

Original Research Article

The impact of intraoperative adverse events on orthopaedic surgery residents

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ABSTRACT

Background: The goal of this study was to quantify the impact of intraoperative adverse events on orthopaedics residents to better understand how these occurrences affect resident training. Additionally, the study identified the emotional toll of adverse events on trainees and barriers to reporting.

Methods: An anonymous 26 question web-based survey was adapted from the Boston intraoperative adverse events surgeons' attitude study (BISA) survey to be applicable to orthopaedic residents. The survey was sent to orthopaedic residency program coordinators listed in the Council of Orthopaedic Residency Directors (CORD) database. The coordinators then distributed the survey to each program's residents and fellows.

Results: 77 orthopaedic residents and fellows completed the survey. Almost all (84.4%) reported having been involved in an IAE during their training, and the majority (80.6%) experienced emotional distress as a result. 50.7% of respondents have never been involved in discussions with patients or their family regarding a complication during their training.

Conclusions: The majority of residents have experienced emotional distress following an intraoperative adverse event, but residents are not routinely involved in subsequent discussions with patients and families following complications. This represents a significant area for improvement in both supporting and training surgical residents.

Keywords: Intraoperative adverse events, Surgical complications, Second victim, Orthopaedic surgery residency

INTRODUCTION

Adverse events in medicine and surgery have a ripple effect that can be devastating for the patient, family, and providers involved. Intraoperative adverse effects (IAEs) have consistently been shown to worsen patient outcomes; one study demonstrated that patients had a 30-day mortality and morbidity of 6% and 58%, respectively, following an IAE.¹ Recent efforts across medicine have been focused both on improving patient safety and supporting physicians through adverse events in an effort to improve physician wellness and limit burnout. Physicians who have experienced burnout or the emotional ramifications of an IAE have increased rates of

intraoperative errors in subsequent months.² The emotional and psychological stress of a physician after a medical error has been coined the "second victim syndrome", a phenomenon with serious psychological and physiologic consequences.³

Surgeons as a group experience burnout and depression at high rates as related to medical errors. A study designed by the department of general surgery at Massachusetts General Hospital in 2017 demonstrated that 32% of general surgeons had experienced an IAE in the prior 12 months. Of that group, 84% of surgeons had experienced anxiety, guilt, sadness, shame/embarrassment or anger as a result of these events.⁴ This study, referred to as the

Boston intraoperative adverse events surgeons' attitude study (BISA) has been utilized as the impetus for formal peer support groups to help surgeons better manage the ramifications of intraoperative errors.⁵ The majority of literature to date has focused on IAEs in general surgery departments and have not investigated the role of trainees, residents or fellows in these issues.

To our knowledge, there is no published literature investigating rates of IAEs in orthopaedics and their impact on the surgeon in training. A better understanding of IAEs in orthopaedics and overall reporting practices and barriers to discussing adverse events is important for improving patient care, supporting physicians and avoiding burnout, and providing a safer healthcare system.

METHODS

After obtaining institutional review board approval, a cross-sectional survey was designed to be administered to orthopaedic surgery residents in the United States. The survey was adapted from the previously published BISA survey, which was initially created for general surgery attendings.⁴ For the purposes of the survey, an IAE was defined as an inadvertent injury/error that occurred during an operative procedure. Questions were intended to assess the respondent's background, personal experience with IAEs, emotional and psychological response to IAEs, and unique perspective as a resident member of the patient care team. One question was adapted to include an example that was relevant for orthopaedic surgeons (ex. reporting certain IAEs in a high-risk case - intraoperative calcar fracture in a revision arthroplasty - is not necessary).

Three additional questions were added to ask trainees about their experience of adverse events as it relates to residency (e.g. how likely are you to disclose an IAE to the patient and/or the patient's family when you practice independently after training?). The resulting 26-question web-based survey including two open ended questions was disseminated to orthopaedic surgery program coordinators as listed in the Council of Orthopaedic Residency Directors (CORD) database. Program coordinators were asked to send the anonymous, voluntary survey link to their residents and fellows. There was no compensation for completing the survey. Responses were anonymous and deidentified. The survey period was August 2020 through October 2020. A quantitative analysis of the closed-ended questions and a qualitative review of the two open ended questions was performed. Statistics were based on the number of respondents that answered each individual question, as all questions were optional. The survey and statistical analysis were performed in SurveyMonkey (Momentive Inc.; San Mateo, California).

RESULTS

A total of 92 respondents started the survey, 77 completed it through the final question representing a 83.7% completion rate. 86 (94.5%) of the surgeons were between

the ages of 25 and 34 and 64 (70.3%) were male. The majority of respondents (61, 66.3%) reported training in the Midwest, though all regions were represented. Respondents ranged from post graduate year one (17, 18.7%) to post graduate year six (6, 6.6%), with third year residents comprising the largest group of responses (30, 33%). Almost all of the surgeons surveyed planned to complete a subspecialty fellowship (90, 97.8%), with sports and "undecided" being the most common subspecialty selections, both with 18 (19.8%) responses. Demographics are summarized in Table 1.

Table 1: Respondent demographics.

Demographics	N (%)
Gender	
Male	64 (70.3)
Female	27 (29.7)
Age (in years)	
25-34	86 (94.5)
35-44	5 (5.5)
Training year	
PGY1	17 (18.7)
PGY2	7 (7.7)
PGY3	30 (33.0)
PGY4	23 (25.3)
PGY5	8 (8.8)
PGY6	6 (6.6)
Region	
Northeast	6 (6.6)
Southeast	13 (14.3)
Midwest	61 (67.0)
Southwest	3 (3.3)
West	5 (5.5)
Other	3 (3.3)

84.4% (65) of surveyants reported being involved in a surgery that was complicated by an IAE in the prior calendar year. 36 of those residents (46.8%) reported more than one IAE in the prior year. All but 14 residents (19.4%) reported some emotional difficulty following the IAE, with more than half of the respondents endorsing both anxiety (46, 63.9%) and guilt (39, 54.2%). Emotional response to events is summarized in Table 2.

Residents reported that colleagues and family members were the most helpful sources of support following a complication, and 72.2% of trainees (52) indicated seeking emotional support in this context. While residents on average reported a 92.1% likelihood of disclosing an IAE to a patient and/or their family when practicing independently, they estimated that only 66.3% of the IAEs at their institution are reported in any formal matter. Fear of liability or litigation, risk of damage to professional reputation, and absence of clear definition of a complication were cited as the most common barriers perceived to reporting an IAE. One half of respondents (39, 50.7%) have never been involved in discussions with

patients or their family regarding a complication during their training.

Table 2: Response to adverse events.

Response to events	N (%)
Number of IAE in the past year	
None	17 (22.1)
One	24 (31.2)
Two	21 (27.3)
Three	9 (11.7)
Four	2 (2.6)
Five or more	4 (5.19)
Emotional response	
Sadness	31 (43.1)
Anxiety	46 (63.9)
Anger	11 (15.3)
Guilt	39 (54.2)
Shame/embarrassment	31 (43.1)
None	14 (19.4)

Table 3: Barriers to reporting events.

Perceived barriers to reporting events	N (%)
Fear of liability/legal consequences	38 (58.5)
Lack of consistent reporting system	30 (46.2)
Professional reputation	36 (55.4)
Lack of time	24 (36.9)
No clear benefit	20 (30.8)
Process unclear	25 (38.5)
Absence of clear definition an IAE	31 (49.23)
Expectation that another provider will	31 (47.7)
Other	4 (6.2)

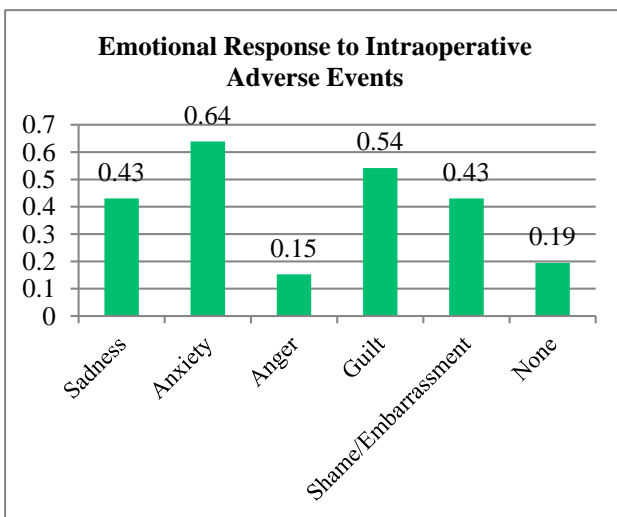


Figure 1: Emotional response to intraoperative adverse events.

Several residents responded to the open-ended questions and noted that residents should be included in discussions about IAEs, including in department wide conferences like

morbidity and mortality discussions. One resident suggested a, “more collaborative or team-based discussion during M&M”. Another suggested a, “standardized system of debriefing after an IAE”. Lastly, in regards to residents being left out of discussions about complications, one resident wrote “I think trainees are ignored in this process. The patients and the attendings are seen as ‘victims’, but these events can be extremely upsetting to the residents involved, too.”

DISCUSSION

Our study demonstrated that almost all residents (84.4%) have been involved in an IAE during their training, and the large majority (80.6%) experienced some amount of emotional distress after. Several studies highlighting physician wellness have associated burnout with medical errors, including errors that involve residents.⁶⁻⁸ This idea is not new, however very few studies have looked at resident response to complications, and none look at orthopaedic residents specifically. A 2015 qualitative survey of 23 surgical residents determined that the perception of emotional vulnerability as a weakness is a barrier to residents both reporting IAEs and seeking support afterwards.⁹ Additionally, residents in other areas of training have repeatedly reported that they did not feel supported by their department after a critical incident, and up to 60% of those involved in an IAE said it was difficult to handle the emotional effects of a complication.¹⁰⁻¹²

It is important to acknowledge that residents are also at risk of experiencing anxiety, depression, guilt and shame associated with IAEs, as attending physicians, program directors, and senior residents may be able to provide better support for their young colleagues. As Herring wrote in a commentary in 2020, “we have not paid enough attention to our teaching and research on the emotional effects of complications upon surgeons ... we must recognize that the emotional burdens of contemplating and managing complications have true and sometimes lasting consequences for the surgeon”.¹¹ Other specialties have found success in creating more formal debriefing processes after an adverse event. One anesthesia department implemented a formal debriefing after critical events, and trainees reported feeling more supported by their senior colleagues.¹⁰

Another troubling finding in this survey was that only one half of residents have been involved in discussions with patients or their family about IAEs. While there may be legal considerations that prevent their direct involvement, it is imperative that residents be updated on how attending physicians communicate these events with their patients. Residents estimated that they have a 92.1% likelihood of disclosing IAEs in the future, but approximate that only two thirds of the events they have witnessed in residency have been disclosed. In order for residents to be equipped to disclose these events, it is imperative that they have exposure to these conversations while in training. Involving residents in these discussions to the extent that

is legally permissible is a first step to improving this education. Other options include a more open conversation about the follow-up of medical errors in department wide M&M conferences in order to provide a learning opportunity for all members of the department. One general surgery department implemented a curriculum with standardized patients to allow residents to practice disclosing a surgical complication and a pilot study demonstrated that it taught important skills.¹³ Attendings sharing their own personal responses to these events may be extremely influential and the most meaningful intervention in training the next generation of surgeons.

In summary, almost all residents have been involved in an IAE and most experienced some distressing emotion after. Residents found their own colleagues to be the best source of support in these situations. Surgeons in training think that they will be better at reporting and disclosing events than their attendings, but many have no experience with these conversations while in training. It is essential to improve the conversation regarding the response to and reporting of adverse events in orthopaedic surgery training in order to create a more resilient and compassionate generation of surgeons.

The study has several limitations, including those inherent with a self-reporting survey and recall bias. It is unknown how many individual residents received the survey and thus we are unable to calculate a response rate. There was a regional disparity with the majority of respondents being from the Midwest. Additionally, one third of respondents self-identified as female, while the most recently published literature estimates that only 14% of orthopaedic residents are women.¹⁴ Longitudinal data assessing how surgeons views and experiences change throughout training and once entering independent practice would be helpful in better understanding how to intervene.

CONCLUSION

With the rise in conversation regarding physician burnout, the idea of the surgeon as the “second victim” after complications during procedures has been discussed more frequently in recent years. The general surgery literature from 2018 demonstrated that a significant portion of surgeons in this situation experience distress after these events. While many have commented on the challenges after an adverse event, very few have discussed how these may affect surgeons in training.

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