



Original Contribution

Assessing the rates of error and adverse events in the ED^{☆,☆☆}

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ABSTRACT

Background: The incidence of errors and adverse events in emergency medicine is poorly characterized.

Objective: The objective was to systematically determine the rates and types of errors and adverse events in an academic, tertiary care emergency department (ED).

Methods: Prospective data were collected on all patients presenting to a tertiary-care academic medical center ED with an annual census of 55,000 patients between January 2009 and November 2012. Cases of patients meeting predetermined criteria were systematically identified by an electronic medical record system. Criteria for review included patients who (1) returned to the ED within 72 hours and were admitted on their second visit, (2) were admitted from the ED to the floor and then transferred to the intensive care unit (ICU) within 24 hours, (3) expired within 24 hours of ED arrival, (4) required airway management, or (5) were referred to the QA committee as the result of complaints. Cases were randomly assigned to individual physicians not involved with the care. All cases were reviewed using a structured electronic tool that assessed the occurrence of error and adverse events. Institutional review board jurisdiction was waived by the Beth Israel Deaconess Medical Center IRB.

Results: During the study period, 152,214 cases were screened and 2131 cases (1.4%) met prespecified criteria for review. The incidence of error in these cases was 9.5% (95% confidence interval [CI], 8.3%–10.8%), representing an overall incidence of 0.13% among all ED patients. In cases that involved error, 50.5% occurred among patients who returned to the ED within 72 hours; 17.3% occurred among floor-to-ICU transfers; 5.4% occurred among mortality cases; 2.0% occurred among airway cases; and 24.8% occurred among cases referred as the result of complaints. The incidence of adverse events in the reviewed cohort was 8.3% (CI, 7.2%–9.6%), representing an overall incidence of 0.11% among all ED patients. In cases that involved adverse events, 48.6% occurred among patients who returned to the ED within 72 hours; 16.4% occurred among floor-to-ICU transfers; 9.0% occurred among mortality cases; 1.1% occurred among airway cases; and 24.9% occurred among cases referred as the result of complaints.

Conclusion: Although the overall incidence of error and adverse events in EDs is low, the likelihood of such events is markedly increased among patients who return to the ED within 72 hours, among patients who require floor-to-ICU transfer within 24 hours, and among those whose cases come to attention as the result of complaints.

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1. Introduction

Errors and adverse events have been recognized as a major problem in medicine since the 1990s [1,2]. Despite the Institute of Medicine's 2000 call to action with the publication of *To Err Is Human* and subsequent works, the burden of medical errors remains significant [3,4]. Recent data suggest that many adverse events still go unreported and the incidence of adverse events attributable to error may be increasing [5,6].

Robust data on the incidence of error and adverse events are needed to mitigate this problem, yet the evidence base remains poor, especially

in the field of emergency medicine. A 2013 systematic review by Stang et al attests to the dearth of high-quality data on the incidence of errors and adverse events in the emergency department (ED) [7]. In a search of 11,624 citations, they were only able to identify 10 relevant articles, 8 of which were observational in design, all of which were of low to moderate methodological quality.

The objective of the present study was to systematically determine the rates of errors and adverse events among patients presenting to an academic, tertiary care ED.

2. Methods

2.1. Study design, goals, and oversight

This was a prospective cohort study of all patients presenting to a tertiary care academic ED (annual census of 55,000) between January 2009 and November 2012.

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The study's goals were to determine the overall incidence of error and to determine the incidence of error within the following prespecified categories of patients: (1) 72-hour returns to the ED, (2) floor-to-ICU transfers within 24 hours of hospital admission, (3) deaths within 24 hours of hospital admission, and (4) patients identified by complaints. Oversight was provided by the ED quality assurance (QA) committee, which is integrated into the hospital's overall QA operations through formal processes and procedures as illustrated in the Figure.

2.2. Selection of participants

All patients presenting to the ED within the study period were eligible for inclusion. With the exception of cases identified by patient or complaints, all cases were identified systematically according to the prespecified criteria noted above by an electronic QA dashboard that interfaced with a commercially available health information system (HIS) system [8]. For the cases that originated by a complaint, senior leadership made a subjective decision about whether or not to forward it for a formal QA review.

2.3. Data collection and processing

Two physician-reviewers who were not involved in the care of the study patients reviewed each case independently. Each case was scored according to an 8-point Likert scale to determine whether: (1) errors were made by the ED team; (2) adverse events occurred; (3) documentation was adequate; (4) resource utilization was appropriate; (5) procedures were performed competently; (6) medical judgment of the ED team was adequate; and (7) care was coordinated appropriately. The types of errors identified were confined to the above categories. Provision was made for free-text comments by the reviewers. A QA committee consisting of physicians, nurses, hospital QA representation, and ancillary staff adjudicated each case in a manner consistent with our previous work [9]. Confidence intervals (CIs) were generated using the CONFIDENCE function of Microsoft Excel 2010.

3. Results

3.1. Characteristics of cases

To facilitate analysis, cases were normalized to International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes

Table 1
Characteristics of cases reviewed

| ICD-9 code description | ICD-9-CM | Cases | % of total |
|---|-----------|-------|------------|
| Abdominal pain unspecified site | 789.00 | 356 | 13.3% |
| Shortness of breath | 786.05 | 128 | 4.8% |
| Nausea and vomiting | 787.0 | 106 | 4.0% |
| Unspecified chest pain | 786.5 | 104 | 3.9% |
| Unspecified accidental fall | E888.9 | 103 | 3.9% |
| Fever, unspecified | 780.6 | 101 | 3.8% |
| Unspecified intracranial hemorrhage | 432.9 | 96 | 3.6% |
| Pain in limb | 785.1 | 80 | 3.0% |
| Cellulitis and abscess | 528.3 | 79 | 3.0% |
| Altered mental status | 780.97 | 78 | 2.9% |
| Lumbago | 742.2 | 78 | 2.9% |
| Cardiac arrest | 427.5 | 76 | 2.8% |
| Other malaise and fatigue | 719.4 | 73 | 2.7% |
| Headache | 784.0 | 68 | 2.5% |
| Hemorrhage of gastrointestinal tract unspecified | 578.9 | 51 | 1.9% |
| Coma | 780.01 | 48 | 1.8% |
| Acute alcoholic intoxication in alcoholism unspecified drinking... | 303.00 | 46 | 1.7% |
| Epilepsy, unspecified | 345.9 | 40 | 1.5% |
| Dizziness and giddiness | 788.1 | 39 | 1.5% |
| Acute respiratory failure | 518.81 | 35 | 1.3% |
| Swelling of limb | 729.81 | 35 | 1.3% |
| Acute but ill-defined cerebrovascular disease | 436 | 31 | 1.2% |
| Acute pharyngitis | 462 | 27 | 1.0% |
| Laboratory examination | V72.6 | 25 | 0.9% |
| Hematuria, unspecified | 599.70 | 23 | 0.9% |
| Syncope and collapse | 780.2 | 20 | 0.7% |
| Suicidal ideation | V62.84 | 18 | 0.7% |
| Accidental poisoning by drugs, medicinal substances, ... | E850-E858 | 17 | 0.6% |
| Cervicalgia | 723.1 | 17 | 0.6% |
| Motor vehicle traffic accident involving collision with other vehicle | E814.0 | 17 | 0.6% |
| Cough | 786.2 | 15 | 0.6% |
| Aortic aneurysm and dissection | 441 | 14 | 0.5% |
| Diarrhea | 787.91 | 14 | 0.5% |
| Allergy, unspecified | 995.3 | 13 | 0.5% |
| Epistaxis | 784.7 | 13 | 0.5% |
| Other abnormal glucose | 790.29 | 13 | 0.5% |
| Pain in joint | 719.4 | 13 | 0.5% |
| Hemiplegia and hemiparesis | 342 | 12 | 0.4% |
| Hypotension unspecified | 458.9 | 12 | 0.4% |

[10,11]. The characteristics of the most common types of cases (ie, the 39 ICD-9 code descriptions that accounted for 80% of all cases) appear in Table 1. Among these, abdominal pain was the most common

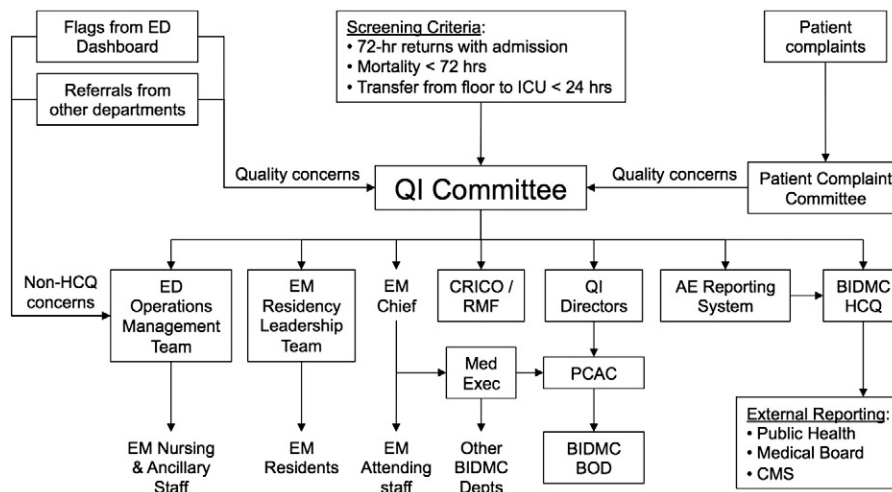


Figure. Key: adverse events (AE), Beth Israel Deaconess Medical Center (BIDMC), Board of Directors (BOD), Centers for Medicare & Medicaid Services (CMS), Controlled Risk Insurance Company (CRICO), ED (ED), emergency medicine (EM), Health Care Quality (HCQ), Patient Care Assessment and Quality Committee (PCAC), Quality Improvement (QI), Risk Management Foundation (RMF).

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