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Economic Measurement of Medical Errors Using a Hospital Claims Database

Guy David, PhD[1], Candace L. Gunnarsson, EdD[2,], Heidi C. Waters, MBA[2], Ruslan Horblyuk, MA, MBA[3], Harold S. Kaplan, MD[4]*

[1]Health Care Management, The Wharton School, University of Pennsylvania, Philadelphia, PA; [2]S[2] Statistical Solutions, Inc., Cincinnati, OH; [3]GE Healthcare, Wauwatosa, WI; [4]Mount Sinai School of Medicine, New York, NY

ABSTRACT

Objective: The primary objective of this study was to estimate the occurrence and costs of medical errors from the hospital perspective. **Methods:** Methods from a recent actuarial study of medical errors were used to identify medical injuries. A visit qualified as an injury visit if at least 1 of 97 injury groupings occurred at that visit, and the percentage of injuries caused by medical error was estimated. Visits with more than four injuries were removed from the population to avoid overestimation of cost. Population estimates were extrapolated from the Premier hospital database to all US acute care hospitals. **Results:** There were an estimated 161,655 medical errors in 2008 and 170,201 medical errors in 2009. Extrapolated to the entire US population, there were more than 4 million unique injury visits containing more than 1 million unique medical errors each year. This analysis estimated that the total annual cost of measurable medical errors in the United States was $985 million in 2008 and just over $1 billion in 2009. The median cost per error to hospitals was $892 for 2008 and rose to $939 in 2009. Nearly one third of all medical injuries were due to error in each year. **Conclusions:** Medical errors directly impact patient outcomes and hospitals' profitability, especially since 2008 when Medicare stopped reimbursing hospitals for care related to certain preventable medical errors. Hospitals must rigorously analyze causes of medical errors and implement comprehensive preventative programs to reduce their occurrence as the financial burden of medical errors shifts to hospitals.

Keywords: direct hospital costs, medical error, medical injury.

Introduction

The current era of health care reform is bringing many changes to health care systems overall and hospitals in particular. Medicare has eliminated payments to hospitals for hospital-acquired conditions. Furthermore, the 2010 Affordable Care Act put into place financial incentives for quality care and financial disincentives for preventable medical errors. All these factors have led to a significant increase in the financial burden of medical errors, and much of that financial burden has been shifted to hospitals. In addition to the negative implications on patient care, medical errors now directly impact a hospital's profitability. This comes at a time when Medicare and commercial health insurance plans are reducing reimbursement to hospitals for procedures and shifting care to ambulatory sites of care as cost-saving measures. Because medical errors are preventable, hospitals must rigorously analyze the causes of medical errors and implement comprehensive preventative programs to reduce their occurrence.

An error was defined by the Institute of Medicine report titled *To Err Is Human: Building a Safer Health System* as "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim" [1]. Injuries that result from medical errors are the focus of this analysis. Preliminary research into the epidemiology of medical errors suggests that they occur more frequently than thought and pose a considerable economic and social burden, as well as serious patient harm [2]. Analyses have projected that in the United States, medical errors cause 44,000 to 98,000 injuries each year [3]. The Institute of Medicine report was published in 2000 and brought to light the fact that medical errors are increasingly likely as health care systems become more complex. The same report noted that reducing medical errors will require a systematic effort to build safety into the processes of care.

In 2010, Landrigan et al. [4] noted that interventions started after 2000 have not been implemented in a reliable manner. The authors retrospectively reviewed medical injuries in the state of North Carolina and quantified the rate of injury at approximately 3%. This rate was similar to that in an earlier study examining records of adult hospitalizations in New York state, which found that 3.7% of all hospitalizations were associated with medical injuries [3]. Naessens et al. [5] found that approximately 4% of hospital discharges had an associated adverse event and the majority (43%) involved skin integrity issues, while 23% were medication errors and 21% were falls.

An analysis of the cost and length of stay associated with voluntary adverse event reporting in hospital settings found that hospital stays with an event report were 17% more costly and 22%

* *Address correspondence to:* Candace L. Gunnarsson, President, S[2] Statistical Solutions, Inc., 11176 Main Street, Cincinnati, OH 45241. E-mail: candaceg@s2stats.com.

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longer than hospital stays without an associated event report. Medication and treatment errors were the most common and expensive types of adverse events, accounting for 77% of all events and added costs [6]. A study of hospital reporting data from Maryland and California determined that potentially preventable complications added approximately 9.4% to 9.7% to hospital inpatient costs [7].

In 2010, a study sponsored by The Society of Actuaries Health Section and performed by Milliman, Inc., examined the economic measurement of medical errors to health plans and society [8,9]. The report estimated that 6.3 million measurable medical injuries occurred in the United States in 2008. In an inpatient setting, 7% of the admissions resulted in some type of medical injury. Of the 6.3 million injuries, 1.5 million were associated with a medical error. Total cost per error was calculated at approximately $13,000, resulting in a total cost of $19.5 billion to the US economy. In addition, these errors resulted in more than 2500 excess deaths and more than 10 million excess days missed from work because of short-term disability [8,9].

In 2008, Medicare eliminated payments to hospitals for hospital-acquired conditions that were deemed to be preventable if hospitals followed clinical practice guidelines. Among these conditions were certain events termed "never events", or events that should never occur in safe hospitals [10]. With these restrictions, and the 2010 Affordable Care Act that further incentivizes quality care and disincentivizes preventable medical errors [11,12], hospitals now bear most of the economic burden of medical errors.

The primary objective of this study was to estimate the costs and occurrence of medical errors from the hospital perspective by using data contained in the Premier hospital database and methodology developed by Milliman, Inc. The current study adds to the discussion by assessing the cost of medical errors from the hospital perspective, rather than from the perspective of managed care. The methodology developed by Milliman, Inc., to estimate the likeliness of an injury's association with a medical error was applied for the first time to the Premier hospital data set. In addition, extrapolation methodology developed by Premier in conjunction with the US Food and Drug Administration allowed for the estimation of the impact of medical errors on the nation's hospitals.

Methods

Milliman, Inc., Study

A 2010 study sponsored by The Society of Actuaries Health Section and performed by Milliman, Inc., examined the economic measurement of medical errors to health plans and society [8,9]. The Milliman study used health plan claims data from the MarketScan databases to assess medical injuries identified through *International Classification of Diseases, Ninth Edition*, codes for medical injuries. The Milliman study utilized an expert panel of clinicians and actuaries to estimate how often each type of injury was likely to be associated with a medical error rather than a consequence of the underlying disease. Injuries were classified into five groups on the basis of the likelihood that they were associated with a medical error, and the midpoint of each range of likelihood of medical error was applied to the frequency of each medical injury to establish the rate of medical error. The Milliman study compared both inpatient and outpatient injury visits to noninjury visits on the basis of a propensity-matching algorithm to estimate the costs associated with injuries.

Data Source

This study utilized clinical and billing data from the Premier hospital database [13]. This database contains clinical and utilization information from more than 600 US hospitals and ambulatory surgery centers and includes more than 45 million inpatient discharges and more than 210 million hospital outpatient visits from acute care facilities, ambulatory surgery centers, and clinics across the nation. The data used in this study included hospital discharge data from October 1, 2007, through September 30, 2010. The entire data set was used to identify inpatient injuries. Injury rates, error estimates, and cost-per-error estimates were developed from hospital billing data in 2008 and 2009.

Identifying Injuries and Errors

The current study utilized the ranges and midpoints of medical errors established in the Milliman study and applied them to the data from the Premier database. All 97 injury groupings identified in the Milliman study were reverified, with only minor modifications, by an outside coding group to ensure that no major changes had occurred since the Milliman list was developed.

For a visit to qualify as an injury visit, at least 1 of the 97 identified injury groupings must have occurred at that specific visit. Visits with four or more unique injuries occurring at that visit were removed from the population, and visits with more than one injury occurrence were counted only once in the overall cost table to avoid overestimation of cost. Visits with injuries were flagged for sensitivity analyses if the patient had a previous visit within an approximate 30-day window of the visit in which the injury occurred. After identifying visits for each type of injury, the likelihood that the specific injury was caused by a medical error was estimated. The final frequency of a specific type of medical error was estimated by multiplying the calculated frequency of the specified type of injury by the midpoint of the error percentage category.

Similarly to the Milliman study, this study established noninjury control groups by using propensity score matching. The propensity score for each subject was estimated on the basis of gender, age group, All Patient Refined Diagnosis Related Groups severity of illness and risk of mortality, admission type, major comorbidities, and hospital characteristics. The propensity score match was a 1:1 greedy match on nearest neighbor with a maximum caliper width of four digits.

Cost Analysis

For each injury visit, a matched noninjury control was chosen to compare the difference between direct medical costs to hospitals. Visits incurring costs below $300 or above $300,000 were removed from the cost analysis because these visits were determined to be outside the normal range of inpatient costs, and therefore not good indicators of the real cost to the hospital. Sensitivity analysis was preformed, which confirmed that removal did not affect the outcome. The cost per error was estimated as the difference in cost over the control for those who experienced a medical injury. *T* tests for statistically significant differences in direct cost were performed, and the injuries with the largest statistically significant differences are reported.

Extrapolation Methodology

This study utilized the extrapolation methodology, which was developed by Premier and validated by the US Food and Drug Administration, for producing nationally representative inpatient discharge data. The method is based on a stratified comparison of Premier's inpatient database to all US hospitals responding to

the American Hospital Association Annual Survey, and validated through a comparison using the National Hospital Discharge Survey. The American Hospital Association Annual Survey was used to effectively identify the universe of US hospitals and treated inpatients in order to generate weights on a hospital level. To calculate hospital weights, all hospitals from the Premier data and American Hospital Association Survey were stratified by the following hospital characteristics: geographic region, bed size, teaching status, and population density (i.e., urban/rural status). Based on these weights, the prevalence of inpatient discharges in the Premier database was extrapolated to a nationally representative number of inpatient discharges suitable for epidemiologic assessments within the acute care inpatient hospital space.

The Premier weights were then applied at the injury level, and the extrapolated counts of injuries were used to calculate the extrapolated counts of errors by multiplying the calculated frequency of the specified type of injury (now an extrapolated count) by the midpoint of the error percentage category. The costs associated with an error from the matched population were applied to the extrapolated injury and error rates to estimate the cost of errors at the national level.

Two separate sensitivity analyses were performed. The first analyzed the most common errors and cost differences after removing the subset of patients previously flagged for having a visit within the 30 days prior to the qualifying injury visit. The second analyzed the most common errors and cost differences after removing the subset of patients having more than one distinct injury occurring at the qualifying injury visit.

Data Handling

All data were imported and maintained in an SAS data file. Tabulation of summary statistics and data analysis were performed by using SAS software, version 9.2. Continuous variables were summarized by using the following descriptive statistics: number of subjects (N), number of subjects in a subgroup (n), mean, SD, median, minimum, and maximum. Discrete variables were summarized by counts and percentages. Univariate *t* tests and multivariable statistical techniques, including propensity matching, were utilized. Data are reported separately for 2008 and 2009.

A protocol describing the analysis objectives and statistical methods was submitted to the New England Institutional Review Board, and exemption was obtained.

Results

There were 448,060 inpatient visits with 624,830 unique medical injuries in 2008 and 470,561 inpatient visits with 660,688 medical injuries in 2009 identified in the Premier database. Of the inpatient visits with injuries, 145,086 visits with a total of 161,655 medical errors were identified in 2008 and 152,088 visits with a total of 170,201 medical errors were identified in 2009. When extrapolated to the entire US population, these results translated to 3,394,164 inpatient injury visits (4,737,813 unique injuries), with an estimated 1,103,803 of these visits containing 1,229,349 unique medical errors in 2008. Results were similar for 2009, with an estimated 3,392,603 inpatient injury visits (4,755,036 unique injuries), with 1,099,382 of these visits containing medical errors (1,228,973 unique errors) in 2009 (Table 1). Results of this study estimated that the total annual cost of measurable medical errors in the US inpatient visits was $985 million in 2008 and just over $1 billion in 2009. The median cost per error to hospitals was $892 for 2008 and rose to $939 in 2009. Nearly one-third of all medical injuries were due to error in both years (Table 1).

The percentage of injuries increased according to age group, with more than 30% of all injuries occurring in persons aged 75 years and older in both 2008 and 2009. A higher percentage of injuries occurred in women than in men (55% vs. 45% for both years), and the majority (62%) of injuries occurred in whites. More than 36% of the injuries occurred in the Southern United States, while the lowest percentage occurred in the West. Hospitals serving urban populations accounted for more than 95% of all injuries. Nonteaching hospitals had a higher percentage of injuries than teaching hospitals (78% vs. 22%), which is likely due to the high percentage of nonteaching hospitals in the database. Small hospitals (under 100 beds) accounted for fewer

Table 1 – Estimated number and cost of medical errors.*

% of injuries that are errors	Count of injuries (n)	Count of errors (n)	Hospital cost per error ($) (median)‡	Total cost of error ($) (median)†
Inpatient year 2008—extrapolated				
>90%	822,316	781,201	1,515	1,183,292,361
65%–90%	1,614	1,251	79	99,367
35%–65%	303,209	151,605	1,756	266,249,374
10%–35%	322,255	72,507	1,033	74,922,621
<10%	1,944,770	97,239	633	61,520,854
	3,394,164	1,103,803	892	984,900,466
Inpatient year 2009—extrapolated				
>90%	822,955	781,808	1,542	1,205,398,945
65%–90%	1,407	1,091	432	471,662
35%–65%	307,594	153,797	1,841	283,080,131
10%–35%	283,732	63,840	965	61,609,712
<10%	1,976,915	98,846	698	68,972,580
	3,392,603	1,099,382	939	1,032,076,651

* Cost data are taken form matched analysis comparison.
‡ Total given for count of injuries and count of errors. Median given for cost per error and total cost per error.
† Count of injuries and count of errors were rounded in this table. Nonrounded values were used to calculate cost.

Table 2 – Demographic characteristics associated with medical injuries, extrapolated.*

Category	2008		2009	
	n	%	n	%
Admissions	3,394,164	100	3,392,603	100
Age group (y)				
<18	70,903	2.09	67,063	1.98
18–24	87,361	2.57	87,396	2.58
25–34	170,968	5.04	171,272	5.05
35–44	264,923	7.81	259,778	7.66
45–54	451,314	13.30	455,617	13.43
55–64	579,120	17.06	594,207	17.51
65–74	662,819	19.53	669,191	19.72
75+	1,106,757	32.61	1,088,080	32.07
Gender				
Male	1,517,638	44.71	1,530,478	45.11
Female	1,876,477	55.29	1,862,089	54.89
Race				
White	2,122,505	62.53	2,115,275	62.35
Black	440,503	12.98	443,527	13.07
Hispanic	200,630	5.91	186,631	5.50
Other/unknown	630,526	18.58	647,171	19.08
Admission type				
Emergency	1,942,780	57.24	2,021,502	59.59
Urgent	521,745	15.37	493,658	14.55
Elective	905,183	26.67	851,628	25.10
Trauma center	4,500	0.13	6,441	0.19
Other/unknown	19,957	0.59	19,374	0.57
APR-DRG severity of illness				
1 = Minor	424,188	12.50	388,301	11.45
2 = Moderate	1,109,416	32.69	1,056,978	31.16
3 = Major	1,262,223	37.19	1,291,843	38.08
4 = Extreme	598,306	17.63	655,477	19.32
APR-DRG risk of mortality				
1 = Minor	1,075,503	31.69	1,024,693	30.20
2 = Moderate	988,420	29.12	952,165	28.07
3 = Major	905,460	26.68	946,689	27.90
4 = Extreme	424,750	12.51	469,052	13.83
Provider area				
Northeast	678,951	20.00	657,079	19.37
Midwest	903,213	26.61	911,543	26.87
South	1,242,167	36.60	1,227,968	36.20
West	569,835	16.79	596,013	17.57
Location of the facility				
Urban	3,241,435	95.50	3,251,382	95.84
Rural	152,729	4.50	141,221	4.16
Teaching status				
Teaching	753,910	22.21	763,453	22.50
Nonteaching	2,640,254	77.79	2,629,150	77.50
Hospital size (number of beds)				
006–099	127,511	3.76	122,520	3.61
100–199	309,406	9.12	357,736	10.54
200–299	601,100	17.71	657,943	19.39
300–399	814,570	24.00	779,927	22.99
400–499	605,755	17.85	566,828	16.71
500+	935,822	27.57	907,649	26.75

APR-DRG, All Patient Refined Diagnosis Related Groups.
* Extrapolated counts of injuries were rounded in this table. Nonrounded values were used to calculate percentages.

than 4% of all injuries, while hospitals with more than 500 beds accounted for the largest percentage (28% in 2008; 27% in 2009). Emergency room admissions accounted for the largest percentage of medical injuries (57% in 2008; 60% in 2009) (Table 2).

Pressure ulcers were the most common medical error for both 2008 and 2009, followed by postoperative infection and iatrogenic hypotension (Table 3). These three errors appear toward the top of the list of costliest individual errors for both 2008 and 2009 (Table 4). Pressure ulcers and catheter-associated urinary tract infection were the only Medicare "never events" (e.g., events that are preventable and as such should never occur in a health care setting) to appear among the 10 most frequent errors. Among those 10 errors for 2008 and 2009, one item, abnormal reaction due to surgery without mention of misadventure, was the only item from the lowest probability of error category.

Together, the top 10 most costly errors accounted for 85% of the total medical cost for measurable medical errors in 2008 and 84% in 2009 (Table 4). Postoperative infections were the most costly error in 2008, followed by pressure ulcers and infection due to central venous catheter (Table 4). Similarly, in 2009, postoperative infection was the most costly medical error followed by infection due to central venous catheter and pressure ulcers (Table 4).

The actual rate of injury by admission type was calculated for 2008 and 2009. In both years, the emergency room had the highest injury rate at 7.5% and 7.9%; trauma centers had the lowest rate at 0.02% (Table 5).

Results of both sensitivity analyses remained consistent with the overall population results, showing minimal differences in the most common errors and costs (data not shown).

Discussion

In this analysis, an injury visit was defined as an inpatient record containing at least 1 of 97 identified injury groupings at that specific visit. This study identified in the Premier database more than 400,000 injury visits containing more than 600,000 medical injuries in 2008 and 2009. More than 160,000 of the injuries were estimated as being due to medical error each year. When extrapolated to the entire US population, there were more than 3 million medical injuries and more than 1 million medical errors per year. Results of this study demonstrated that the direct cost of medical errors to hospitals was close to $1 billion in 2008 and just over that in 2009. The median cost per error to hospitals was $892 for 2008 and rose to $939 in 2009.

The rate of injuries in actual (not extrapolated) admissions was found to be consistent between 2008 and 2009. Of the total admissions in 2008 after attrition rules were applied (N = 3,346,914), 7.46% had an injury in the emergency room. Trauma centers had the lowest rates of injuries, followed by urgent and elective admission types. The variability by source of admission suggests value in having better error reduction protocols in place that apply uniquely to emergency room admissions.

This study utilized similar methodology to the Milliman study, including the use of weights calculated by Milliman, to estimate the cost of medical errors to hospitals. While the focus of the earlier report was health plan data, the current analysis utilized hospital billing records and therefore demonstrated the direct cost of medical errors to hospital systems. The current study found very similar rates of medical errors to the Milliman, Inc., study. Both studies also found pressure ulcers and postoperative infection to be the most common types of medical errors. In addition, this study found differences in rates of errors depending on patient age, gender, and certain hospital characteristics. Exploration of the reasons for these differences would be of interest in future studies.

This study assessed direct costs to hospitals for treating medical errors. Given the restrictions on reimbursement for

Table 3 – Top 10 actual and extrapolated inpatient medical errors—2008 and 2009.*

Injury	Number of injuries by visit		Estimated number of errors by visit	
	Actual	Extrapolated	Actual	Extrapolated
2008				
Pressure ulcer (Medicare never event)	64,966	507,118	61,718	481,762
Postoperative infection	20,714	155,708	19,678	147,922
Hypotension—iatrogenic	15,434	117,174	7,717	58,587
Accidental puncture or laceration during a procedure, NEC	7,941	57,709	7,544	54,824
Substances causing adverse effects in therapeutic use	139,411	1,054,543	6,971	52,727
Hemorrhage complicating a procedure	11,679	88,528	5,840	44,264
Hematoma complicating a procedure	11,599	84,722	5,800	42,361
Infection due to central venous catheter	5,456	39,615	5,183	37,635
Catheter-associated urinary tract infection (Medicare never event)	4,969	37,211	4,721	35,351
Abnormal reaction due to surgery without mention of misadventure	74,112	571,053	3,706	28,553
2009				
Pressure ulcer (Medicare never event)	66,668	495,208	63,335	470,447
Postoperative infection	21,604	153,407	20,524	145,736
Hypotension—iatrogenic	17,826	128,741	8,913	64,370
Substances causing adverse effects in therapeutic use	151,745	1,104,992	7,587	55,250
Infection due to central venous catheter	7,552	52,856	7,174	50,213
Accidental puncture or laceration during a procedure, NEC	6,986	48,513	6,637	46,087
Catheter-associated urinary tract infection (Medicare never event)	6,409	45,831	6,089	43,540
Hematoma complicating a procedure	11,958	82,458	5,979	41,229
Hemorrhage complicating a procedure	11,643	82,192	5,821	41,096
Abnormal reaction due to surgery without mention of misadventure	80,550	579,197	4,027	28,960

NEC, not elsewhere classified.
* Extrapolated number of errors and injuries by visit were rounded to the whole number.

Table 4 – Top 10 extrapolated inpatient errors with the largest annual measurable cost—2008 and 2009.*

Injury	Extrapolated injuries	Extrapolated errors	Median cost per error ($)	Total error cost (extrapolated) ($)
2008				
Postoperative infection	155,708	147,922	3,408	504,151,435
Pressure ulcer (Medicare never event)	507,118	481,762	1,040	500,801,536
Infection due to central venous catheter	39,615	37,635	13,289	500,130,140
Hemorrhage complicating a procedure	88,528	44,264	2,880	127,465,760
Hematoma complicating a procedure	84,722	42,361	2,909	123,220,682
Accidental puncture or laceration during a procedure, NEC	57,709	54,824	1,866	102,318,355
Catheter-associated urinary tract infection (Medicare never event)	37,211	35,351	2,095	74,047,551
Iatrogenic cerebrovascular infarction or hemorrhage	9,363	8,894	7,894	70,216,732
Pneumothorax	44,809	22,404	2,718	60,884,704
Hypotension—iatrogenic	117,174	58,587	1,024	59,977,722
2009				
Postoperative infection	153,407	145,736	3,906	569,286,560
Infection due to central venous catheter	52,856	50,213	10,394	521,932,865
Pressure ulcer (Medicare never event)	495,208	470,447	1,017	478,501,236
Hematoma complicating a procedure	82,458	41,229	3,083	127,088,250
Hemorrhage complicating a procedure	82,192	41,096	2,912	119,670,491
Ventilator-associated pneumonia	8,376	7,957	14,511	115,457,451
Catheter-associated urinary tract infection (Medicare never event)	45,831	43,540	2,171	94,545,522
Accidental puncture or laceration during a procedure, NEC	48,513	46,087	1,974	90,990,676
Hypotension—iatrogenic	128,741	64,370	1,223	78,737,849
Iatrogenic cerebrovascular infarction or hemorrhage	9,764	9,276	7,634	70,811,303

NEC, not elsewhere classified.
* Data in tables were rounded to the whole number.

Table 5 – Rate of injuries by admission type.

Category	2008		2009	
	n	%	n	%
Admissions	3,346,914		3,456,580	
Admission type				
Emergency	249,679	7.46	272,400	7.88
Urgent	75,655	2.26	76,141	2.20
Elective	119,527	3.57	118,130	3.42
Trauma center	624	0.02	1,023	0.03
Other/unknown	2,575	0.08	2,867	0.08

preventable medical errors, these costs directly impact the profitability of hospitals. In 2008, Medicare restricted reimbursement for the treatment of "never events," or events that should never occur in a health care setting. Moreover, most commercial insurance plans followed Medicare's lead and also restricted reimbursement for these medical errors. This study found that pressure ulcers and catheter-associated urinary tract infections are among the most costly medical errors, and both are classified as Medicare "never events." The cost to the hospitals to treat these preventable medical errors is great, and hospitals now must bear financial responsibility without the possibility of reimbursement, impacting the profitability of the hospital. The Affordable Care Act of 2010 places further focus on patient safety by providing incentives for quality care and financial disincentives for preventable medical errors [11,12]. Costs of medical errors are being shifted to hospitals with recent proposed legislation and a renewed focus on quality. Thus, hospitals must continue to analyze the causes for medical errors and put rigorous programs in place to reduce their incidence.

This study had several limitations. First, the data used to identify medical errors came from a hospital system administrative database, rather than a database expressly used to track medical injuries and errors. The Premier database contains data from only outpatient and inpatient hospitals, and therefore injuries and costs that occurred in other levels of care are not captured in this analysis nor are costs related to any follow-up appointments for medical injuries and errors that took place in the physician office setting. In addition, the direct cost of medical errors to hospitals in this study was likely a conservative estimate. Visits that contained more than four unique injuries per visit or had costs of more than $300,000 per visit were excluded from the analysis. Injuries were also underestimated because only unique injuries were included in the analysis per visit. If a visit contained more than one occurrence of an injury, that visit and its related costs were counted only once in the overall cost estimate. Furthermore, the costs of medical errors identified here are costs to hospitals, rather than to patients or society as a whole. Other costs, such as lost work time and litigation-related costs, are not taken into account. Therefore, the overall costs associated with medical errors are likely much higher than those cited in this study.

Despite its limitations, this study provides important insights into the epidemiology and direct cost of medical errors in the US inpatient setting. The Institute of Medicine called attention to medical errors and the need for programs to reduce them a decade ago; however, the incidence and cost of medical errors remains high. The impact of medical errors on hospitals is large and continues to rise. Medicare and commercial health plans no longer reimburse hospitals for preventable medical errors, and further financial disincentives have been created to decrease rates of hospital-acquired infections and preventable readmissions while incentivizing hospitals on the basis of the quality of care in the Accountable Care Act [11]. For hospitals to remain profitable, one important step should be a rigorous analysis of medical errors and comprehensive preventative programs to reduce their occurrence.

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