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Emergency Medicine Morbidity and Mortality Conference and Culture of Safety: The Resident Perspective

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ABSTRACT

Objective: Morbidity and mortality conference (M&M) is common in emergency medicine (EM) and an Accreditation Council for Graduate Medical Education (ACGME) requirement. We aimed to characterize the prevalence of elements of EM M&M conferences that foster a strong culture of safety.

Methods: Emergency medicine residents at 33 programs across the United States were surveyed using questions adapted from a previously tested survey of EM program directors and the Agency for Healthcare Research and Quality (AHRQ) Culture of Safety Survey.

Results: The survey response rate was 80.3% (1,002/1,248). A total of 60.3% (601/997) of residents had not submitted a case of theirs to M&M in the past year. A total of 7.6% (73/954) reported that issues raised at M&M always led to change while 88.3% (842/954) reported that they sometimes did and 4.1% (39/954) reported that they never did. A total of 56.2% (536/954) responded that changes made due to M&M were reported back to the residents. Of residents who had cases presented at M&M, 24.2% (130/538) responded that there was regular debriefing, 65.2% (351/538) responded that there was not, and 10.6% (57/578) were unsure. A total of 10.2% (101/988) of respondents agreed that M&M was punitive, 17.4% were neutral (172/988), and 72.4% (715/988) disagreed. A total of 18.0% (178/987) of residents agreed that they felt pressure to order unnecessary tests because of M&M, 22.3% (220/987) were neutral, and 59.6% (589/987) disagreed. A total of 87.4% (862/986) felt that M&M was a valuable educational didactic session, and 78.3% (766/978) believed that M&M contributes to a culture of safety in their institution.

Conclusions: While most residents believe that M&M is a valuable didactic session and contributes to institutional culture of safety, there are opportunities to improve by communicating changes made in response to M&M, debriefing residents who have had cases presented, and taking steps to make M&M not feel punitive to some residents.

Morbidity and mortality conferences (M&M) are an important forum for physician review of medical error and quality issues in medicine.

Following the 1999 Institute of Medicine report "To Err Is Human,"[1] there has been widespread support for improving patient safety through the creation of

cultures within healthcare organizations that support robust reporting and disclosure of error.[2] The Agency for Healthcare Research and Quality (AHRQ) has developed a safety culture survey, which has been used at over 1,000 U.S. hospitals, and has identified gaps in culture of safety, particularly in the domain of nonpunitive response to error.[3] Having M&M conferences in EM residencies is an Accreditation Council for Graduate Medical Education (ACGME) requirement,[4] but there is little formal guidance for how to best structure this conference to support the culture of safety. Previous studies of EM M&M conferences have found variability in the frequency of M&M, methods used for case identification, and content of conferences.[5,6]

Tenets of a strong culture of safety include robust case reporting, creating a nonpunitive environment, and follow-up of issues that are identified.[2] M&M provides the opportunity to evaluate errors and adverse events in a systematic manner to improve practice and support safety culture. By identifying individual tasks, cognitive processes, and systems factors that contribute to errors and near misses, it is possible to develop approaches to modify them and avoid similar future events. Reporting changes back to the residents is important to reinforce that issues identified in M&M influence practice change. Additionally, M&M can be a forum for professional growth and responsibility if it is perceived as supportive and there are opportunities to debrief challenging events. However, if conference discussion is focused on individual performance, fear of blame or criticism can limit participants' comfort with openly discussing medical errors and negatively impact conference effectiveness; this is especially true for residents.[7] We previously conducted a survey of U.S. EM residency program directors to evaluate the presence of features of safety culture and found significant variability in the structure and goals of M&M across residencies, including follow-up of issues identified and debriefing of residents.[6]

Little is known about how EM residents view M&M conference and the prevalence of elements that support safety culture within these conferences. To build on information learned from our previous study of program directors, we conducted a national survey to evaluate EM residents' perspective of M&M conference and their views of culture of safety in their institutions. Specifically we aimed to determine the objectives of M&M, if residents considered M&M punitive and if residents viewed M&M as contributing to the culture of safety in their institutions.

METHODS

Study Design

We surveyed emergency medicine (EM) residents' perceptions of their residency's M&M conference and institutional culture of safety at 33 EM residencies.

Study Setting and Population

In May 2015, we conducted a survey of EM residents at 33 programs across the United States, including both 3- and 4-year programs. In academic year 2014/2015 there were 128 postgraduate year (PGY) 1–3 programs and 39 PGY 1–4 programs in the United States.[8] We invited all 151 programs that had participated in our previous survey of program directors to participate,[6] and 33 agreed to participate. As most national EM residency surveys suffer from low response rates, we chose to include only programs where an identified local investigator agreed to promote the study in an effort to ensure a high response rate. We were interested in diversity across programs and M&M structures, which we achieved. This study was approved by the institutional review board of our institution.

Measurements

The survey included both questions from our prior survey of program directors evaluating their residency's M&M conference as well as questions from the validated AHRQ Safety Culture survey.[6,9] The AHRQ safety culture survey was developed using an iterative expert-based process, including a review of existing research and other culture surveys. It has been administered at over 1,000 hospitals, and survey items have demonstrated validity and reliability.[9] We included questions from the following domains of the AHRQ survey: organizational learning-continuous improvement, feedback and communication about error, communication openness, and nonpunitive response to error.[3] The AHRQ survey is available as Data Supplement S1 (available as supporting information in the online version of record of this paper, which is available at http://onlinelibrary.wiley.com/doi/10.1002/aet2.10033/full).

A faculty member who served as the site project director at each residency sent out a standardized e-mail to all residents in their program describing the study. The survey was administered to residents by

e-mail from the central site using the REDCap survey tool (http://project-redcap.org/). Individual responses were tracked by the central site to determine response rate, except for one site that participated by using an anonymous link that the program director forwarded to their residents (required of local institutional review board). Participating site directors were not informed of which residents had completed the survey to maintain resident anonymity. Specific language in the survey invitation that accompanied the survey link conveyed that all answers would be kept confidential and that participation was voluntary (Data Supplement S2, available as supporting information in the online version of this paper). Completion of the survey implied consent to participate. Weekly reminders were e-mailed to all nonparticipants using the same unique survey links for 8 weeks. Neither individual resident survey completion nor information on individual results was shared with the residents' institutions.

Data Analysis

We calculated descriptive and bivariate statistics. Percentages were computed excluding missing values from the total. Raw data from five-point Likert scores are reported in the tables. In the text of the results, responses 1 and 2 are combined to indicate "disagree" and 4 and 5 are combined to indicate "agree." We calculated a composite culture of safety score by calculating the average of the four AHRQ safety domains. This process mirrors the method used in the AHRQ safety culture survey to calculate the composite survey score but was limited to the four domains we assessed. We constructed a linear multiple variable regression to evaluate the association of program characteristics and features of M&M with the culture of safety measure. Data analysis was performed with STATA MP 13.1.

RESULTS

We surveyed 1,248 residents and received 1,002 responses (80.3% response rate). Response rates at residency programs ranged from 70% to 96%. The survey was administered at 13 programs in the Northeast, eight in the Midwest, eight in the South, and four in the West. There were twenty 3-year programs and thirteen 4-year programs surveyed. Respondent PGY and structure of M&M conference are summarized in Table 1.

The majority of respondents had not submitted a case of theirs to M&M or their hospital's patient safety

Table 1
Survey Demographics and Structure of M&M Conferences in EM Residency Programs

Survey response rate	80.3 (1002/1248)
PGY	
1	31.7 (317)
2	28.9 (289)
3	26.8 (268)
4	12.7 (127)
Residency program structure	
PGY 1–3	51.8 (519)
PGY 1–4	48.2 (483)
Region	
Northeast	40.9 (410)
Midwest	24.4 (244)
South	18.2 (182)
West	16.6 (166)
Most important objective of M&M	
Discuss adverse outcomes	33.5 (323)
Identify systems errors	22.5 (217)
Discuss interesting cases	12.3 (119)
Identify cognitive errors	10.7 (103)
Teach individual profess accountability	6.2 (60)
Number of your cases submitted to M&M in past 12 months	
0	60.3 (601)
1	20.6 (205)
≥2	19.2 (191)
Number of your cases submitted to PSRS in past 12 months	
0	77.9 (773)
1	12.0 (119)
≥2	10.1 (100)
Number of your cases presented at M&M	
0	44.4 (443)
1	27.3 (272)
≥2	28.4 (283)
Is there a method for anonymous case submission to M&M?	
Yes	29.8 (295)
No	11.7 (116)
I don't know	58.4 (578)
Residents that are involved in cases are identified?	
Always	23.4 (229)
Frequently	11.7 (115)
Rarely	18.4 (180)
Never	46.5 (456)
Residents that are involved in cases are asked to comment?	
Always	27.7 (271)
Frequently	28.2 (276)
Rarely	19.2 (188)
Never	24.8 (243)

Data are reported as % (n).
M&M = morbidity and mortality conference; PGY = postgraduate year; PSRS = patient safety reporting system.

reporting system (PSRS) in the past 12 months, while more than half had a case of theirs presented at M&M conference (Table 1). The proportion of residents reporting cases increased with increasing experience, from 17.1% of PGY 1 residents to 58.3% of PGY 4 residents. Despite this, 44.2% (174/394) of senior EM residents (PGY 3 and 4) had not reported a case to M&M in the past 12 months. A full breakdown of case submission and presentation by PGY is summarized in Table 2. Respondents were more comfortable submitting cases to M&M that they were personally involved in than cases that they were not involved in (Table 3, difference = 25.3%; 95% confidence interval

Table 2
Case Submission to M&M and PSRS and Case Presentation at M&M by PGY

	PGY				
	1	2	3	4	Overall
Submitted ≥ 1 case to M&M in past 12 months	17.1 (54/315)[13.1–21.8]	42.4 (122/288) [36.6–48.3]	54.7 (146/267) [48.5–60.8]	58.3 (74/127) [49.2–67.0]	39.7 (396/997)[36.7–42.8]
Submitted ≥ 1 case to PSRS in past 12 months	17.0 (53/312) [13.0–21.6]	21.7 (62/286) [17.0–26.9]	24.7 (66/267) [19.6–30.3]	29.9 (38/127) [22.1–38.7]	22.1 (219/992) [19.5–24.6]
Have had their case presented at M&M	27.4 (87/317) [22.6–32.7]	58.7 (169/288) [52.7–64.4]	73.3 (195/266) [67.6–78.5]	81.9 (104/127) [74.1–88.2]	55.6 (555/998) [52.5–58.7]

Data are reported as % (n) [95% CI].
M&M = morbidity and mortality conference; PGY = postgraduate year; PSRS = patient safety reporting system.

[CI] = 21.0 to 29.5). Residents were less likely to have reported cases to a PSRS than to M&M (difference = 17.8%; 95% CI = 13.9 to 21.9; p < 0.001). While interns reported to M&M and a PSRS at about the same rate (Table 2, difference = 0.1%; 95% CI = –5.7 to 6.0]), PGY 3 and PGY 4 residents were more likely to report to M&M than a PSRS (PGY 3 difference = 30.0%, 95% CI = 22.1 to 37.9; PGY 4 difference = 28.3%, 95% CI = 16.6 to 40.1]). There is a trend for increased case submission with PGY both to M&M and to the PSRS (p < 0.001 and p = 0.001 respectively).

Resident views on the objectives and focus of M&M vary as listed in Table 1. Average scores for relative importance of the objectives of M&M (score 1– 6, 1 representing most important) were discuss adverse outcomes (2.8, 95% CI = 2.7 to 2.9), identify systems errors (2.8, 95% CI = 2.7 to 2.9]), identify cognitive errors (3.0, 95% CI = 2.9 to 3.1), discuss interesting cases (3.5, 95% CI = 3.4 to 3.6), and teach individual professional accountability (3.8, 95% CI = 3.8 to 3.9]). Three-quarters (76.3%, 757/992) of residents agreed that case discussions at M&M are focused on systems errors while 59.1% (586/991) of residents agreed that discussion is focused on cognitive errors. Eighteen percent of residents agreed that they feel pressure to order unnecessary tests because of M&M. Ten percent (101/988) of residents agreed that M&M feels punitive, while 17.4% (172/988) were neutral and 72.4% (715/988) disagreed (Table 3).

There is variation in how residents perceived identification of physicians involved in M&M cases. Nearly half (46.5%, 456/980) of residents report that residents who are involved in cases are never identified, and 24.8% (243/978) reported that residents are never asked to comment (Table 1). Twenty-four

percent (231/975) of respondents described anonymous case presentation, meaning that involved residents are never named nor asked to comment. Residents reported that clinicians who are involved in cases are always present at M&M 8.6% (84/981) of the time, frequently present 56.3% (552/981) of the time, and rarely present 10.0% (98/981) of the time; 20.5% (201/981) reported that they do not know because clinicians are not identified.

Residents reported mixed experiences with followup and debriefing (Table 3). Few residents (7.6%, 73/ 954) felt that issues raised at M&M conference always lead to change. Changes that occur as a result of M&M were reported back to residents slightly more than half (56.2%, 536/954) of the time. Only 17.5% (168/958) of respondents answered that residents who have had cases presented at M&M receive regular debriefing. When analysis was limited to residents who had cases presented at M&M, 24.2% (130/538) responded that there is regular debriefing, 65.2% (351/538) responded that there is not, and 10.6% (57/578) were unsure.

Overall, the majority of respondents (87.4%, 862/ 986) felt that M&M is a valuable educational didactic session (Table 3). The majority of residents (78.3%, 766/978) also agreed that M&M contributes to the culture of safety in their institution. Scores on the AHRQ safety culture survey were as follows: the composite-level percent positive response was 63.2% (95% CI = 61.1 to 65.2) for organizational learning and continuous improvement, 51.9% (95% CI = 49.8 to 54.1) for feedback and communication about error, 71.0% (95% CI = 68.9 to 73.2) for communication openness, and 49.7% (95% CI = 47.3 to 52.2] for nonpunitive response to error. Except for nonpunitive response to error, more than 50% of the respondents

Table 3
Residents' Perceptions of M&M

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Comfort submitting cases I was not involved in	21.9 (217)	21.0 (208)	27.5 (272)	20.8 (206)	8.8 (87)
Comfort submitting cases I was involved in	32.9 (326)	35.2 (349)	21.4 (212)	7.3 (72)	3.1 (31)
M&M feels punitive	2.6 (26)	7.6 (75)	17.4 (172)	29.2 (289)	43.1 (426)
Case discussion is focused on cognitive errors	14.7 (146)	44.4 (440)	27.1 (269)	11.4 (114)	2.3 (23)
Case discussion is focused on systems errors	23.9 (237)	52.4 (520)	17.2 (171)	5.2 (52)	1.2 (12)
Mistakes have led to positive changes	21.2 (209)	46.4 (458)	27.5 (271)	3.8 (38)	1.0 (10)
Feel pressure to order unnecessary tests because of M&M	3.3 (33)	14.7 (145)	22.3 (220)	41.1 (406)	18.5 (183)
M&M is a valuable educational didactic session	53.1 (524)	34.3 (338)	9.6 (95)	1.5 (15)	1.4 (14)
M&M contributes to culture of safety at my institution	36.7 (359)	41.6 (407)	18.5 (181)	2.0 (20)	1.1 (11)
	Always		Sometimes		Never
Issues raised at M&M lead to change	7.6 (73)		88.3 (842)		4.1 (39)
	Yes		No		
Changes are reported back to residents	56.2 (536)		43.8 (418)		
	Yes		No		Don't know
Debriefing for residents	17.5 (168)		42.8 (410)		39.7 (380)

Data are reported as % (*n*).
M&M = morbidity and mortality conference.
Agreement was measured on a five point Likert scale: 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree.

responded positively to the survey items in each domain. Scores on the composite of the four domains across residency sites ranged from 42.9% to 82.0% (median = 61.1%).

We used a multiple-variable linear model to evaluate the contribution of features of M&M to the culture of safety. After adjustment, the following aspects of M&M had stronger positive association with average positive scores on the AHRQ safety domains: residents who reported that they feel comfortable submitting cases to M&M that they were not personally involved in (effect size = 0.04, 95% CI = 0.02 to 0.05) and residents who reported that they receive feedback on changes that are made as a result of event reports (effect size = 0.10, 95% CI = 0.09 to 0.12; complete model in Table 4). With regard to the primary objective of M&M, discussing adverse outcomes had a strong negative association with average AHRQ culture of safety score compared to teaching personal accountability (a decrease in the average AHRQ score of 5.75%, 95% CI = −9.84 to −1.67).

DISCUSSION

Morbidity and mortality conference is an important didactic tool in residency and an ACGME requirement. With robust case reporting, systematic review of errors, and the creation of a nonpunitive environment, this conference has the potential to support culture of safety in residency programs. We found that while EM residents value the conference as an educational session that supports safety culture, the majority of EM residents have not submitted a case to M&M in the past year. Practices that support a culture of safety are not perceived to be occurring by many residents.

While reporting cases to M&M increases across years, nearly half of senior residents have not submitted a case to M&M in the past 12 months. We suspect this reflects perception of error and/or comfort of reporting, as it is unlikely that senior residents have not been involved in cases with near misses or errors over the course of a year. One explanation for this may be a lack of awareness by residents about what constitutes a patient safety issue or a restricted definition that excludes "near misses"—errors that result in no harm. The terminology in the conference name itself ("morbidity" and "mortality") may contribute to this perception. Of note, this survey did not specifically ask whether each program called the conference "M&M." A different naming paradigm could influence resident reporting of events. The rate of reporting seems to plateau after PGY 2, raising concern that senior residents may not see M&M as a safe or valuable process by which to report cases. One approach to the discussion of medical error includes acknowledging that medicine is difficult, some types of errors are inevitable but they give us a tool to improve our skill as physicians and the systems in which we work, and the goal of conference is not to criticize but to learn from our experiences.[10]

There is clear overlap in the goals of M&M conference and institutional PSRS. Both allow for the opportunity to discuss systems issues among a group of dedicated professionals and identify opportunities

Table 4
Association Between Features of M&M and Culture of Safety

Outcome	Effect	95% CI
Average of four safety culture measures*		
Region		
South	Ref.	
Midwest	−4.02	−10.96 to 2.91
Northeast	−4.47	−12.24 to 3.30
West	−2.22	−12.10 to 7.66
Program is 3 years	−1.39	−7.18 to 4.39
Number of cases submitted to M&M		
0	Ref.	
1	5.49	1.79 to 9.19
≥2	1.38	−2.98 to 5.73
Comfort submitting cases not personally involved in*	3.50	2.38 to 4.62
Regular debriefing for residents who have their cases discussed at M&M	1.44	−2.63 to 5.52
Residents involved in cases are never identified by name	3.78	−0.26 to 7.82
Feedback given about changes that are put into place based on event reports*	10.29	9.00 to 11.57
PGY		
1	Ref.	
2	−0.19	−4.44 to 4.05
3	−1.16	−5.26 to 2.92
4	−2.69	−7.83 to 2.46
Objective of M&M is to		
Teach individual professional accountability	Ref.	
Discuss adverse outcomes	−5.76	−9.84 to −1.67
Identify systems errors	−0.66	−6.10 to 4.77
Identify cognitive errors	−3.17	−7.76 to 1.42
Discuss interesting cases	−1.36	−8.07 to 5.34
Other	0.15	−6.21 to 6.51

These are the results of multiple variable linear regression with the outcome of the average across four domains of the safety culture survey and independent variables from the resident views of M&M. The effect reflects the percent change in the average of four safety culture score due to a one-unit increase in the independent variable, accounting for the effect of other variables in the model.
M&M = morbidity and mortality conference.
*1 = strongly disagree, 5 = strongly agree.

where systems change may occur to improve safety in the care environment. Despite this, as residents progress through training, they are less likely to use the PSRS than to report to M&M. This is concerning from hospitals' perspective as PSRSs are a critical tool to determine risks across the institution and attempt to address them. Possible explanations include reporting burden, perceived value of reporting, and fear of dissemination. A previous study found lack of feedback on actions taken and the time to fill out the form as the most common barriers to physician reporting in PSRS.[11] Given the multiple demands on resident time, the value to the reporting resident must be tangible, transparent, and aligned with residents' goals. Identification of what messaging or rewards best incentivize resident reporting is an area worth further

exploration. As many residents will work in nonacademic settings after training and may not regularly participate in M&M conferences, having increased comfort with using the PSRS (more uniformly available) is an important skill for them to acquire during training.

Maintaining a nonpunitive environment is a key tenet of safety culture. Maintaining anonymity around submission and review of errors is one method to support a nonpunitive culture. While anonymity has been previously shown to increase adverse event reporting,[12,13] the ACGME does not offer guidance on anonymity in M&M conferences. Fewer than 30% of residents reported a known venue to submit cases anonymously, and only one-quarter of respondents report that resident anonymity is completely maintained during case presentation at M&M conference. Despite this, residents are more comfortable submitting cases that they were involved in as compared to cases that they were not involved in. This may represent the fear of embarrassing a colleague or of being viewed as judging the actions of others as previously discussed. These concerns might be less relevant in anonymous case presentations. While the vast majority of residents feel that M&M is not punitive, a small minority of residents responded that M&M feels punitive. Residents who feel M&M is punitive are less likely to submit cases to M&M and less open to discussing errors in conference. While this survey did not examine their reasons for feeling that M&M is punitive, it is possible that deidentifying cases during presentation (and thereby removing any focus of case discussion on the actions of the individual) would decrease the likelihood that M&M is viewed as punitive by those residents.

Formal debriefing of trainees is a recommended technique to enhance a culture of safety.[14–16] Beyond that, it is an important component of programs' educational missions to assess residents' reaction to adverse events, develop performance improvement plans if needed, and help foster a sense of personal and professional accountability and help trainees develop resiliency. Despite this, only a quarter of residents reported regular debriefing after having cases presented at M&M. Interestingly, this perception is discordant from a prior study of EM faculty members responsible for overseeing M&M, in which 44% of programs reported that residents who have had their cases discussed at M&M received regular feedback.[6] Establishing a pathway by which a designated faculty member

follows up to debrief with every resident who has had a case presented at M&M would offer the opportunity to improve resident feedback.

Another key technique in creating a safety culture is follow-up of actions taken to address issues identified in the M&M process.[14–16] Three-quarters of residents perceive that case discussions are focused on systems errors, yet only 7.6% of residents feel that issues raised at M&M always lead to change and just fewer than 44% report that these changes are not reported back to residents. Failure to follow up with providers on how adverse events led to systems improvements is a documented barrier to creation of a culture of safety.[17,18] M&M may not lead to change because it is organized as an educational conference as part of the residency and may not have a clear connection or follow-up with ED operations and hospital management. Implementation of a regular, structured follow-up system is one method to improve open discussion of error, help identify areas of improvement, and promote initiatives to improve the culture of safety. One program did this successfully by identifying key issues during M&M, creating work groups to target system-based problems, and reporting changes at a subsequent conference.[19]

More than three-quarters of EM residents surveyed felt both that M&M is a valuable educational experience and that it contributes to a culture of safety at their institutions. When we examined multiple features of M&M, we found that several are independently associated with safety culture. Residents who felt comfortable submitting cases they were not involved with had higher positive scores on the AHRQ safety domains. This may reflect that residents who work in institutions with strong safety cultures are less concerned about potential negative effects of exposing errors that involved a colleague. In addition, residents who reported receiving feedback about changes made as a result of event reports were also more likely to have a higher score on the AHRQ survey, reinforcing the importance of follow up in creating safety culture. These are areas for future research.

LIMITATIONS

As with all surveys, there is the potential for response bias. Our analyses are limited to the views of the residents who completed the survey; our high overall response rate of 80% with a ≥70% response rate at each site should limit the effects of response bias. Our

study was not a random sample of residencies; rather it was those residencies where a faculty member volunteered to administer the survey. While site administering faculty were given standardized communications with which to distribute and promote the survey, it is possible that those sites with faculty interested in administering the survey have different styles or culture associated with M&M. While we have representation of a diverse group of residency programs in the United States (both geographically and in structure), our study did include a larger proportion of 4-year programs than the national distribution. It is possible that residents in programs that did not participate in the study may have different views than those who were included. We hypothesize that programs choosing to participate in this study may have more progressive views about M&M, potentially leading to our results reflecting better practices and culture of safety than would be seen in nonparticipating programs. However, it is also possible that programs that identify safety culture as an area of deficiency may have perceived a greater need to address the topic. Had more programs with less progressive views participated, the important gaps we identified in M&M culture would likely have been greater. Questions on reporting cases in the past 12 months rely on self-perception of the past year. It is possible that more senior residents had longer time horizons (interpreted 12 months as a longer time period). This could partially explain the increasing rate of reporting in more senior residents. While our survey was created from questions previously piloted in a survey of residency directors as well as validated questions from the AHRQ safety culture survey, this combined survey did not undergo formal psychometric testing. Finally, our analysis is cross-sectional, so while we can determine associations between residents' views of M&M and the culture of safety, we cannot assign causality.

CONCLUSIONS

While most emergency medicine residents believe that morbidity and mortality conference is a valuable didactic session and contributes to culture of safety in their institution, the majority have never submitted a case of theirs to morbidity and mortality conference. There are opportunities to support the culture of safety by improving communication of changes made in response to issues raised at morbidity and mortality conference, debriefing with residents who have had

cases presented at morbidity and mortality conference, and reducing the likelihood that some residents view morbidity and mortality conference as punitive. It is likely that such changes would also increase case reporting. As morbidity and mortality conference is a required Accreditation Council for Graduate Medical Education conference, there is a need to test different models of morbidity and mortality conference to determine best practices to optimize education and support a strong safety culture.

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APPENDIX A

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Supporting Information

The following supporting information is available in the online version of this paper available at http://onlinelibrary.wiley.com/doi/10.1002/aet2.10033/full

Data Supplement S1. AHRQ survey.

Data Supplement S2. A national study of ED morbidity and mortality conferences and the culture of safety.