Cause-and-effect Analysis of Risk Management Files to Assess Patient Care in the Emergency Department

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Abstract

Objectives: Identifying the etiologies of adverse outcomes is an important first step in improving patient safety and reducing malpractice risks. However, relatively little is known about the causes of emergency department–related adverse outcomes. The objective was to describe a method for identification of common causes of adverse outcomes in an emergency department. This methodology potentially can suggest ways to improve care and might provide a model for identification of factors associated with adverse outcomes. **Methods:** This was a retrospective analysis of 74 consecutive files opened by a malpractice insurer between 1995 and 2000. Each risk-management file was analyzed to identify potential causes of adverse outcomes. The main outcomes were rater-assigned codes for alleged problems with care (e.g., failures of communication or problems related to diagnosis). **Results:** About 50% of cases were related to injuries or abdominal complaints. A contributing cause was found in 92% of cases, and most had more than one contributing cause. The most frequent contributing categories included failure to diagnose (45%), supervision problems (31%), communication problems (30%), patient behavior (24%), administrative problems (20%), and documentation (20%). Specific relating factors within these categories, such as lack of timely resident supervision and failure to follow policies and procedures, were identified. **Conclusions:** This project documented that an aggregate analysis of risk-management files has the potential to identify shared causes related to real or perceived adverse outcomes. Several potentially correctable systems problems were identified using this methodology. These simple, descriptive management tools may be useful in identifying issues for problem solving and can be easily learned by physicians and managers. **Key words:** adverse outcomes; risk management; patient safety; emergency department. ACADEMIC EMERGENCY MEDICINE 2004; 11:1035–1041.

Emergency physicians often treat unfamiliar patients with diverse complaints under conditions of time pressure and frequent interruptions. These and other conditions may increase the likelihood of adverse outcomes.[1,2] The Harvard Medical Practice Study found that 3.7% of hospitalized patients experience an adverse outcome, resulting in thousands of potentially preventable patient deaths per year.[3–6] Although only 2.9% of adverse events detected in the Harvard study took place in the emergency department (ED), the investigators attributed 70.4% of these adverse events to negligence and judged that 93% of adverse outcomes in the ED were potentially preventable.

Improving emergency care, ensuring patient safety, and reducing malpractice risk are important goals for medical centers and emergency physicians and their insurers. Identifying the etiologies of real or perceived adverse outcomes is an important first step toward these goals. However, relatively little is known about risk factors associated with adverse outcomes in the emergency setting. Various methods, including autopsy review, closed claim analysis, and diagnosis-specific patient chart analysis, have been used to assess errors and malpractice in the ED.[7–11] Unfortunately, research to date has not concentrated on common causes of ED adverse outcomes.

Although ED administrators typically investigate adverse outcomes and review them in various quality assurance formats, a case-by-case analysis does not always promote improvements in patient safety.[12] Aggregating data from many incidents may permit more effective identification of concerns and problem processes.[8,13] The objective of this study was to

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systematically examine ED risk-management files to assess the presentations, causes, and characteristics of real or perceived adverse outcomes. Risk-management files were used because they are more numerous than lawsuits[14] and provide richer information than medical records at less cost,[15] thereby making our analysis more likely to reveal recurring and underlying issues. We aimed to answer the following specific questions: 1) What were the chief complaints of patients who allegedly experienced adverse outcomes? 2) What appeared to be the common general causes of adverse outcomes? 3) What were the significant specific factors involved in these cases? Answers to these questions may suggest opportunities for system improvement and provide a useful model for other centers desiring a method to identify factors that are associated with adverse outcomes.

METHODS

Study Design. This was a structured retrospective review of consecutive risk-management records from a single institution. The institutional review board reviewed and approved this project as exempt from informed consent.

Study Setting and Population. All patients were treated in an urban academic ED system located in the southeastern United States. The hospital is a Level 1 trauma center and provides tertiary care to a population of approximately one million people. The hospital has both pediatric and adult EDs. Total ED volume was about 60,000–70,000 patient visits per year during the time period of this study. Approximately 45% of patients are seen in the pediatric ED. Chest pain is the chief complaint of 6% of adult patients, and 7% of adults are seen for psychiatric emergencies. The ED is staffed by attending physicians, emergency medicine residents, residents from other services, and medical students. All patients are seen by an attending emergency physician.

Study Protocol. The raw data for this project were taken from 74 consecutive ED-related files opened by a medical malpractice insurer between January 1995 and December 2000. Files arise from patient complaints, incident reports, and threatened or served lawsuits. The insurer screens these reports and then opens files in instances judged worthy of further investigation due to potential liability or the need to defend threatened claims. Only a small percentage of patient complaints and incident reports generate a claims file. All claims files were included. Risk-management files contain a summary of the alleged adverse event and a copy of relevant medical records. They may also include summaries of interviews with the personnel involved, expert medical and legal opinions, and any other material pertinent to the event. Files associated with post-ED inpatient care were not included in this study. All available information was reviewed in addition to the medical record.

Measurements. Case files were distributed to and initially evaluated by individual members of a team that included an ED nurse manager, an ED staff nurse, two nurse-trained risk-management claims investigators, two first-year medical students, and a PhD researcher. The risk managers and PhD researcher had previous experience with the method of cause-and-effect analysis[16] and taught the others how to apply the technique via four hours of training using actual case examples and feedback. In this method, which uses Ichikawa or "fishbone diagrams,"[17] a reviewer identifies the alleged adverse event and identifies all actions, events, and environmental circumstances that helped explain why the event may have occurred and attempts to rule out factors that likely did not contribute to the adverse outcome. Given the very sensitive nature of the risk-management data and to emphasize its use for quality improvement purposes, all research team members signed a strict pledge of confidentiality.

Cause-and-effect diagrams (or "fishbone diagrams") were created for each case to depict relationships between an adverse event and its contributing factors.[17] Figure 1 shows a fishbone diagram of a fictitious case composed of elements drawn from many cases. In this example, a patient was discharged from an ED with an undiagnosed pneumothorax in part because of diagnostic, staffing, and communication problems.

Next, the reviewer for each case assigned codes to the apparent contributing causes from a list of 120 descriptions that identify a specific type within general categories of potential causes. Codes were drawn from a list of malpractice claims description codes adapted from the Harvard Risk Management Foundation Allegations of Negligence.[18] For example, if review of a file suggested that an adverse event had occurred in part because a physician did not sufficiently explain warning signs warranting a return to the ED, the numerical code for "inadequate discharge instruction" from the list of communication-related items was assigned to the case.

The reviewer presented each case analysis to the review team in order to reach a professional consensus about the apparent cause(s) of the outcome. The team reviewed the file together and challenged the reviewer to support his or her code assignments while offering alternate explanations for discussion until reaching a consensus about the apparent cause(s) of the outcome. Thus, causation assignment potentially could change following group discussion. Disputes or uncertainty about specific code assignments were resolved by the PhD researcher and risk managers to ensure consistency with previous work using this method. Interrater reliability was not assessed because

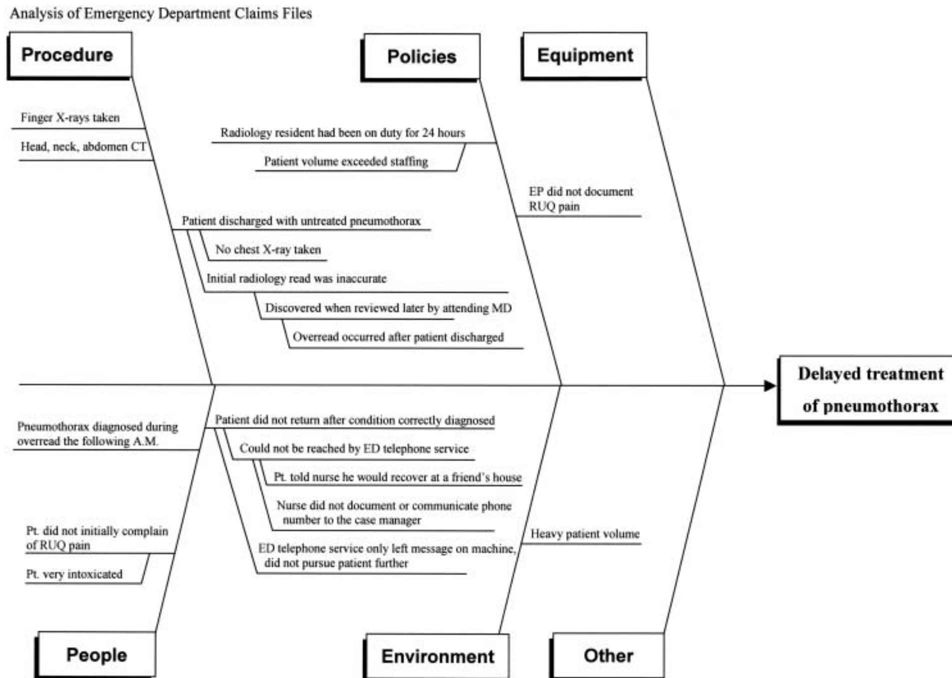

Figure 1. A hypothetical case of a 45-year-old intoxicated man involved in a motor vehicle crash who presented at 2 AM following helicopter transport. The cause-and-effect diagram depicts aspects of his care and the adverse outcome following the failure to diagnose a pneumothorax.

group consensus was used to determine the causes of the outcome.

Data Analysis. The codes for each case were collected in a spreadsheet (Microsoft Excel; Microsoft Corp., Redmond, WA) and analyzed with descriptive statistics (frequency counts and proportions). We also recorded the patient's reason for presentation and the consultant services involved.

RESULTS

Cases were grouped by chief complaints to determine whether ED adverse outcomes clustered around specific groups of patients (Table 1). Four types of patient presentation accounted for 73% (57 of 74 cases) of all files: injuries (28%), abdominal/pelvic complaints (23%), infections (14%), and psychiatric emergencies (12%). Chest pain and headache, two presentations typically believed to be at high risk for adverse outcomes, each accounted for only 4% of files.

The reviewers identified potentially preventable causes of the alleged adverse outcomes associated with each file. In 92% of cases ($n = 68$), reviewers identified at least one contributing cause. In the remaining 8% of cases, reviewers acknowledged the presence of an undesired outcome but could not identify a preventable underlying cause.

Table 2 shows the general categories of underlying or contributing causes for the 74 cases. Because reviewers often identified issues from multiple categories within a single file, category percentages are independent and their sum exceeds 100%.

The most common single category was failure to properly diagnose, a problem found in 45% of the files. Within this category, a wide variety of specific types of diagnostic failure was found. Incorrect initial interpretation of radiographs, however, was found to be a major diagnostic-related factor associated with these files. Initial radiology resident readings of radiographs, subsequently overread by a faculty radiologist, contributed to 24% of adverse outcomes (18 cases) and were the sole problem identified in 13 of those cases. The remainder of diagnostic issues appeared diverse, isolated, and unconnected to common systems issues. They typically involved the

TABLE 1. Classes of Emergency Department Patient Presentations in 74 Claims Files

Patient Presentation	No. of Cases	%
Injury	21	28
Abdominal/pelvic	17	23
Infections	10	14
Psychiatric	9	12
Chest pain	3	4
Back pain	3	4
Neurologic	3	4
Headache	3	4
Shortness of breath	2	3
Failure to thrive	2	3
Other (testicular torsion, vaginal bleeding, cancer complication)	3	4

TABLE 2. General Categories and Specific Causes of Adverse Outcomes

Cause Category	No. of Cases (%)
Communication	22 (30)
Between patient and caregiver	8 (11)
Among caregivers	7 (9)
Upsets patient, no effect on outcome	6 (8)
Other	5 (7)
Diagnosis	33 (45)
Misdiagnosis	15 (20)
Delayed diagnosis	15 (20)
Failure to order test	7 (9)
Other	10 (14)
Care and treatment	14 (19)
Continuity of care	3 (4)
Failure to monitor patient	3 (4)
History overlooked	2 (3)
Premature discharge	2 (3)
Delay in obtaining consult	2 (3)
Other	7 (9)
Patient behavior	18 (24)
Supervision	23 (31)
Resident supervision	21 (28)
Physician coverage	14 (19)
Other	2 (3)
Documentation	15 (20)
Incomplete documentation	8 (11)
Inconsistent documentation	2 (3)
Discharge instructions	2 (3)
Other	3 (4)
Administration	18 (24)
Failure to follow policy	7 (9)
Lack of policy or protocol	4 (5)
Inadequate staffing	5 (7)
Other	7 (9)
Medication error	4 (5)
Equipment issues	4 (5)
Blood/IV issues	3 (4)
Other	12 (16)
No issue identified	6 (8)

Specific causes are independent, and their sums may exceed the category total. For instance, multiple failures of communication were detected in several case files.

failure to recognize warning signs of serious disease on initial evaluation, such as underestimating the seriousness of a headache or abdominal pain.

Supervision-related issues were found to be a problem in 31% of the files. The majority of these were related to radiology resident supervision. Supervision of ED-based residents appeared at issue in 10% of cases. Although these cases varied greatly, they shared situations in which residents did not present findings or treatment decisions to attending physicians in a timely fashion. In some circumstances, this was complicated by a resident's lack of familiarity with a procedure or policy. For example, one psychiatric patient was inappropriately involuntarily admitted without review by the attending physician because the resident was unfamiliar with the procedure. Although this was not found to be a recurring problem, it illustrates the themes present in supervision issues.

Communication failures were associated with 30% of the files and appeared to contribute directly to an adverse medical outcome in 15 cases (20%). These cases often involved disruptions in the flow of critical information from caregiver to caregiver or between patient and caregiver. In one example, abnormal results from a diagnostic workup initiated in the ED were acknowledged by emergency physicians but not brought to the attention of the inpatient physicians who received the patient. Poor communication that upset the patient or family (but was not relevant to medical outcome) occurred in six cases (8%). In one case, a child died unavoidably in the ED. A parking ticket given during the ED visit and a large bill that arrived two days after the child's funeral compounded the father's distress and anger at the ED. Although these events did not affect the medical outcome, they adversely impacted the family's satisfaction with the care received and provoked the family to question the institution's concern for patients.

Patient behavior contributed to nearly one fourth (24%) of all alleged adverse outcomes. In some cases, appropriate outpatient treatment was prescribed but the patient was noncompliant. Several patients experienced poor outcomes or generated concerns in part because they were too intoxicated to give an accurate history or give consent. Another patient-behavior theme centered on the threat psychiatric patients posed to themselves and others while in the ED.

Lapses related to administration were identified in 20% of files. Failure to follow a policy or the lack of a policy or protocol contributed to an adverse outcome in 14% of cases (e.g., failure to use a chaperone or an interpreter during a diagnostic workup). Seven percent of files contained an interview with involved parties that raised the concern that patient volumes exceeding staff resources may have contributed to an adverse outcome.

Documentation issues were identified in 20% of files. These problems included incomplete documentation (11%) and lack of documented discharge instructions (3%). In two cases, the documentation issue appeared to contribute directly to the adverse outcome. In both of these cases, failures to document significant findings at triage delayed diagnosis and treatment by assigning a triage level less acute than indicated.

Errors in administration of medications and problems with medical equipment were occasionally associated with risk-management file openings. These each accounted for four (5%) of the 74 cases.

DISCUSSION

In this study, we have identified and described common characteristics of patient care given in a cohort of ED patients about whose care a risk management file was generated. Such files are generated for

a variety of reasons, and the fact that a file was opened does not necessarily imply that an adverse event or poor outcome occurred. Nevertheless, either a real or a perceived problem with patient care must have occurred for the file to have been opened. The fact that an adverse event or poor outcome occurred does not necessarily mean that the incident was avoidable. In this study, however, we found that 92% of files generated from the ED at an academic medical center had at least one potentially preventable underlying cause. Although our methods differed from those of Brennan et al.,[3,4] it is nevertheless noted that our study and the Brennan study found almost identical rates of preventable adverse outcomes, pointing to the potential for improvement in the delivery of emergency care. While we found this project to be useful for identifying opportunities for individual and organizational performance improvements at the study institution, our other expectation is that this model can be used by others seeking to supplement existing methods of quality improvement and malpractice risk reduction.

Injuries and abdominal case complaints were common among the files, a finding that likely reflects the patient population at the study institution. On the other hand, the proportion of files opened in cases involving chest pain was lower than that suggested in older studies.[8,10] This finding may be due to nursing and physician education about the management of patients with chest pain and increased use of diagnostic modalities. Alternatively, the study ED might have a lower percentage of patients with chest pain (6%) than other centers. However, the percentage of cases involving psychiatric complaints (12%) was higher than reported elsewhere[19] and is somewhat disproportionate to the volume of psychiatric patients seen in the ED (7%).

Like other studies, we found that errors regarding diagnosis and treatment plans were very common.[8,11] Review on a case-by-case basis likely would give the appearance that these were idiosyncratic events resulting from individual slips and lapses. However, our pooling of aggregate data revealed clusters of common issues that suggested opportunities for system-level improvement. The most obvious example was our finding that the initial radiology resident interpretations of radiographs later overread by the attending radiologist contributed to a significant number of risk-management files. This was consistent with other researchers' reports that problems with initial radiographic interpretations may contribute to treatment changes, adverse outcomes, and malpractice claims in the ED.[20–22] This is also an excellent example of how practice patterns of other services can affect care provided in the ED. Such findings can drive quality improvement programs designed to improve the reliability of radiographic reports, improve interdepartmental communication, and engender shared responsibility for emergency patients. For example, problems with radiology resident interpretation of radiographs led to the implementation of a system of 24-hour attending radiology coverage in the study ED.

Problems with communication were, as expected, a significant problem in risk-management files and appeared to contribute to an adverse outcome or precipitated file opening in almost one third of cases. Previous studies have identified communication issues as a significant factor in ED patient dissatisfaction.[23] Failures of communication between caregivers were a factor in 11% of the files we reviewed. The study ED has now implemented dictation of all ED charts, which are rapidly accessible on the hospital computer system for review by primary care providers, consultants, and admitting clinicians. Others have shown that the use of computerized physician order entry can reduce the rates of medication-related errors and improve other processes.[24] The study ED has now implemented computerized physician order entry in the pediatric ED and is in the process of implementing it in the adult ED. Teamwork tools such as those developed for use in the ED by Risser et al.[25] may also improve information flow and help prevent lapses. All members of the study ED, including physicians, nurses, receptionists, and care partners, are now required to attend crew-training sessions similar to those used by aviation flight crews. These sessions focus primarily on communication between team members. [26]

Poor communication does not always lead to a poor outcome but may lead to notable patient anger or even in some cases the filing of lawsuits.[27,28] In this study, we noted a number of cases with poor communication that was not relevant to the outcome but that upset patients or families. While problems with caregiver-to-patient communication are very complex and have many manifestations, this study helped lead to increased use of case managers who help facilitate follow-up and serve as a contact person for discharged patients.

Our data also showed that patient behavior was a factor in 24% of adverse outcomes. Patient behavior is impossible to control before presentation and can be hard to predict in the ED. Although some adverse outcomes may not be preventable when the patient's behavior is a factor, it is important to maintain a respectful approach, good communication, safe boundaries, and careful documentation. Identifying this issue and its implications, such as the need for security personnel stationed nearby, is an important first step in reducing risk. In fact, the study ED has now changed its policies regarding police monitoring of psychiatric patients to reflect problems with this patient group.

We identified adverse outcomes whose apparent causes were disparate but whose underlying causes signaled resource issues. In these cases, patient volumes exceeded staff (7%) or equipment and bed

resources (4%). When patient volumes exceed capacity for timely delivery of care, delays in care may occur and physicians may feel pressure to act with incomplete data or discharge patients prematurely. Subsequent adverse outcomes might later be attributed to errors of judgment made with the available resources. Problems with patient volume have led to a number of changes in the study ED, including the development of a new fast-track area and the use of a nurse facilitator to optimize bed management.

The elimination of medication errors is currently a major focus point in error reduction in the ED and other health care settings. This study found that only a small proportion of claims files were related to medication errors, although it is probable that these types of errors were much more prevalent. It is likely that most of these errors led to no permanent injury. Thus, this type of error might be unlikely to result in the generation of a malpractice claim file despite being very prevalent.

The extent to which these data generalize to other institutions is unknown. Regardless of the data's generalizability, the more important question is how physicians, risk managers, insurers, and administrators can meet their quality improvement goals by obtaining such data from their own EDs. Note, however, that in a litigious environment, any quality improvement–related uses for these data depend on their protection from legal discovery. Justifying this protection in turn depends on actually using such data for identifying and working to overcome common causes of adverse outcomes. Other ED groups will experience different rates and causes of the real and perceived adverse outcomes associated with risk-management files. This is not a limitation of our study, but a reflection that this review methodology may uncover system problems that are unique to other institutions.

LIMITATIONS

This project has several limitations. Risk-management files are dependent on the accuracy and completeness of investigators' reports. Many of the issues we identified (e.g., medication errors and certain problems with documentation) were very rare, considering both the volume of services provided and the number of risk-management files opened over the target period. Nevertheless, these types of problems almost certainly represent only part of a larger problem and thus are worth considering as opportunities for process improvement. A corollary limitation is that underlying issues may not emerge or allegations may prove groundless. However, the insurer participating in this project had an excellent history of fully investigating adverse outcomes and identifying events that could lead to lawsuits. Risk managers learn about as many adverse events as possible, but we do not know the completeness of detection. Important patterns would be missed if patient outcomes did not exceed the subjective level of seriousness used by ED personnel and patients to make reports or by risk managers to trigger file openings. The effort directed to investigating incidents undoubtedly varied. Nevertheless, the potential problem patterns we uncovered are consistent with those described in studies of medical malpractice, and it is likely that system-level etiologies are similar across medical institutions.[8,11] As mentioned above, this methodology may also be limited in detecting some types of systems problems, such as noninjurious medication errors.

CONCLUSIONS

Emergency physicians and ED leaders can use the research methods applied in this study to investigate causes of adverse outcomes and medical errors in their own EDs. Simple, descriptive management tools such as cause-and-effect diagrams and coding systems can be useful in identifying issues for problem solving. Physicians and managers can learn the methods quickly. Involvement of emergency physicians is important because patient safety is unlikely to improve unless the physicians understand the causes of adverse outcomes and provide leadership in quality improvement. Collaborating with risk managers and encouraging broad departmental involvement in patient safety and quality improvement research will have great potential for leading to safer policies, establishing more cooperative environments, and reducing errors and unexpected adverse outcomes; if malpractice risks are reduced, the efforts may prove cost-effective.

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