Medical Injury Identification Using Hospital Discharge Data

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Abstract

Objective: Determine the feasibility of using routinely collected hospital data for medical injury surveillance. Methods: The development, validation, and testing of screening criteria for medical injury was based on International Classification of Disease code discharge diagnoses, using 2001 patient data from Wisconsin hospitals. Outcomes included sensitivity; specificity; rate of medical injury per the criteria; and impact of injury on length of stay and hospital charges. **Results:** Compared with medical records review, the sensitivity of the screening criteria was 59.9 percent and the specificity was 97.4 percent. The rate of medical injury was 133.3 per 1,000 hospitalizations.* Patients with a medical injury had a 14.6 percent longer hospital stay and incurred 18.5 percent more in hospital charges than patients without a medical injury. **Conclusions:** Screening criteria applied to discharge diagnoses identify frequently occurring medical injuries with substantial impact. These criteria are being used to monitor patterns of medical injury in select Wisconsin hospitals to better determine the utility of using hospital discharge data to focus patient safety efforts.

Introduction

A report from the Institute of Medicine (IOM) in 2000, *To Err Is Human*,[1] focused public attention on the issue of patient safety and highlighted the need for better data on adverse event occurrences. The IOM report called for evaluations of alternative approaches for implementing patient safety reporting systems. While the IOM report primarily emphasized error reporting systems, focusing on the injuries or adverse events that result from medical care (rather than errors of negligence) may be more reliable, engender less defensiveness, and promote a greater emphasis on patient outcomes.[2]

Leape recently summarized[3] existing national- and state-based systems for reporting adverse events. National systems are voluntary and most focus on relatively few types of reportable events, such as adverse drug events or nosocomial infections. Twenty states have developed mandatory patient safety reporting systems, but these systems vary widely by the types of events to be

* Because a patient can have medical injuries in more than one category, the sum of injured patients in each category is greater than the total number of patients (see Table 2).

reported and whether the reported data is disseminated to the public. Most of the reports made to these systems are not investigated or analyzed in detail.

Surveillance is a cornerstone of the public health approach to disease and injury prevention.[4, 5] A core principle in the design of surveillance systems maintains that any system requiring special effort on the part of the individual making the report will result in incomplete reporting. Therefore, surveillance systems that use information collected for other purposes tend to provide a more complete description of the adverse event.[5] All of the current national- and state-based systems described by Leape[3] require some active effort on the part of an individual to file a report. Not surprisingly, most of these systems have produced adverse event reports at rates substantially lower than indepth patient safety studies based on a detailed review of medical records.[6, 7, 8] The one active surveillance system that appears to have a high level of ascertainment of adverse events is the Centers for Disease Control's (CDC) National Nosocomial Infection Surveillance System, which is based on reports from hospital infection control practitioners, who participate voluntarily.

A potential source of routinely collected patient safety surveillance information is hospital discharge data. Many state health agencies routinely collect summary data for all inpatients discharged from non-Federal, acute care hospitals using information taken from the Health Care Finance Administration Uniform Billing Report Form (UB-92). The UB-92 data includes International Classification of Disease[9] (ICD-9-CM) *N*-codes and, where relevant, *E*-codes. In cases of injury, *E*-codes attribute the injury to an external cause, such as therapeutic misadventure. *N*-codes describe the nature of the injury, such as a complication particular to a specific surgical procedure, but make no attempt to attribute the cause of the injury.

Because they are collected primarily for administrative purposes, hospital discharge data have important limitations in the depth of clinical detail they provide. At the same time, they are universally available in many states and are inexpensive when compared with an active reporting system. A key determinant of the utility of hospital discharge data for patient safety reporting is how effectively adverse events can be identified from ICD-9-CM *E*-code and *N*-code diagnoses.

There are two systems relevant to patient safety reporting that make use of hospital discharge data: the Complications Screening Program (CSP)[10] and the Agency for Healthcare Research and Quality - Patient Safety Indicators (AHRQ-PSI).[11, 12] Both of these systems focus on assessing the provided quality of care during a specific inpatient hospitalization. Accordingly, they attempt to exclude patient safety problems that occur prior to the index hospitalization, such as outpatient care or care provided during a previous hospitalization. Each of the systems also focus on a relatively small number of indicators designed to reflect a high probability of poor care quality during the hospitalization. In contrast, major studies based on chart reviews have attempted to provide a more comprehensive assessment of patient safety problems by including the full spectrum of adverse

events (i.e., those that occurred during the index hospitalization, as well as those caused by medical care prior to the index hospitalization).[6, 7, 8]

In this report, we describe the development of comprehensive surveillance screening criteria for medical injury based on ICD-9-CM diagnostic codes,[9] and assess the accuracy of the criteria in comparison with the criterion standard of medical record review. To evaluate the utility of the criteria for medical injury surveillance, we applied the screening criteria to a routinely collected administrative database of all patients discharged from acute-care, non-Federal Wisconsin hospitals during 2001.

Methods

Development of medical injury surveillance criteria

For the purpose of this patient safety surveillance system, medical injury has been defined as any untoward harm associated with a therapeutic or diagnostic health care intervention.[2] The qualifier "untoward" excludes damage to the body that is an inextricable component of the intervention, such as a surgical incision. To develop comprehensive surveillance or screening criteria for medical injuries, we reviewed the ICD-9-CM codes to identify *N*-codes or *E*-codes indicative of a medical injury. An electronic version of the 1998 ICD-9-CM update was obtained to facilitate identification of potential medical injury codes through searches for keywords such as "complications," "iatrogenic," "poisoning," and "adverse." In addition, a physician reviewed each rubric in the ICD-9-CM to identify potential medical injuries not associated with any of the keywords. Electronic lists of ICD-9-CM codes to be included and excluded from the medical injury surveillance criteria then were circulated to other members of the research team, including physicians, nurses, statisticians, epidemiologists, and a medical technologist. Additional codes were made part of the surveillance criteria on the basis of this review.

Medical injuries were classified into four broad categories: (1) drugs; (2) procedures; (3) devices, implants, or grafts; and (4) radiation. These categories were further divided into 40 subcategories to indicate the cause of injury more precisely. The classification scheme and the ICD-9-CM criteria for each of the categories and subcategories are listed in the Appendix.*

Case definition

In this study, a discharge was considered to fulfill the criteria for medical injury if any of the nine diagnosis fields or the special *E*-code field contained any one of the codes listed in the surveillance criteria. A given patient discharge could be associated with more than one type of medical injury.

*Appendixes cited in this report are provided electronically at www.mcw.edu/medicalinjury.

Validation

To validate the medical injury surveillance criteria, we compared identification of medical injury based on hospital discharge diagnoses to the "gold standard" of a detailed medical records review. Medical records of 100 patients discharged in 1999 from a single teaching hospital were included in the validation study. A random sample of 50 medical records for patients who met the surveillance criteria based on discharge diagnoses, and 50 records of patients who did not meet the criteria were identified and subjected to a blinded review. An experienced research nurse abstracted the relevant data from the records. Two physicians then rated each patient for the occurrence of any medical injury, based on the abstracted data and without any knowledge of the injury classification developed from the screening criteria. In the event of a question, the physicians reviewed the entire medical record for the patient admission. Disagreements were resolved by a third physician, used in only three cases. The reviewers' response to the question, "Did this patient experience untoward harm as a result of a diagnostic or therapeutic healthcare intervention?" was the criterion used to produce the gold standard classification of medical injury for the medical records review. Sensitivity and specificity (and the 95 percent confidence intervals) were adjusted for the different proportions of medical records reviewed, among those patients who met the surveillance criteria and those who did not.[13]

Study population

The Wisconsin Bureau of Health Information (BHI) collects, edits, and publicly disseminates Form UB-92 data on all patients discharged from non-Federal hospitals in the state. To better assess the utility of the surveillance criteria in identifying medical injuries, we studied discharges from Wisconsin's 132 general, acute care hospitals, during 2001. Newborn delivery discharges were excluded for the purposes of this analysis.

Statistical analysis

Rates of medical injuries were calculated as the number of discharges with the particular type of medical injury, divided by the total number of discharges. Statistical analysis was performed using Stata® software.[14] Rate ratios and 95 percent confidence intervals for specific discharge outcomes in patients with a medical injury compared to those without injuries were calculated using standard methods for categorical data.[14]

The impact of medical injury on length of hospital stay (LOS) and on hospital charges was calculated using linear regression on log transformations of the LOS and charge data for patient discharges with and without medical injury. For analytic purposes, we added one day to the routinely reported length of stay so that the measure indicates the number of days for which the patient was hospitalized. Therefore, patients admitted and discharged on the same day were considered to have had a one day length of stay. Mean excess LOS and percent of LOS increase compared to discharges without the specified medical injury were

determined after adjusting for APR–DRG (All Patient Refined–Diagnosis Related Groups) disease classification,[15] indices for risk of mortality, and severity of illness calculated by the APR–DRG medical information system. Because the indices for risk of mortality and severity of illness were intended to adjust for the severity of the underlying illness in patients with and without a medical injury, they were calculated after excluding all medical injury-related diagnostic codes. "Hospital of discharge" also was used as a random effect variable in the regression model, to account for intrahospital similarities. Predicted cumulative excess LOS for each category of medical injury was calculated as the product of the mean excess LOS and the number of cases in the specific category. Less than 0.2 percent of patients could not be assigned a severity of underlying illness score, primarily because after excluding these medical injury codes, no valid codes representative of the principal diagnosis remained. Those patients who could not be assigned a severity of illness score were dropped from analyses of the length of hospital stay. In analyses of hospital charge data, those patients who could not be assigned a severity of illness score, who had a principal diagnosis of "V650" (Healthy person accompanying sick person), or who had no hospital charges were dropped. This study methodology was reviewed and approved by the Medical College of Wisconsin's Institutional Review Board.

Results

Validation

The medical records review confirmed the presence of a medical injury in 45 of the 50 patients (90 percent) who met the surveillance criteria, and determined that 7 of the 50 patients (14 percent) who did not meet the screening criteria had, in fact, experienced a medical injury (Table 1). Using the chart review as the gold standard for medical injury identification, the screening criteria based on discharge diagnoses had a sampling-adjusted sensitivity of 59.9 percent (95 percent confidence interval: 42.8 percent to 75.0 percent) and specificity of 97.4 percent (95 percent confidence interval: 94.1 percent to 98.8 percent).

Table 1. Validation of medical injury surveillance criteria

		Medical chart review		
		Injury	**No Injury**	*Total*
Screening criteria	Injury	45	5	50
	No Injury	7	43	50
	Total	**52**	**48**	

Sensitivity* = 59.9% (95% confidence interval: 42.8%– 75.0%)
Specificity* = 97.4% (95% confidence interval: 94.1%– 98.8%)
* Adjusted for selection of the verification sample

Incidence and nature of medical injuries

After applying the screening criteria to the 558,389 eligible discharges from the selected Wisconsin acute care hospitals, we found that 74,447 patients experienced a medical injury—a rate of 133.3 per 1,000 hospital discharges (Table 2). The surveillance criteria flagged more than 33,000 discharges with a patient injury from a medical or surgical procedure; more than 31,000 discharges with injuries due to a drug or biologic agent; more than 16,000 discharges with injuries due to failure or complications of a device, implant, or graft; and more than 1,400 discharges with injuries due to radiation.

Table 2. Rate of medical injury in patients discharged from Wisconsin general, acute care hospitals, by category, 2001

Category	Cases	Rate/1000 discharges	Mean excess LOS (days)*	Percent increased LOS*	Cumulative excess LOS**
Drug	31,382	56.2	0.47	8.6	14,611
Device, implant, or graft	16,267	29.1	0.87	16.0	14,093
Procedure	33,225	59.5	1.10	20.5	36,710
Radiation	1,469	2.6	0.69	12.7	1,015
Any injury	74,447	133.3	0.77	14.5	57,619

* Mean excess length of stay (LOS) and percent increased LOS compared to discharges without the specified medical injury after adjusting for APR–DRG (All Patient Refined - Diagnosis Related Groups), risk of mortality and severity of illness (see Methods section).
** Cumulative excess LOS is the product of cases and mean excess LOS.
Note: The number of injured patients in each category sum to more than the total number of injured patients because patients can have a medical injury in more than one category.

A more detailed categorization of the nature of the medical injuries is provided by the 40 subcategories shown in Table 3. The table provides the number and rate of occurrence in each category, as well as the excess length of hospital stay (in days) associated with each subcategory.

Both *E*-codes and *N*-codes were useful for identifying medical injuries. Of the 74,447 patient discharges with medical injuries, 22,586 (30.3 percent) were identified only through an *E*-code; 31,117 (41.8 percent) were identified only through an *N*-code; and 20,744 (27.9 percent) had both *E*-code and *N*-code diagnoses indicative of the injury. The relative utility of *N*-codes and *E*-codes varied substantially among the different types of medical injuries. *E*-codes identified 98.5 percent of the medical injuries due to drugs and 78.9 percent of those due to radiation, but only 22.5 percent of injuries due to medical or surgical procedures and 26.1 percent of those linked to devices, implants, or grafts. Conversely, *N*-codes identified only 22.1 percent of medical injuries due to drugs and 53.9 percent of those due to radiation, but 95.5 percent of injuries due to medical or surgical procedures and 89.3 percent of those associated with devices, implants, or grafts.

Table 3. Rate of medical injury in patients discharged from Wisconsin general acute care hospitals, by subcategory, 2001

Subcategory	Cases	Rate/1,000 Discharges	Mean Excess LOS‡ (days)
DRUGS and BIOLOGICS			
Antibiotics	2,745	4.9	1.27***
Hormones	3,580	6.4	0.70***
Systemic agents	3,825	6.9	0.47***
Agents affecting blood constituents	1,887	3.4	0.77***
Blood products	401	0.7	0.82***
Non-narcotic analgesics, antipyretics, antirheumatics	4,027	7.2	N/A†
Narcotic analgeics	2,483	4.4	0.38***
Anticonvulsants, antiparkinsonism	1,206	2.2	0.36***
Sedatives, hypnotics	2,410	4.3	N/A†
Other psychotropics	2,951	5.3	N/A†
Autonomic nervous system	591	1.1	N/A†
CV drugs	3,637	6.5	0.47***
GI, smooth muscle and respiratory	581	1.0	N/A†
Water, mineral, uric acid	1,772	3.2	0.41***
Anesthesia	540	1.0	N/A†
Other drug complications	538	1.0	N/A†
Specific reaction to unknown drug	1,316	2.4	1.43***
Misc. comp due to unspecified drugs	2,923	5.2	0.02**
All drug-related injuries	31,382	56.2	0.47**
DEVICE, IMPLANT, OR GRAFT			
Cardiac device	1,243	2.2	0.15*
Vascular device	4,630	8.3	1.23***
Orthopedic device	3,892	7.0	0.20***
GU device or implant	1,518	2.7	1.01***
Transplanted organ or body part	1,791	3.2	1.37***
Other comp device	5,321	9.5	0.68***
All device, implant, and graft-related injuries	16,267	29.1	0.87***

Table 3. Rate of medical injury in patients discharged from Wisconsin general acute care hospitals, by subcategory, 2001, cont.

Subcategory	Cases	Rate/1,000 Discharges	Mean Excess LOS‡ (days)
PROCEDURE			
Comp of amputation or other removed organ	2,017	3.6	1.35***
Tracheostomy	263	0.5	0.60***
Formation or a stoma	1,114	2.0	1.03***
GI comp due to procedure	4,554	8.2	1.95***
Cardiac complications	3,470	6.2	0.49***
Vascular complications	2,361	4.2	0.61***
Respiratory complications	3,771	6.8	1.14***
Nervous system comp	1,489	2.7	1.37***
GU complications	1,956	3.5	0.86***
Infection/inflammation	4,203	7.5	2.01***
Hematoma, hemorrhage, seron	4,958	8.9	1.06***
Nonhealing wound	3,657	6.5	1.22***
Misc. comp due to specific procedures	1,080	1.9	0.24***
Misadventures	2,773	5.0	0.84***
Not elsewhere specified complications	6,413	11.5	0.88***
All procedure-related injuries	33,225	59.5	1.10***
RADIATION			
Radiation	1469	2.6	0.69***
All radiation-related Injuries	1469	2.6	0.69***
Total all medical injuries	**74,447**	**133.3**	**0.69*** **

Source: Wisconsin Bureau of Health Information; hospital inpatient discharge data of year 2001
‡ Mean Excess Length of Stay (LOS) for each subcategory of medical injury compared to discharges without the specified medical injury were calculated after adjusting for: APR–DRG (All Patient Refined–Diagnosis Related Groups), risk of mortality and severity of illness—see methods.
† N/A No increased LOS was associated with the subcategory.
* $P < 0.05$
** $P < 0.01$
*** $P < 0.001$

Impact and outcomes

Analysis of the BHI data indicated that medical injuries were associated with a substantial impact among those affected. Compared with those without any such diagnosis, patients with a discharge diagnosis indicating a medical injury stayed in hospitals an average of 0.77 days longer after adjusting for APR–DRG, severity

Table 4. Adjusted length of stay and hospital charges by diagnosis of Wisconsin medical injury inpatients, for 2001***

	Patients with medical injury	Patients without medical injury	Absolute difference	Percent difference***	95% confidence limits
Adjusted length of hospital stay (days)*	6.11	5.34	0.77	14.5%	14.1%–15.0%
Adjusted total hospital charges**	$14,916	$12,587	$2,329	18.5%	18.0%–19.0%

* Sample size for patients with medical injury is 73,485 and for patients without medical injury is 483,840.
** Sample size for patients with medical injury is 73,483, and for patients without medical injury is 483,819.
*** Adjusted for severity of underlying illness, risk of mortality, APR–DRG (see "Methods" section).

of illness, risk of mortality, and hospital of discharge; they also incurred $2,329 in additional hospital charges (Table 4).

Discussion

Surveillance of medical injuries through analysis of routinely collected hospital discharge data appears feasible. Our validation study found that screening criteria based on ICD-9-CM *N*-code and *E*-code discharge diagnoses can identify medical injuries with good sensitivity and specificity, compared with the gold standard of medical record review. Application of the surveillance criteria to all Wisconsin hospital discharges during 2001 indicates that the framework provides an efficient approach to patient safety monitoring that can identify a diverse range of medical injuries. The increase in hospital charges and the length of hospital stay associated with these injuries point to their economic and clinical importance. Moreover, projecting the rate of medical injury found in this study to the 31.7 million discharges from U.S. acute care hospitals during 2000,[16] suggests that more than 3.5 million patients are discharged annually with a diagnosis indicative of a medical injury.

The need for better approaches to monitoring patient safety was highlighted in the Institute of Medicine report *To Err Is Human.*[1] That report called for mandatory reporting of serious patient safety incidents and voluntary reporting of other errors or incidents. Most current patient safety reporting systems focus on incidence of medical error or negligence. Perceived blame and punishment for error, however, may be an incentive for concealment and denial. Barriers to the reporting of errors or negligence include fear of possible legal discovery in malpractice litigation and adverse publicity, which could have economic consequences as severe as those resulting from malpractice damages.[2] In addition, the determination of negligence or medical error often is arbitrary. Interobserver agreement in identifying negligence, for example, appears to be substantially lower than that for identifying injury caused by health care interventions.[2, 6] The criteria evaluated in this report focus on the identification of medical injury—

untoward harm resulting from a diagnostic or therapeutic health care intervention—rather than on error or negligence. We believe this injury prevention approach is a useful complement to other approaches that focus on error reduction.[2]

Health care facilities in Wisconsin are required to submit inpatient discharge data files and ambulatory surgery data files to BHI. Similar datasets exist in a number of other states, which would permit future application of this patient safety reporting system model beyond Wisconsin. For example, AHRQ's Healthcare Cost and Utilization Project (HCUP) compiles similar patient-level discharge data in its Nationwide Inpatient Sample (NIS) and State Inpatient Databases (SID). These datasets extend the capacity for useful comparisons and contrasts.

The application of these medical injury screening criteria to large population-based databases permits public health surveillance of patient safety. Potential uses of public health surveillance systems have been delineated[5] to include estimating the magnitude of a health problem in the population; understanding the natural history of disease or injury; documenting the distribution and spread of health events; testing hypotheses concerning etiology; evaluating control strategies; detecting change in specific health practices; identifying research needs; contributing to epidemiologic and laboratory research; and facilitating planning. These potential applications of surveillance systems all are relevant to the nascent field of patient safety.

Our criteria formed the basis of a randomized trial using Wisconsin hospitals to evaluate the utility of medical injury feedback reports, and the targeted interventions. Each of the 129 Wisconsin general acute-care, non-Federal hospitals that were in operation at the time of randomization were assigned to one of three groups: control (34), feedback report only (65), and intervention (30). In addition to the feedback reports, the intervention group had access to a nurse who assisted in interpreting the reports and implementing patient safety efforts, and the group received manuals detailing evidence-based methods for reducing five specific medical injuries. The reports have been provided at approximately 6 month intervals and cover consecutive 6-month time periods. They contain four tables: (1) number of occurrences, adjusted injury rates per 1000 discharges, percentile ranking among Wisconsin hospitals, and statewide increase in length of stay, for the 4 broad categories; (2) similar details for the 40 additional subcategories of medical injuries; (3) the 10 most frequent events at the institution with the greatest increase in length of stay; and (4) injury rates of 16 subcategories relevant to surgery, using only surgical discharges in the calculation of rates. We are currently refining risk adjustment methods and exploring performance measures based on multilevel modeling for our administrative surveillance data. An evaluation of the impact of the feedback reports is underway.

Few comprehensive studies of patient safety, adverse events, or medical injuries are available to provide a comparison with our results. A landmark study in the patient safety field, the Harvard Medical Practice Study, defined adverse

events as, "injuries caused by medical management and that prolonged hospitalization, produced a disability at the time of discharge or both."[6, 17] Studies in Australia, and in Colorado and Utah, employed similar definitions and included detailed reviews of thousands of medical records.[7, 8, 18] Despite the similarity of methods, however, the estimates of adverse events in these studies range from 2.9 percent to 16.6 percent (Table 5). Our estimate of the overall rate of medical injury is within that range. Our screening criteria identified a higher proportion of patient safety problems due to drugs than in the chart based review studies, but a similar proportion due to operations or procedures.

In contrast to the comprehensive studies of patient safety, and our surveillance approach, the AHRQ Patient Safety Indicators[11, 12, 19] and the Complications Screening Program[10, 20] focus exclusively on in-hospital patient safety problems. As a result, the AHRQ Patient Safety Indicators and the Complications Screening Program are more appropriate tools for evaluating the quality of care in hospitals. Our approach, in contrast, includes medical injuries identified or treated in-hospital—even if they occurred in the outpatient setting, a nursing home, or during previous hospitalizations. It provides a more accurate estimate of the full scope of patient safety problems. In addition, it can be used to target certain patient safety problems such as drug reactions and device failures, which occur frequently in an outpatient setting.

Table 5. Rates of adverse events or medical injury in selected studies

Study*	HMPS	QAHCS	CUS	WMIPP
Location	New York	New South Wales, South Australia	Colorado and Utah	Wisconsin
Year	1984	1994	1992	2001
Ascertainment of adverse events/ medical injury	Medical record review	Medical record review	Medical record review	Discharge diagnosis screening
Number of patients	30,121	14,179	15,000	581,104
Adverse event or medical injury rate / 100 discharges	3.7	16.6	2.9	13.3
% of Adverse event or medical injury due to operations or procedures	48.0%	50.3%	44.9%	40.3%
% of Adverse event or medical injury due to drugs	19.0%	10.0%	19.0%	38.1%

* HMPS = Harvard Medical Practice Study; QAHCS = Quality in Australian Healthcare Study; CUS = Colorado/Utah Study; WMIPP = Wisconsin Medical Injury Prevention Program

Limitations of this approach to patient safety monitoring should be considered. Because it is based on hospital discharge data collected for administrative purposes, this approach shares the same limitations of all studies that rely on such data.[21] The validation study described in this report was performed using a sample of medical records from a large, academic hospital with the staff and resources to commit to the detailed coding of discharge diagnoses. Completeness of medical records and specificity of coding in other hospitals may influence the ability of the criteria to detect medical injuries; accordingly, the criteria should be revalidated in diverse hospital settings. While medical record review is regarded as the gold standard in patient safety studies, there is evidence of variability among reviewers in their determination of adverse events and negligence.[6, 22] Studies have found, however, that reliability is higher for the detection of adverse events (which is analogous to our definition of medical injury) than for negligence or error.[2] Another limitation to our approach is the variability among states in external cause of injury coding, with respect to hospital discharge data.[23] In Wisconsin, however, external cause of injury coding is complete;[24] our approach would be of greatest utility in states with a high level of *E*-coding. At the same time, the face validity of the diagnostic codes comprising the criteria, the agreement of the criteria with medical record review, and the adverse outcomes experienced by individuals fulfilling the criteria all indicate that the criteria are useful in identifying injuries from health care interventions that have an appreciable impact on patient health.

Conclusion

The Wisconsin Medical Injury Prevention Program Screening Criteria can identify medical injuries from hospital discharge data. As with other screening criteria, sensitivity and specificity are imperfect but appear to be sufficient for monitoring patterns and trends in medical injuries—something existing systems are not equipped to do well. Using these criteria, areas most in need of patient safety interventions can be identified and targeted. This approach provides patient safety researchers with another useful tool, in addition to those studies based on detailed chart review and those and those that rely on ad hoc error reporting systems.[22]

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