

EDUCATIONAL ADVANCES

Resident Perceptions of Medical Errors in the Emergency Department

Stephen M. Schenkel, MD, MPP, Rahul K. Khare, MD, Marilyn M. Rosenthal, PhD, Kathleen M. Sutcliffe, PhD, Elizabeth L. Lewton, PhD, MPH

Abstract

Objectives: To evaluate resident experience and perceptions of medical error associated with emergency department (ED) care. **Methods:** Using a semistructured interview protocol, three researchers interviewed 26 randomly selected medical, surgical, and obstetrics residents regarding medical error. The authors chose a 16-case subset of incidents involving ED care for initial review. Interview transcripts were reviewed iteratively to draw out recurrent categories and themes. Two investigators separately analyzed all cases to ensure common understanding and agreement. **Results:** Most cases involved misdiagnosis, misread radiographs, or inappropriate disposition. Two thirds of the case patients died or experienced delays in care. Residents felt that the complexity of the patients, as well as the complexity of their own jobs, contributed to error. Attending supervision, nurse evaluation, and additional physician involvement all were noted to be important

checks within the hospital system. Residents most often held the ED responsible for error. In addition, they deemed themselves, their teams, and their lack of training responsible. Though residents often discussed events with their admitting teams, follow-up with the ED or other associated individuals was uncommon. The findings revealed seven common themes that include factors contributing to errors, checks and adaptations, and follow-up of the event. **Conclusions:** Residents are aware of medical error and able to recall events in detail. Whereas events are discussed among inpatient teams, little information finds its way back to the ED, potentially resulting in misunderstandings between departments and hindering learning from events. In-depth interviewing allows a nuanced and detailed approach to error analysis. **Key words:** residents; medical error; emergency medicine. *ACADEMIC EMERGENCY MEDICINE* 2003; 10:1318–1324.

From the prominent Institute of Medicine (IOM) announcement that medical injury kills 44,000 to 98,000 patients annually, medical error and patient safety have become large and public concerns for every hospital and every medical specialty.^{1,2} In the process of grappling with the challenges the IOM report presents, it has become clear that emergency medicine occupies a unique space in the nature and response to medical error and patient safety.^{3,4}

Given the complexity of the emergency department (ED) environment, a driving question for researchers who study patient safety has been how to develop a fuller sense of the threats to patient safety, and how to develop appropriate and operable responses. Recent error-finding efforts have included dedicated, persistent interviewing of all staff after every shift, recording information on standardized data sheets,

and the review of charts selected through anonymous reporting.^{5,6} Whereas broader hospital attempts to quantify error have focused on chart review, other methods have been attempted, including incident report review, caretaker observation, e-mail solicitation for error reporting, and automated computer screening.^{4,7}

Relatively few analyses of patient safety have focused on the roles of residents and other trainees. There is some suggestion, though, that housestaff provide a rich source of information. O'Neil and colleagues found that housestaff reporting via e-mail identified an equal number of events as a record review, but generally identified more preventable events at lower cost.⁸ Wu et al. found a wide variety of errors reported when they surveyed internal medicine house officers regarding their responses to medical mistakes.⁹

We specifically sought to understand residents' experiences and perceptions of medical mishaps. This effort entailed in-depth interviews with residents in multiple specialties at various points of training. In-depth interviews regarding medical error have been performed with family practitioners and internists, but not, to our knowledge, with house staff.^{10,11} In this study, we analyzed a subset of the interviews, specifically all cases in which residents discussed a lapse in patient safety associated with ED care.

From the University of Michigan, Department of Emergency Medicine (SMS, RKK), Department of Behavioral Sciences (MMR), and School of Business Administration (KMS, ELL), Ann Arbor, MI. Received April 2, 2003; revision received June 30, 2003; accepted July 9, 2003.

Address for correspondence and reprints: Stephen Schenkel, MD, MPP, Emergency Medical Services, University of Maryland, 419 W. Redwood St., Baltimore, MD 21201. Fax: 734-763-9298; e-mail: sschenkel@post.harvard.edu.

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METHODS

Study Design. This study evaluated resident perceptions of errors using case interviews. The study protocol received approval from the University of Michigan Institutional Review Board as well as the appropriate hospital boards at the study site.

Study Setting and Population. Twenty-six residents were chosen at random from all categorical residency programs available at a 600-bed community teaching hospital.

Study Protocol. Three researchers interviewed 26 randomly selected medical, surgical, and obstetrical residents using a semistandardized interview protocol designed to draw out detailed descriptions of three medical mishaps and one “near miss.”¹² While there are emergency medicine residents at the hospital, they are part of a joint program and were not included in the interview sample. All residents were volunteers and all participated with the understanding that conversations, while recorded and transcribed, would be stripped of names and other identifying information as much as possible. No attempt was made to guide the conversation to any one aspect or area of training, and interviewees were generally free to respond to requests for further explanation with as much or as little detail as desired. Interviewers probed for what the residents saw as the nature of the errors described, the causes of errors, the principal individuals involved, the results for the patients, and the responses on the part of the resident.

Interviewers deliberately chose and emphasized the term “mishaps” during conversation to cast the widest possible net and avoid the weight of the term “error.” In this discussion, however, the terms “mishap” and “error” have been used interchangeably. Whereas interviewees were asked to categorize the cases that they presented, no attempt was made to request cases within categories, and the choice of case presentation was left entirely to the interviewees. Interviewees were free to stop the tape recorder or end the interview at any time; none took advantage of this.

A total of 70 case interviews were obtained. A subset of 16 cases involving ED care was selected for this initial evaluation. All residents were closely involved with the events they described, although not always while in the ED. Some saw the patients primarily in the ED, whereas others received the patients after admission from the ED. This subset of cases was reviewed iteratively with the goal of drawing out categories and themes of discussion. Each case was reviewed by at least two separate investigators to ensure appropriate categorization and common understanding of themes. We met to discuss the overall analysis and ensure agreement.¹³⁻¹⁵

RESULTS

Sixteen cases were reviewed with the development of seven distinct categories or themes of discussion (Table 1). While some of these discussions were prompted, such as factors that might be associated with the event, others, most notably the checks and adaptations within the medical system, rose from the conversations.

Nature of the Mishaps. All of the cases reviewed involved the ED. The majority of cases that residents described involved some form of misdiagnosis (Table 2). More than one case appeared in which radiographs were either lost or read incorrectly. In three cases, residents recalled necessary antibiotics not being provided in the ED; in one case, the antibiotic was placed on the patient’s bed but not administered. An equal number of cases involved inappropriate ED disposition. Only one complication of an ED procedure was noted—a pneumothorax from a central line. One resident questioned what he thought to be inappropriate treatment in the ED, the provision of normal saline to a hypernatremic patient.

Patient Outcomes. Patient outcomes were often severe (Table 3). Five patients died during their hospital stay. One patient was transferred to the ICU from the floor within an hour of arrival; another was discharged from the ED twice before ultimately being admitted and dying from complications of hemorrhoid banding. In only one case where the interviewee spoke specifically about a “near miss” was the patient’s outcome both good and unaffected by the mishap.

In most cases, residents suspected that mishaps complicated hospital courses or delayed necessary care, although they were not always convinced of this. Residents expressed uncertainty as to whether the timing of the treatment or diagnosis truly influenced outcomes (Table 4). Comments regarding patient outcomes reflected a sense of the limitations of medical interventions.

Resident Interpretation of the Locus of Responsibility. These 16 cases were chosen based on the involvement of the ED. It is partially by design, then, that the residents most often interpreted the ED team

TABLE 1. Major Themes in Residents’ Discussions of Medical Mishaps

Nature of the mishap
Patient outcome
Resident interpretation of locus of responsibility
Factors associated with the event
Checks and adaptations
Acknowledgment and follow-up
Offered solutions

TABLE 2. Nature of the Mishaps

Misdiagnosis (8)
30-year-old M with end-stage renal disease, pneumonia diagnosed as fever of unknown origin
60-year-old F with ischemic limb diagnosed as cerebrovascular accident
90-year-old M admitted for urosepsis, found to have pneumonia
90-year-old F with atypical chest pain found to have acute MI
20-year-old M after motor vehicle collision, missed cardiac tamponade
65-year-old M admitted for pneumonia, found to have pulmonary embolus
60-year-old M admitted for CVA, found to have spinal cord compression
M admitted for acute MI found to have intracerebral hemorrhage
Misread radiograph (3)
30-year-old M with end-stage renal disease, missed pneumonia
Hypotensive F with free air missed on abdominal films
20-year-old M after motor vehicle collision, later noted to have visible pericardial blood on abdominal CT
Medication not given (3)
Antibiotics not started in ED
Inappropriate ED disposition (3)
Hypotensive male, admitted to floor, immediately transferred to ICU
41-year-old F with CHF, ejection fraction 20%, sent home for outpatient pneumonia treatment, subsequently admitted
40-year-old M with complication of hemorrhoid banding, twice sent home from ED without notification of surgeon
Procedural complication (1)
Pneumothorax after central line placement
Other (2)
Provision of normal saline to a hypernatremic patient
Delayed diagnosis of intra-abdominal hemorrhage in a 20-year-old F with ITP and syncope
Note: total is >16 because some cases fit multiple categories

as primarily responsible for the mishaps described. The ED was not alone, however, in being assigned responsibility for events. Residents also discussed the responsibilities of the admitting or consulting teams, the responsibilities of individual residents and consultants, and even the responsibility of the patient in preventing mishaps (Table 5; available as a data supplement at aemj.org).

Contributory Factors. For the majority of cases, residents generated one or more factors associated with the mishap that they felt partially explained the event or its resolution. These factors fell into three broad categories—the complexity of hospitalized patients, the organization of work within the hospital, and lack of appropriate training (Table 6; data supplement, aemj.org). The organization of work included inability to locate x-rays, trouble communicating with patients, the large burden of patient responsibilities, and even illness among care providers.

Checks and Adaptations. Residents noted a number of checks in hospital systems and personal adaptations that generally worked to prevent mishaps (Table 7; data supplement, aemj.org). In the cases reviewed, these checks were often the points at which a mishap was uncovered. On their account, the patient may

have experienced only a delay in definitive care rather than a more serious outcome. Attending and senior resident physician supervision and independent nurse evaluation of patients featured prominently in detecting the problems. The addition of more physicians allowed the gathering of further information and the confirmation of decisions. Residents also discussed their own efforts to confirm interpretations or actions.

Residents implied their awareness of the potential for mishap by their emphasis on repetition and confirmation, both by people and through studies. Several residents noted the important role that specialty consultation plays in avoiding error, as well as the need to obtain additional labs or additional opinions to keep complicated patients on track. There was some suggestion that the mishaps taught residents when they needed to call for help or confirmation.

Acknowledgment and Follow-up. Residents reported limited documentation of mishaps (Table 8; data supplement, aemj.org). Charting occasionally was mentioned, sometimes with statements suggesting that the event may not actually have been noted in the chart. Two cases were taken to morbidity and mortality conferences. Only one case generated an incident report, and one case was sent to risk management. Informally, the majority of cases were discussed with the primary physician team, most often with the attending in charge. Few cases were discussed with the ED or other involved services. Even when asked directly whether there was follow-up with the ED, residents frequently stated that they were not certain. Two cases were discussed with nurses, two at rounds, and one explicitly with family members.

TABLE 3. Patient Outcomes (per Residents' Assessments)

Death	5
Delay in definitive care	6
Complicated course of hospitalization or illness	3
No effect	2

TABLE 4. Comments Reflecting Uncertainty in the Link between Mishaps and Outcomes

<p>“I don’t know if he was given antibiotics earlier during the night, like 12 hours earlier, maybe that could have saved his life, or could not.”</p> <p>“I think that now we have the benefit of having the autopsy results back and heparin, I don’t think heparin would have saved this man’s life even if we had started it.”</p> <p>“His life expectancy would probably be very short because it was metastatic lung cancer and it was...not a good diagnosis to have. But potentially at least the paralysis...could have been prevented.”</p>

Offered Solutions. Asked directly, residents offered a limited number of solutions to the problems they noted (Table 9; data supplement, aemj.org). These generally fell into three categories: computer-based responses, system redesigns, and improved communication.

DISCUSSION

Our interviews were designed to uncover residents’ perceptions; therefore, they may tell us more about the residents themselves than the ED or the system of medical care. Alternatively, they may offer hints toward improved education, understanding, and ultimately, patient care.

The majority of events that residents recalled were cases of misdiagnosis. This is consistent with previous studies.¹⁶ In this respect, physicians are distinct from nurses, who tend to focus more on errors in care delivery such as medication dosages, than in the cognitive errors of care determination.¹⁷ A greater concern for misdiagnosis might also be expected of residents who, in the midst of their training, are taught to focus on differential diagnosis.¹⁸

Generally, residents recalled cases in which patient outcomes were poor, in which necessary care had been delayed, or in which there was a substantial change in medical course after recognition of the mishap. Wu, in questionnaires from 114 house officers, noted a trend toward significant adverse outcomes following medical errors.⁹ A bias toward severity may simply be the result of what residents recall; if so, it suggests a limitation in any retrospective survey of residents regarding patient safety. Residents were, at times, careful to note that they could not firmly establish the link between a mishap and the patient’s ultimate outcome. Despite this uncertainty, however, residents felt the mishaps were important, noting that earlier intervention might have alleviated some part of a bad outcome.

Many reported mishaps were associated with radiology. These suggest the importance of the relationship between the ED and radiology and the emphasis that residents place on diagnostic imaging. Radiologic misinterpretation carries a high malpractice risk for emergency medicine, and several authors have described interventions designed to improve emergency readings, including the creation of a “false-negative case file,” group review of all films with a disparity between ED and radiology reads, and improved and consistent communication between the emergency and radiology departments.^{19–21}

One of the surprising aspects of the residents’ interpretations of responsibility for the mishaps is the varied view of the role of the ED. At one end of the spectrum, interviewed residents expressed frustration that not all questions had been answered while the patient was still in the ED. At the same time, the admitting teams and consulting residents noted that there were cases in which the final diagnosis, and the judgment of the seriousness of that diagnosis, should not be viewed as entirely within the purview of the ED. The ED goals of initial patient evaluation, intervention, and disposition are not always understood by subsequent care providers. A clearer understanding of the role of the ED may benefit patient safety by narrowing the scope of investigation and providing focus. This also suggests that ED patient safety efforts may be more rewarding if focused on more complete communication and appropriate disposition rather than more extended diagnostic effort. Furthermore, a shared understanding of the complementary roles of the ED and the admitting services may contribute to more effective and efficient communication.

Residents were easily able to point out issues that contributed to patient risk. Two aspects of their concerns are closely related: the complexity of hospitalized patients, and the need for more knowledge and training to provide appropriate care. Caring for more complex patients may require a broader knowledge base, but this point of view also reflects a very traditional view of patient safety, specifically that individual knowledge can prevent adverse outcomes. This response is somewhat ironic: those interviewed, after all, were trainees at a training institution. It is also troubling, because the most logical response to a deficit in training is more training. This is a valuable approach, certainly, but one with limitations. It may also be a common response because this is an area over which trainees feel that they and their instructors have some control. However, the implied suggestion, that with sufficient training there will be no mishaps, contradicts established theories on human performance.

Residents also acknowledged the importance that workplace systems play in patient safety. They noted the likely contributions of long nights and heavy patient loads.²² There is an almost overwhelming diversity to the nature of their organizational concerns, from the resident too sick to communicate effectively, to inadequate translation services, to difficulty locating an x-ray. The commonality among these aspects of workplace organization may be that they

are not usually easy to remedy. In the effort to reduce error, however, these may be some of the most rewarding challenges, but each requires concerted, individual attention.

A number of residents emphasized the importance of supervision, most typically provided by the inpatient senior resident or attending, as a safeguard against mishap. The presumably error-prone environment of a teaching hospital has been one of the arguments for 24-hour staff supervision in the ED.²³ Holliman et al. demonstrated that attending supervision successfully averted limb- or life-threatening errors in 17 of 1,000 patients, including cases of missed fractures, inability to intubate, and inappropriate outpatient disposition.²⁴ There was little recognition in our interviews that levels of supervision differ throughout the hospital, and that in the ED attending staff evaluated every patient during the initial visit, whereas the initial evaluation by an admitting attending might wait until the next morning.

It is notable that despite formal and informal adaptations to prevent them, mishaps still occurred. Often, residents suggested that if a single person had acted differently, the mishap might have been prevented. Even for diagnostic studies and interventions, interviewees frequently emphasized additional human evaluation, both to confirm the results of studies and to be sure that specific events were carried through in a timely fashion. Individual vigilance, by multiple individuals, was felt to play an essential role in the prevention of mishaps. This emphasizes the importance that residents placed on both systems and individual action in providing safe medical care, and also demonstrates how often systems level responses may still rely on individual action.

Whereas residents reported significant discussion of mishaps within the circle of the primary inpatient team, there was little discussion outside of this circle and little involvement of formal quality assurance or risk management systems. Residents indicated that their primary responsibility was to notify their attendings, and that further discussion would have to originate from the attending. Residents did not view informing the ED of the error as part of their responsibility. Even in the cases where follow-up was supposed to pass from the attending through the administrative hierarchy to the ED, there was no mentioned mechanism for confirmation to the resident that the concern was carried forward. Because this feedback loop is never closed, there is little reward for the resident in discussing the case and no systematic reinforcement.

The limited and circuitous feedback leaves the ED and other involved individuals or services with little ability to improve their processes. It also leaves little opportunity to explain decision making and develop a better understanding of prior events, thought processes in the ED, and changes in the patient's

condition. By the time concerns pass through a formal administrative superstructure, it will likely be too late to benefit the individual patient. A more direct mechanism might contribute to resident education, individual patient care, and improved communication between the ED and the admitting services.

Few of these 16 cases would have been discovered through chart review or an incident reporting system.^{8,25} Standardized ED case review, evaluating all cases of death within 48 hours of admission or transfer to the intensive care unit within 48 hours of admission, might have uncovered several. The concern, however, for improvement of hospital mechanisms and, specifically, improvement in ED care, is clear. Without some form of feedback, no change can take place, and little effort was made to get critical, timely, and educated feedback to the ED.

In two cases, residents noted their discussions with families, although neither mishap was entirely and openly acknowledged. Greater openness with families, rather than provoking malpractice litigation, may protect against claims by reducing patient or family anger at a perceived cover-up.²⁶ Although disclosure regarding error maintains trust in the doctor-patient relationship and is clearly an ethical responsibility, our interviews suggest that it is rare and difficult to carry out, even in the most well-intentioned family discussions.^{27,28} Without institutional support, the guidance of their staff physicians, and training in appropriate conversational approaches, residents are unlikely to undertake these conversations.^{29,30}

Residents only occasionally mentioned morbidity and mortality rounds, a traditional training mechanism for reviewing error in medical care.³¹ It is not clear whether this is because they are not attended by, or available for, residents, or are not valued as a method of reviewing mishaps.

Despite acknowledging the need for better mechanisms to assure patient safety, residents had few suggestions for achieving this. Most commonly they called for guidelines and suggested a need for closer communications. Weingart has suggested that residents are poorly trained to take part in quality improvement efforts and has offered suggestions to make them more aware of organizational problem solving and to enable them to take part in hospital-wide efforts.³² Resident comments in our interviews confirm this—residents are aware that there is a larger system at work, but they are not always certain what this means and how they might play a role in shaping that system.

Implications for Resident Training and Error Analysis. Whereas residents are certainly aware of the mishaps that take place in the hospital, they appear to be only minimally aware of the various methods of error analysis and systems-based approaches to patient safety.^{33,34} There is a need for

further training in approaches to patient safety that reach beyond the individual resident or care team.

In a recent study, emergency medicine residency directors indicated that all 112 of 112 programs surveyed have methods in place to track and report ED-associated errors, such as morbidity and mortality conferences, quality assurance case reviews, continuous quality improvement audits, and radiographic and electrocardiogram overread conferences.³⁵ Our interviews suggest that another source of cases for analysis are admitting services. Analysis of these events, particularly if carried out jointly with the other involved services, might provide a broader understanding of patient safety, lead to greater understanding of the role of the ED, and smooth communication between the various services.

As a test series, these cases suggest some of the difficulties involved in a broad reporting system with follow-up analysis, including extreme complexity, wide variety, and limited straightforward points for intervention. They also suggest the benefits of an interview-based approach as the rich detail uncovers the broad range of influences on patient safety and the multiple causative factors that may play a role. Interviews provide a mechanism to approach errors in diagnosis, one of the most intractable of medical errors, but also one of the most frequently recalled by house officers.

The lack of feedback offered to ED staff suggests that the ED itself must actively seek out complications and mishaps resulting from ED care. This may mean soliciting feedback or using automated systems to uncover possible problems. ED directors usually review cases of in-patient transfers of service or death in under 48 hours, but the admitting residents interviewed appeared to be unaware of this. Even with these reviews, however, the presence and details of mishaps might not be clearly documented in the medical record.

LIMITATIONS

This series of 16 events provides only an initial picture. The biases of recall and hindsight influence all of our interviews. We can make, at best, only limited and relative quantitative statements because our analysis is qualitative in nature. We believe that our findings are typical of what might be discovered at a community teaching hospital, though they have characteristics specific to the hospital in which the interviews were conducted. Even a single episode of error, or a near miss, can result in understanding or systems change with widespread benefits it is appropriately analyzed.³⁶⁻⁴⁰

Because the original interview study design included only internal medicine, surgical, and obstetrical residents, all of our interviews were with residents in training programs other than emergency medicine.

Most had spent at least one month during their internship working in the ED. There are probably differences in the view of medical error between these residents and emergency medicine-trained attendings or residents. The process of decision making in the ED, and therefore the nature of errors in decision making and the appropriate responses, differs from that of other specialties.⁴¹ Interviews with admitting residents provides only one side of the story. This is an essential side, however, if we are to understand the web of interactions and relationships that allows the hospital to work.

Ideally, we would have been able to analyze these cases from multiple points of view, including those of consultants and attendings. Chart review or patient interview might also aid understanding of circumstances. However, because all interviews were conducted after the fact and under a guarantee of anonymity, these confirmatory methods were not consistently possible. Further review of these cases would likely enhance understanding of these events; however, the loss of anonymity required might prevent open discussion during the interviews. Finally, one might question whether what the residents perceived as error would be considered such in the eyes of a more experienced observer. Because our goal was to analyze resident perceptions, and because the existence of an "error" may not always be generally agreed, we did not push for factual confirmation.

CONCLUSIONS

Residents are aware of mishaps occurring in the hospital and are able to recall events in detail when interviewed. Interviews offer a detailed and nuanced means of analyzing mishaps in medical care. Residents recognize the uncertainty that is inherent in decision making and post-hoc error analysis. They also recognize their own limitations and emphasize their individual roles in preventing mishaps along with noting the importance of attending supervision. The exact role of the ED in the care of the hospitalized patient is not generally agreed upon. The ED rarely receives direct feedback after a mishap occurs, limiting the ability to learn from events, and perhaps further compromising patient care as the new care team does not seek a more complete story.

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