

# Improving the E Coding of Hospitalizations for Injury: Do Hospital Records Contain Adequate Documentation?

## ABSTRACT

**Objectives.** Incomplete external cause of injury (E) coding limits the usefulness of hospital discharge data sets for injury surveillance and research. Hospital medical records were examined to determine whether they contained adequate cause of injury documentation to allow for more complete E coding of injury discharges.

**Methods.** Medical records for a sample of discharges involving a principal diagnosis of injury from the Uniform Hospital Discharge Data Set for Rhode Island were selected. We assigned E codes to these discharges and compared our E codes with those of the discharge data set.

**Results.** Documentation of cause of injury in the medical records was sufficient to allow assignment of a specific E code to 70% of the injuries for which no E codes or vague E codes were submitted on the Uniform Hospital Discharge Data Set. It was estimated that specific cause of injury documentation is available in the medical records of 80% of all injury discharges in Rhode Island; for approximately 90%, an E code describing at least the broad cause of injury could be assigned.

**Conclusions.** Rates of E coding can be substantially increased by making better use of existing documentation in medical records. (*Am J Public Health*. 1995;85:1261-1265)

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### Introduction

Injuries remain an important public health problem in the United States. Injuries occur to nearly one in four Americans each year and cost an estimated \$158 billion in 1985.<sup>1</sup> Although nonfatal injuries account for 99% of all injuries,<sup>1</sup> knowledge of their causes is severely lacking. Complete and accurate data on cause of injury are essential to the development and evaluation of effective prevention programs at the local and national levels.<sup>2-4</sup> Thus, improved surveillance of nonfatal injuries has been widely recommended as a high priority for injury control.<sup>2-17</sup>

Hospital discharge data systems are frequently used in injury prevention and are potentially one of the most cost-effective sources of data for monitoring nonfatal injuries.<sup>18</sup> The Uniform Hospital Discharge Data Set includes information on the nature of injuries (e.g., fractures), requiring hospitalization, and this information is coded according to the ninth revision of the *International Classification of Diseases, Clinical Modification (ICD-9-CM)*.<sup>19</sup> The ICD-9-CM also has a supplementary classification system for external causes of injury (E codes) used in association with injury diagnosis codes. By classifying the circumstances leading to injury, E codes provide the basic information needed to design, implement, and evaluate injury prevention programs. Hospitals in the United States, however, have been inconsistent in their use of these codes.<sup>12,14,16,18,20,21</sup>

The Uniform Hospital Discharge Data Set provides a common core of data on hospital discharges in the Medicare and Medicaid programs. As of April 1994, the uniform hospital billing form (UB-92; formerly UB-82), the principal vehicle for

collecting Medicare and Medicaid data, was in use in 21 state hospital discharge data systems to evaluate hospital care and costs; another 6 states, including Rhode Island, use some other form of hospital discharge data collection for this purpose.<sup>22</sup>

In most states, fewer than half of hospitalized injuries have a corresponding E code, and the proportion varies considerably across states.<sup>21,23-27</sup> Some studies have estimated hospitalized injuries from available cause of injury information<sup>25,26</sup>; however, this can lead to biased injury rates since E-coded hospital discharges exclude a large proportion of the discharges of older people and those with multiple conditions and cannot be taken as representative of all injury hospitalizations.<sup>21,28</sup>

Complete and accurate documentation of cause of injury in medical records is fundamental to E coding of hospitalized injury data, and improvements in documentation are considered key to increasing rates of E coding.<sup>11,12,16,20,29</sup> However, few published studies have examined the adequacy of cause of injury information available in medical records,<sup>23,30,31</sup> and

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**TABLE 1—Types of E Codes Reported on the Uniform Hospital Discharge Data Set: Selected Discharges with a Primary Diagnosis of Injury, Rhode Island, 1988 and 1990**

Patient Characteristics	Type of E Code, %				
	Specific E Code (n = 447)	Vague E Code (n = 415)	Unspecified Cause E Code (n = 49)	No E Code (n = 458)	All Injury Discharges, 1988 and 1990 (n = 16 085), %
Age, y					
0–14	16.3	8.0	16.1	4.9	11.5
15–24	21.9	16.4	28.6	14.9	18.0
25–44	36.2	19.1	20.4	21.7	27.9
45–64	14.5	11.8	20.4	12.4	13.8
65+	11.0	45.0	14.3	46.1	28.8
Length of hospital stay, d					
≤2	45.6	28.7	49.0	26.4	33.7
> 2–7	34.0	29.2	36.7	28.6	32.9
>7	20.4	42.2	14.3	45.1	33.4

none have quantified the extent to which limited information on cause of injury contributes to incomplete E coding of hospital discharge data.

To better understand the reasons for underreporting of E codes for hospitalized injuries, we examined data for a sample of injury discharges from all 11 acute care hospitals in Rhode Island. The objectives of the study were to evaluate the quality and availability of cause of injury information in medical records and to determine the extent to which inadequate cause of injury documentation may contribute to incomplete E coding.

### Data Sources and Methods

A total of 1440 discharges were selected from the 16 085 injury discharges in the Rhode Island Uniform Hospital Discharge Data Set for the years 1988 and 1990. Included were discharges involving a principal diagnosis of injury or poisoning (ICD-9-CM injury diagnosis code)<sup>19</sup> in the range 800 to 994, or 995.5 or 995.81 (child and adult maltreatment syndromes). One third of the discharges were selected from among those with a specific E code on the Uniform Hospital Discharge Data Set, one third from those with a vague or unspecified cause E code, and one third from those with no E code. Vague E codes provide only general information about the cause of injury (e.g., fall, homicide); unspecified E codes provide little or no more information about the cause of injury than could be inferred from the corresponding injury diagnosis code (e.g., fracture, burn). After exclusion of 70

discharges for which medical records could not be found and 8 that were not true injuries (e.g., nontraumatic fractures), the final number of discharges was 1362.

The following information was abstracted from each discharge medical record by one of three trained data abstracters: narrative description of the cause of injury, place of occurrence, and the health professional recording the information (coded as physician, physician's assistant, nurse, emergency medical technician, other, or unknown). Information was recorded separately from each of the following forms: face sheet, ambulance run sheet, emergency department record, history and physical, discharge summary, nursing assessment, and other (including all other forms in the medical record, mostly consultations and progress notes).

For each discharge, we assigned E codes (E800 through E999) separately to the cause of injury information from each type of medical record form (form E codes) and from the full medical record. Place E codes, a recommended supplement to cause of injury E codes describing the location where the injury occurred, were assigned only to discharges with an assigned E code within the range specified by the ICD-9-CM.<sup>19</sup> Since published E coding rules are very scanty, we consulted a nosologist specializing in injury coding and developed our own supplementary guidelines to ensure uniformity (available on request). Two professional nosologists assigned the E codes; two researchers reviewed these codes and assigned final E

codes without knowledge of the codes on the Uniform Hospital Discharge Data Set. The most specific E code possible was assigned, and coding conventions were conservative. In cases of disagreement, a decision as to the most reasonable E code was made by one of the authors (JAL).

We examined the distribution of discharges in each of the three categories by age and length of stay. To determine whether E codes may have been precluded by the limited number of fields for diagnosis codes on the Uniform Hospital Discharge Data Set (seven for Rhode Island), we calculated E coding rates according to the number of diagnosis fields filled.

To determine the agreement of our assigned E codes with Uniform Hospital Discharge Data Set E codes, we compared our codes with the E codes for discharges with specific E codes on that data set. The levels of agreement were defined as (1) complete agreement (to the fourth digit or, for E codes without fourth digit classifications, to the third digit), (2) agreement to the third digit (for E codes with fourth digit classifications), (3) agreement to ICD-9-CM section (e.g., fall, motor vehicle crash, poisoning), and (4) disagreement. Assigned place of occurrence E codes were also compared with those on the discharge data set.

To examine the level of documentation of cause of injury available from specific medical records forms, we compared (for each discharge) the E code we assigned from each type of form with the E code we assigned based on information from the full medical record.

### Results

In comparison with injury hospitalizations with specific E codes and all injury discharges for the state, the discharges of people 65 years of age and older and those with a longer length of stay were overrepresented among injury hospitalizations with vague E codes and no E codes on the Uniform Hospital Discharge Data Set (Table 1).

Of the 16 085 injury discharges, 1164 (12.2%) had all seven diagnosis fields filled; 60.1% of the cases with six or fewer fields filled had E codes on the Uniform Hospital Discharge Data Set, while only 40.9% of the cases with all seven fields filled had E codes (data not shown). In our study sample, 99 of the 101 cases with no E code and all seven diagnosis fields filled had cause of injury documentation sufficient to assign at least a vague E code.

**TABLE 2—Agreement between the Uniform Hospital Discharge Data Set and Study-Assigned E Codes: Selected Discharges with a Primary Diagnosis of Injury, Rhode Island, 1988 and 1990**

Level of E Code Agreement	No. <sup>a</sup> (n = 428)	% Agreement
Complete (4- or 3-digit specific <sup>b</sup> )	287	67.0
3rd digit	32	7.4
Section <sup>c</sup>	33	7.7
Disagreement	76	17.8

<sup>a</sup>Excludes 19 cases for which documentation in the medical record was insufficient for us to assign a specific E code.

<sup>b</sup>3-digit specific refers to E codes that do not have a 4th digit (e.g., E927 [overexertion]).

<sup>c</sup>CD-9-CM broad category for cause of injury (e.g., E880–E888 ["accidental" falls]).

#### *Agreement of Assigned E Codes with Specific Uniform Hospital Discharge Data Set E Codes*

Eighty-two percent of cases with a specific E code on the Uniform Hospital Discharge Data Set had an E code that agreed with our assigned E code at all levels, and about two thirds of the discharge data set E codes agreed with our assigned E codes at the most specific levels (Table 2). Of the 18% of discharges for which our assigned E code disagreed with the discharge data set E code, 64% disagreed in the coding of intent; 51% had a discharge data set E code for self-inflicted poisoning (E950.0 to E950.9), while our assigned E code was for accidental poisoning by drugs, medicinals, and biologicals (E850.0 to E858.9).

#### *Documentation of External Cause and Place of Injury in the Medical Record*

Documentation in the medical record was sufficient to assign a specific E code to more than 70% of discharges with a vague/unspecified cause E code on the Uniform Hospital Discharge Data Set, and 66% of discharges with no E code on the discharge data set. Falls and motor vehicle crashes involved the largest numbers of discharges with specific cause of injury information. Of the cases with no E code on the discharge data set, docu-

**TABLE 3—The Sufficiency of Cause of Injury Documentation for Cases with a Vague/Unspecified or No E Code on the Uniform Hospital Discharge Data Set (UHDDS): Selected Discharges with a Primary Diagnosis of Injury, Rhode Island, 1988 and 1990**

Study-Assigned E Code <sup>a</sup>	% Cases with UHDDS E Code Vague/Unspecified (n = 464)	% Cases with No UHDDS E Code (n = 451)
<b>Specific E codes</b>		
Falls (E880–E886)	35.6	24.5
Motor vehicle, traffic (E810–E818)	22.0	13.1
Homicide/inflicted by other (E950–E959)	0.9	1.5
Suicide/self-inflicted (E960–E969)	3.7	4.9
Accidental poisonings (E850–E869)	4.5	3.0
Suffocations/foreign bodies (E911–E915)	0.2	3.1
All other specific E codes	3.2	16.3
Subtotal with specific cause of injury documentation	70.1	66.4
<b>Vague E codes</b>		
Motor vehicle traffic (unspecified) (E819.0–E819.9)	5.2	4.0
Fall (other and unspecified) (E888)	20.0	20.3
Suicide and self-inflicted (unspecified means) (E958.9)	0.0	0.0
Assault (unspecified means) (E968.9)	0.4	0.4
Undetermined intent (E980–E989)	0.0	0.0
Subtotal with vague cause of injury documentation	25.6	24.7
<b>Unspecified cause E codes</b>		
Fracture (cause unspecified) (E887)	0.4	2.7
Unspecified fire, burn not otherwise specified (E899)	0.0	0.0
Unspecified cutting and piercing instrument (E920.9)	0.6	0.4
Subtotal with unspecified cause of injury documentation	1.0	3.1
Subtotal with no cause of injury documentation (E928.9)	3.0	5.8

<sup>a</sup>Based on cause of injury documentation in medical record.

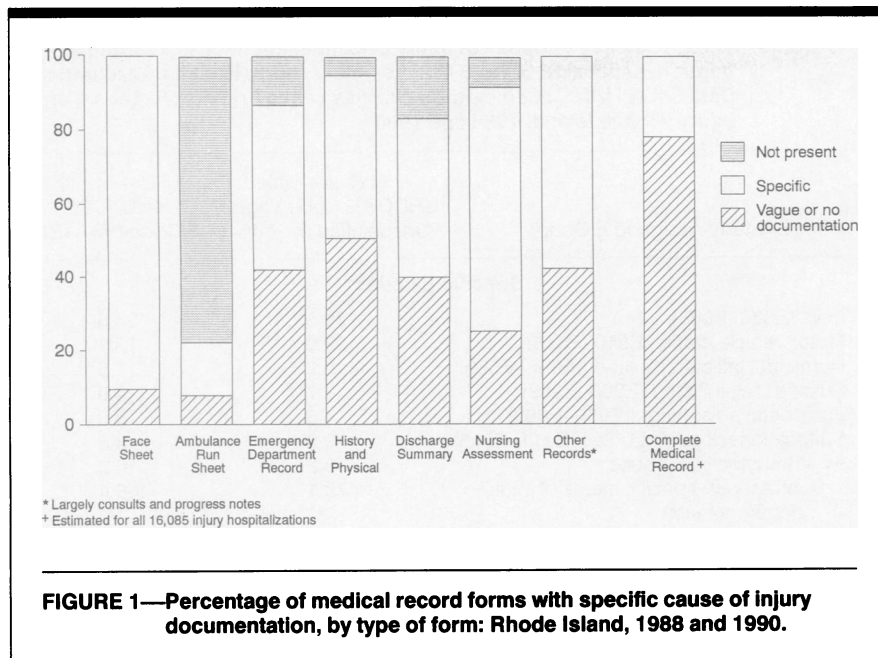
tation was sufficient to assign at least a vague E code, indicating the broad cause of injury group, for an additional 24.7% of cases; for 5.8% of cases, there was no cause of injury documentation present (Table 3).

Applying the proportions with specific cause of injury documentation in each of the three E code categories to the numbers of Uniform Hospital Discharge Data Set injury discharges in each E code category for the entire state (6114 with specific E codes, 3169 with vague/unspecified E codes, and 6802 with no E codes), we estimate that specific documentation would be available in the medical records for 78.4% of all injury discharges (Figure 1). An additional 10.5% could be assigned at least a vague E code, leaving only 11.1% for which cause of injury documentation may be inadequate to assign an E code.

Place E codes were assigned to only 1 of 259 (0.4%) discharges in the sample with a Uniform Hospital Discharge Data Set E code in the recommended range for assigning these codes. Four of the 1103 discharges with E codes outside of the recommended range had a place E code on the discharge data set. Documentation in the medical record was sufficient to assign place E codes to 104 (40.1%) of the 259 discharges for which place codes should have been assigned on the discharge data set; 62 of these discharges were coded as having occurred in the home (E849.0).

#### *Documentation by Type of Medical Record Form*

The history and physical form had the best level of agreement of form E codes (based on documentation from that form only) with assigned E codes (based



**FIGURE 1—Percentage of medical record forms with specific cause of injury documentation, by type of form: Rhode Island, 1988 and 1990.**

on documentation from the entire medical record); however, specific cause of injury documentation was present on this form for only 51% of study cases (Figure 1). Of the discharges with inadequate cause documentation on the history and physical form, more than 40% involved falls, and more than 20% involved motor vehicle crashes. A high proportion of emergency department record and discharge summary forms also had specific cause of injury documentation (42% and 40%, respectively).

## Discussion

This study demonstrates that E coding of hospitalized injuries for Rhode Island, and probably for other states, could be substantially improved simply by making better use of existing cause of injury documentation in medical records. We estimate that nearly 80% of hospitalized injuries for Rhode Island could be assigned a specific E code by means of available cause of injury documentation. This compares with an overall E coding rate of 58% and a reporting rate for specific E codes of 38% during the study period. Another 10% of the discharges with no E code on the Uniform Hospital Discharge Data Set could be assigned an E code to indicate at least the broad category of cause of injury. Results were similar for New York State, where it was found that more than 90% of a sample of hospitalized injuries could be E coded by means of available medical record documentation.<sup>32</sup>

We were unable to find cause of injury documentation in the medical records of approximately 4% of our sample of discharges that had a specific E code on the Uniform Hospital Discharge Data Set. This may have been because the form or forms with the cause of injury documentation were missing from the record at the time of abstraction, the information was present in the record but was missed by our abstractors, or the specific E code was incorrectly assigned on the discharge data set. If the E codes for these discharges were correct on the discharge data set, we estimate that the proportion of injury discharges in the state with specific cause of injury documentation would increase by 2 percentage points.

Our study confirms a previous report that the limited number of fields for diagnosis codes on the Uniform Hospital Discharge Data Set also may preclude the assignment of E codes.<sup>21</sup> Since E codes are not reimbursable under the Health Care Financing Administration's (HCFA's) prospective payment system, there is no financial incentive for hospitals to assign E codes. Thus, reimbursable diagnosis codes are more likely to be listed on the Uniform Hospital Discharge Data Set even when the cause of injury is documented in the medical record and an E code should be assigned. As shown previously,<sup>21</sup> we found that older people and those with a longer length of stay (i.e., with an increased number of diagnoses due to multiple trauma, comorbid conditions, and/or complications) were less likely to have an E code assigned. Al-

though E coding of the cases with diagnosis codes in all available fields would increase the overall E coding rate for the state by less than about 2%, not E coding them would result in an underestimate of the causes for a portion of more severe injuries and those with higher costs associated with longer lengths of stay.<sup>21</sup>

The HCFA has recently added a separate labeled space for an E code on the UB-92, the new uniform billing form for hospital services. This will ensure sufficient space for an E code to be listed without superseding a reimbursable diagnosis code and will increase the potential for E coding of injury discharges, but only in states that use the UB-92. A HCFA requirement for the use of E codes in its prospective system would likely be the most effective way of increasing rates of E coding.<sup>3,16,18</sup> Use of the last digit of the UB-92 E code space to indicate the place of occurrence of the injury should also be considered.

The lack of guidelines for E coding contributed to inconsistencies in coding among nosologists and prompted the development of our own detailed coding rules. Disagreement between our E codes and those on the Uniform Hospital Discharge Data Set was due in part to the conservative nature of our coding rules, especially for intentional injuries. Guidelines for E coding are currently being developed by the National Center for Health Statistics.<sup>33</sup> Implementation of these guidelines and the training of medical records coders in their use should lead to improvements in the reliability and completeness of E coded injury hospitalization data.

Improvements in documentation of cause of injury also will be necessary to ensure complete E coding. Most injury discharges in our study involved adequate cause of injury information, but nearly one third of those with vague or no E codes had inadequate documentation to assign a specific E code; more than half of all discharges had insufficient information regarding place of occurrence. Documentation of intent, especially for poisonings involving medications, was extremely variable, a problem that has been reported previously.<sup>34</sup> Better documentation of cause of injury for falls and motor vehicle crashes, the most common causes of hospitalized injury,<sup>1</sup> would improve the potential for assigning a specific E code to an estimated half of all injuries not adequately E coded in Rhode Island.

We found that cause of injury documentation varied widely across medical

record forms, with no one type of form having cause of injury information for more than 51% of discharges. This suggests that medical records coders need to review completely the medical record to assign an accurate E code. Since coders are already required to read the complete record in order to properly code the medical condition (in this case, the injury or injuries), review of the medical record to determine the cause of injury should not substantially increase their burden.

Hospital discharge data sets are potentially the most cost-effective means of monitoring injuries requiring hospitalization, but their usefulness is greatly limited by incomplete E coding. The similarity between our results and unpublished data for New York State<sup>32</sup> suggests that, for other states, rates of E coding may be substantially increased simply by making better use of existing documentation in the medical record. Mandated E coding of hospital discharge data and the use of standardized E coding guidelines will help increase the rate of E coding for injury discharges for which the cause of injury is already documented in the medical record. Further efforts to improve documentation by medical providers will also be required to ensure complete and accurate E coding. Agencies regulating hospitals, medical personnel, and medical records coders must combine efforts to increase injury E coding if monitoring—and ultimately prevention—of nonfatal injuries is to be successful. □

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