provides clarity for residency program leaders and educators about the commonly experienced formative events that have the greatest perceived impact on resident well-being. These results may inform curricular planning and can suggest times when trainees may need attention or support. Future research should evaluate the direct impact of formative events on well-being and the success of related interventions.

Keywords: Well-being, residency, anesthesia, formative events

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Figures

Table 1. Characteristics of 76 Anesthesiology Residents Who Responded to a Survey on Formative Events During Residency, Johns Hopkins Hospital, 2016-2017

Characteristic	Data
Age in Years, Mean (SD)	31 (2.7)
Gender, no. (%)	
Female	32 (42.1)
Male	33 (43.4)
Unreported	11 (14.5)
Race, no. (%)	
White	41 (53.9)
African American	3 (3.9)
Asian or Pacific Islander	14 (18.4)
Hispanic or Latino	1 (1.3)
Other	3 (3.9)
Unreported	14 (18.4)
Married or Partnered, no. (%)	40 (52.6)
Parent of One or More Children, no. (%)	11 (14.4)
Residency Year, no. (%)	
Clinical Anesthesia Year 1	25 (32.9)
Clinical Anesthesia Year 2	22 (28.9)
Clinical Anesthesia Year 3	19 (25.0)
Unreported	10 (13.2)
Years in Health Care, mean (SD)	7.7 (2.0)

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Table 2. Formative Events Frequency and Impact

Event and Valence (+/-)	Frequency			Impact			
	Exposure Rate (%)		≥ Weekly (%)	No Impact (%)	Relative Impact ^a (0-100)		Sig. ^b
	Female	Male	Overall	Overall	Female	Male	
1. Being praised by a faculty member for doing a good job with a case that we had together that day. (+)	100.0	100.0	64.5	0.0	76.6	68.5	0.09
2. One of my colleagues expresses gratitude for something I have done to help him/her. (+)	100.0	100.0	26.3	0.0	70.3	66.9	0.45
3. Leaving work at an earlier than expected hour so that I am not too tired to engage in self-care or other fulfilling activities. (+)	100.0	100.0	12.0	0.0	88.7	79.8	0.07
4. Being assigned an extra case after finishing my cases. (-)	100.0	100.0	46.0	5.6	69.4	62.9	0.35
5. Being criticized by a faculty member for something I did while we were working together that day. (-)	96.9	100.0	10.5	0.0	67.7	62.9	0.34
6. A patient expresses genuine gratitude to me for the care I have provided them. (+)	100.0	97.0	36.9	0.0	80.5	79.2	0.79
7. Being given the responsibility to make critical decisions that shape the anesthesia care plan. (+)	96.9	100.0	60.6	0.0	76.6	72.6	0.43
8. Being treated more like a resource than a person. (-)	96.9	97.0	35.5	2.8	71.8	54.0	0.01 ^d
9. Identifying a role model faculty member who inspires me. (+)	96.9	100.0	11.8	0.0	78.2	72.6	0.30
10. Having a member of the residency leadership check in with me to ask how I'm doing. (+)	93.8	97.0	7.9	2.9	57.8	56.7	0.86
11. Being blamed for something outside my control. (-)	96.9	93.9	9.2	2.9	66.9	56.9	0.15
12. Having a chance to hear about mistakes made by other residents. (+)	96.9	97.0	12.0	1.5	70.2	56.7	0.01 ^d
13. Having to wait more than an hour after being told that someone is on their way to relieve me for the day. (-)	93.8	93.9	15.8	2.9	70.0	60.3	0.16
14. Teaching a medical student. (+)	87.5	87.9	1.3	4.5	58.0	61.6	0.59

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Table 2 continued. Formative Events Frequency and Impact

Event and Valence (+/-)	Frequency			Impact			
	Exposure Rate (%)		≥ Weekly (%)	No Impact (%)	Relative Impact ^a (0-100)		Sig. ^b
	Female	Male	Overall	Overall	Female	Male	
15. Having an opportunity to discuss a mistake I have made with someone I trust without fear of retaliation. (+)	90.6	97.0	0.0	4.6	74.1	60.0	0.03 ^c
16. Having my attending leave for the day without checking in with me. (-)	84.4	87.9	9.2	9.4	49.1	38.9	0.14
17. Finding that someone has set up my room for me without being asked. (+)	78.1	87.9	1.3	3.3	66.0	55.6	0.12
18. Having a surgeon throw things or yell in anger in the operating room. (-)	87.5	84.8	6.6	10.0	58.9	44.2	0.06
19. Meeting with a respected mentor to have frank and honest discussions about my performance and career. (+)	78.1	87.9	1.3	0.0	72.0	66.7	0.41
20. Getting yelled at for making an honest mistake. (-)	68.8	87.9	2.6	3.4	71.6	60.7	0.13
21. Seeing my attending doesn't stand up for me when the surgeon blames me for something that happened. (-)	71.9	81.8	2.6	1.7	75.0	62.5	0.09
22. Publishing a paper or conference abstract. (+)	65.6	72.7	0.0	2.0	64.3	63.6	0.93
23. Learning that others have spoken negatively about me behind my back. (-)	62.5	63.6	1.3	4.3	81.3	62.5	0.04 ^c
24. Having a patient die under my care. (-)	53.1	57.6	0.0	2.4	76.5	77.8	0.88

^a Relative impact score = estimated impact on students for whom event did occur, calculated by assigning numerical values to the verbal descriptors (0 = "yes, but no impact"; 1 = "a little impact"; 2 = "moderate impact"; 3 = "a lot of impact"; and 4 = "tremendous impact"), summing the values for each event, and dividing by the total number of events experienced. The result was then scaled to 100 by multiplying the result by 25.

^b Statistical significance for independent samples t test comparison of perceived impact by gender.

^c P ≤ .05

^d P ≤ .01

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Supplemental File Survey

Please answer the following questions for each of the events listed below: (1) How often do you experience the event? (2) How much impact did the event have on your personal well-being?

If you have not experienced the event, please indicate so in both columns.

Event	How often do you experience this event?						How much impact did the event have on your personal well-being?					
	I have not experienced this event. (1)	Less than annually (2)	A few times per year (3)	A few times per month (4)	A few times per week (5)	Every day (6)	I have not experienced this event. (1)	Less than annually (2)	A few times per year (3)	A few times per month (4)	A few times per week (5)	Every day (6)
Being praised by a faculty member for doing a good job with a case that we had together that day. (1)												
Being criticized by a faculty member for something I did while we were working together that day. (2)												
A patient expresses genuine gratitude to me for the care I have provided them. (3)												
One of my colleagues expresses gratitude for something I have done to help him/her. (4)												
Meeting with a respected mentor to have frank and honest discussions about my performance and career. (5)												
Having an opportunity to discuss a mistake I have made with someone I trust without fear of retaliation. (6)												
Having a chance to hear about mistakes made by other residents. (7)												
Leaving work at an earlier than expected hour such that I am not too tired to engage in self-care activities or those that are fulfilling. (8)												
Having to wait more than an hour after being told that someone is on their way to relieve me for the day. (9)												
Having a member of the residency leadership check in with me to ask how I'm doing. (10)												

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Supplimental File Survey cont.

Event	How often do you experience this event?						How much impact did the event have on your personal well-being?					
	I have not experienced this event. (1)	Less than annually (2)	A few times per year (3)	A few times per month (4)	A few times per week (5)	Every day (6)	I have not experienced this event. (1)	Less than annually (2)	A few times per year (3)	A few times per month (4)	A few times per week (5)	Every day (6)
Being given the responsibility to make critical decisions that shape the anesthesia care plan. (12)												
Being blamed for something outside my control. (13)												
Getting yelled at for making an honest mistake. (14)												
Having my attending leave for the day without checking in with me. (15)												
Learning that others have spoken negatively about me behind my back. (16)												
Seeing my attending doesn't stand up for me when the surgeon blames me for something that happened. (17)												
Being treated more like a resource than a person. (18)												
Teaching a medical student. (19)												
Publishing a paper or conference abstract. (20)												
Being assigned an extra case after finishing my cases. (21)												
Having a patient die under my care. (22)												
Having a surgeon throws things or yell in anger in the OR. (23)												
Identifying a role model faculty member who inspires me. (24)												