

Coding External Causes of Injury (E-Codes) in Maryland Hospital Discharges 1979–88: A Statewide Study to Explore the Uncoded Population

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Abstract: We examined the trends in hospital discharge E-coding in Maryland over a 10-year period. The overall proportion of E-coded discharges has increased from 40 percent in 1979 to 55 percent in 1988. E-coding was lower in the severely injured, the elderly, and patients with long hospital stays. Our findings demonstrate that E-code reporting varies because of the limited number of data fields

available for coding of discharge diagnoses. Universal, systematic reporting of E-codes in hospital discharge data is essential if these data are to provide critically needed information about nonfatal injuries. Hospital discharge data formats should contain separate fields for E-codes and the use of these codes, we believe, should be mandated. (*Am J Public Health* 1990; 80:1463–1466).

Introduction

Efforts to examine trends in the incidence of injury, patterns of acute care, and patient outcomes have generally required substantial investments in case ascertainment and data collection. The increasing availability of computerized statewide hospital discharge data offer new opportunities for timely and efficient data collection and policy analysis of issues related to the prevention of injuries and trauma care delivery.^{1–8} The recent development of a computerized conversion table that translates ICD-9CM coded discharge diagnoses into Abbreviated Injury Scale (AIS) scores has led to new applications of these databases, providing population-based data specific to the severity of injuries.^{8–11} Currently, 28 states require that uniform hospital discharge data be collected on all acute care hospitalizations.⁸

The lack of consistent coding of the external cause of injury limits the usefulness of these databases.^{12,13} Although a classification of external causes exists within the structure of the International Classification of Diseases (ICD E-codes),¹⁷ hospitals vary in their use of these codes. Accurate data on the causes of nonfatal injuries and a means to measure their trends are not available in the United States. Underreporting of E-codes in hospital discharge abstracts has been recognized as a major limitation in their use for these purposes.^{12–15}

To better understand factors responsible for incomplete E-coding, we analyzed 10 years of Maryland hospital discharge data. The specific objectives of the study were: to examine time trends in the level of E-coding in the statewide population-based hospital discharge data; and to determine demographic and clinical characteristics of the uncoded population (the missing E-code population), in order to identify strategies for improving reporting of E-codes.

Methods

Uniform hospital discharge abstract data for the state of Maryland during the 10 years from 1979 to 1988 were used to

examine trends in E-coding over time. All 52 non-federal acute care hospitals in Maryland are mandated by law to submit uniform data to the State's Health Services Cost Review Commission (HSCRC). External causes of injury are reported as ICD-9CM E-Codes and can be included in the database as one or more of five possible discharge diagnoses.

The Study Population consisted of the 349,487 hospital discharges in the state of Maryland with a principal diagnosis of traumatic injury. Traumatic injuries were defined as those injuries coded with ICD-9CM diagnoses codes 800–959 excluding: late effects (905–909), foreign bodies (930–939), and early complications (958). Poisonings (960–979), toxic effects (980–989), other and unspecified effects of external causes (990–995), and complications of medical and surgical care (996–999) were also excluded. E-coding status of each discharge abstract was defined as one of the following three categories based on existence of an E-code and availability of ICD-9CM code recording space: 1) E-coded discharge, 2) Uncoded discharge with no coding space available (no E-code, not codable), 3) Uncoded discharge with coding space available (no E-code, codable). Using the 1988 data, coding status was examined by age of the patient, injury severity, body region of the injury assigned as the principal diagnosis (head-neck/extremities), length of hospital stay, and level of hospital care, i.e.: 1) Specialty Referral Trauma Centers (SRTC) (One adult and one pediatric); 2) Regional Trauma Center (RTC) (nine centers); 3) Community Hospital (Com Hosp) (41 hospitals). Injury Severity was assessed by the Injury Severity Score (ISS)¹⁶ and was assigned to each discharge using the ICDMAP software^{9,10} that maps ICD-9CM coded diagnoses into Abbreviated Injury Scale (AIS) scores and ISS. E-code status was examined for the 10 years 1979–1988.

Results

The proportion of E-coded trauma discharges increased over the study period by 38 percent, from 40 percent in 1979 to 55 percent in 1988 (Figure 1). Over the same period, however, the proportion of uncoded discharges that had vacant space available for additional codes (no E-code, codable) decreased from 98 percent in 1979 to 53 percent in 1988.

Increasing age was associated with a decrease in the percent of E-coded discharges as well as an increase in the proportion of not codable discharges (Figure 2). In 1988, the year with the highest coding rate, 73 percent of the 0–5 age

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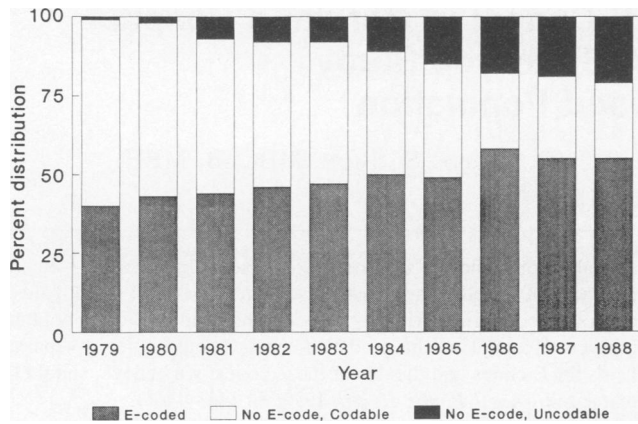


FIGURE 1—E-Coding Status by Year, Maryland Trauma Discharges, 1979-88

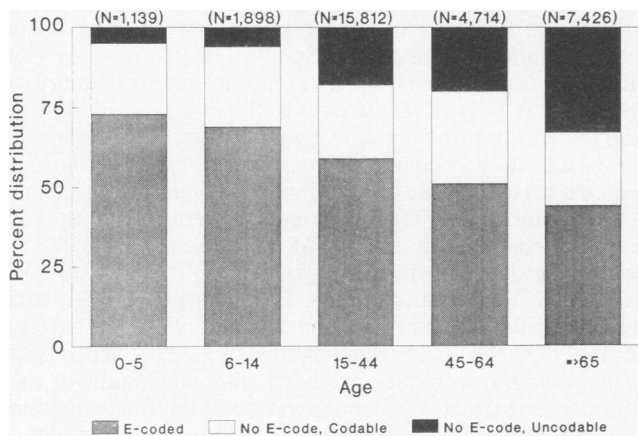


FIGURE 2—E-Coding Status by Age, Maryland Trauma Discharges, 1988

group discharges were E-coded as compared to 44 percent in the ≥ 65 age group. However, in age group 0-5, 18 percent of the uncoded discharges were not codable, as compared to 59 percent in age group ≥ 65 . This differs from earlier study years; in 1979, for example, the proportion of E-coded discharges ranged from 44 percent in 0-5 age group to 40 percent in ≥ 65 , while the percent of uncoded discharges that were not codable ranged from 0-1 percent.

As the Injury Severity Score (ISS) increased the proportion of E-coded discharges decreased and the proportion of uncoded discharges that were not codable increased (Figure 3). In 1988, the proportion of E-coded discharges ranged from 59 percent of ISS group 1-8 to 25 percent of ISS ≥ 25 . However, in ISS group 1-8, 29 percent of the uncoded discharges were not codable, as compared to 92 percent of the uncoded discharges of ISS group ≥ 25 . In the early years of the study period, E-coding status did not vary with ISS; for example, in 1979, the proportion of E-coded discharges ranged from 42 percent of ISS 1-8 to 39 percent of ISS ≥ 25 ; out of the uncoded discharges the percent of not codable discharges, however, was very low ranging from 0-2 percent.

Table 1 compares the 1988 E-coding status within ISS subgroups between the two most prevalent body-region categories: head/neck and extremities. In both groups the proportion of E-coded discharges decreased with increasing ISS. However, the proportion of coded discharges in the extremities group was lower than the head-neck group in all ISS categories, with more notable differences in the most

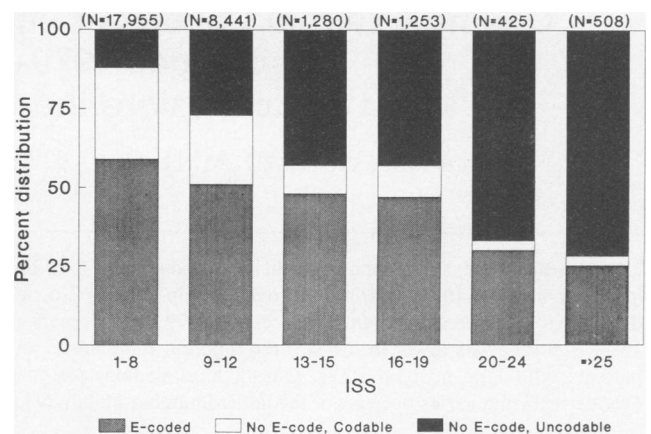


FIGURE 3—E-Coding Status by Injury Severity Score, Maryland Trauma Discharges, 1988

severe groups (ISS 16 and higher). There were also marked differences between the head/neck and extremities groups in the proportion of uncoded discharges that were not codable. For example, in the ISS 16-19 Head/Neck group 47 percent of the discharges were uncoded, and 72 percent of them were not codable. This is compared to discharges with a principal injury to the extremities of which 76 percent were uncoded, and of them 95 percent were not codable.

In 1988, 64 percent of the 1 day LOS group were E-coded, as compared to 25 percent of the 29-56 days, and 12 percent of LOS ≥ 57 days (Figure 4). Of the uncoded discharges the proportion that were not codable increased from 17 percent of the uncoded discharges in the 0-1 day LOS group to 96 percent of the uncoded discharges in the ≥ 57 days LOS group.

E-coding increased over the study period in all levels of care, however trauma centers coded a higher proportion of discharges. For example, in 1988 over 60 percent of trauma center discharges were E-coded as compared to 47 percent of the discharges from community hospitals (Figure 5). In community hospitals, 70 percent of the uncoded discharges were codable, as compared to 28 percent and 7 percent of the uncoded discharges in Regional Trauma Centers and Specialty Referral Trauma Centers, respectively.

Discussion

This study demonstrates that the current structure of many statewide hospital discharge data systems restricts the use of E-codes for specific subgroups of patients. In Maryland, reporting of E-codes is not required and is done inconsistently across hospitals and patients. In many hospital discharge data systems, including HCFA's UB-82, E-codes can only be included in the discharge abstract as one of five discharge diagnoses.¹³ Since ICD E-codes are not used as a basis for reimbursement, they receive low priority in the selection process of the five ICD-9CM codes reported.¹⁴ Thus E-coding rates are lowest among selected groups of patients that are typically characterized by large number of discharge diagnoses, i.e. severely injured patients having multiple injury-related diagnoses, the elderly patients who are likely to have chronic diseases existing prior to the trauma and are more prone to complications leading to additional discharge diagnoses, and the patients with long hospital stays either due to severe injuries or complications. Injuries, preexisting chronic conditions and complications all take precedence

TABLE 1—E-Coding Status by Body-Region of Principal Diagnosis and by ISS, Maryland Trauma Discharges, 1988

ISS	%E-Coded		% No E-Code Codable		% No E-Code Uncodable		Total	
	Head/Neck	Extremities	Head/Neck	Extremities	Head/Neck	Extremities	Head/Neck	Extremities
1-8	65	54	20	38	15	8	100	100
9-12	61	48	12	25	27	27	100	100
13-15	52	44	3	8	45	48	100	100
16-19	53	24	13	4	34	72	100	100
20-24	26	22	2	5	72	73	100	100
≥25	31	12	3	2	66	86	100	100

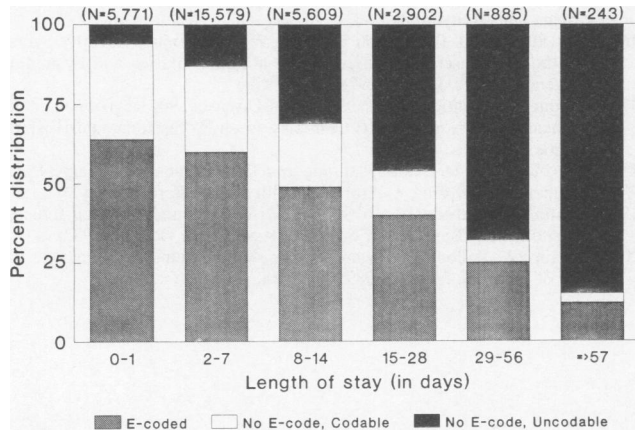


FIGURE 4—E-Coding Status by Length of Hospital Stay, Maryland Trauma Discharges, 1988

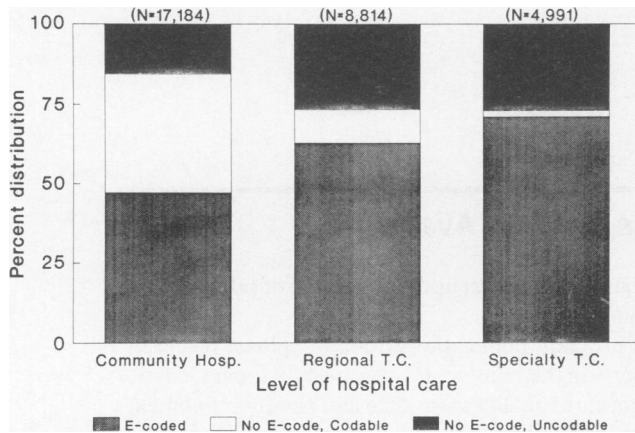


FIGURE 5—E-Coding Status by Level of Hospital Care, Maryland Trauma Discharges, 1988

over cause in coding since they may influence the rate at which hospitals are reimbursed.¹⁴

In Maryland, the proportion of E-coded trauma discharges has increased from 40 percent in 1979 to 55 percent in 1988. This is likely due to increasing awareness and interest in injury control and Emergency Medical Services (EMS) in the state. Of the uncoded discharges, however, the proportion that were codable has decreased from 98 percent in 1979 to 53 percent in 1988. This trend was most marked in the selected groups of patients described above. This finding suggests that while there is an increasing awareness of the importance of E-coding in the state, there is less potential for including an E-code in the hospital discharge data. This is

likely due to the increased attention paid to characterizing the full extent and nature of the injury, complications, and comorbidities and utilization of all five ICD-9CM coding spaces.

Simply increasing the number of fields for recording diagnoses, however, is not an adequate solution. In California, for instance, where a maximum of 25 hospital discharge diagnoses can be recorded,¹⁸ only 40 percent of the trauma discharges in 1983 have been E-coded (MacKenzie EJ, unpublished data). Rather, it will be necessary to mandate E-coding and provide data fields separate from those available for recording diagnoses, preexisting medical conditions, and complications. Mandatory E-coding legislation or regulation, as initiated in New York, California, Wisconsin, and Washington State,¹³ and more recently in Rhode-Island and Vermont, provide the means to ensure better compliance with E-coding practice. As has been demonstrated in this study, however, it is essential that separate fields for recording of E-codes be created otherwise it may not be recorded on computerized data bases for those injury cases with multiple diagnoses. There is a need for two E-coding fields in order to adequately characterize the external cause and intent of the injury.¹⁹ Monitoring trends in E-coding rates in these states will be important to assess the extent of compliance and accuracy. Mandating that trauma discharges be E-coded will only be effective if hospital coders are properly trained.¹³ Computer software recently developed by the Centers for Disease Control should assist in simplifying E-coding and increase in reliability.²⁰ In addition, training manuals and courses for E-coding are now available.¹⁹

Until such time as E-codes are uniformly recorded for all trauma discharges, caution must be exercised when extrapolating results by cause of injury based on only those discharges that are E-coded. This study shows systematic underreporting of external causes of injury in specific trauma patients groups such as the elderly, the severely injured, etc. At the very least, extrapolations should only be made within strata of the population defined by age of the patient and the nature and severity of the injuries sustained. It is also important to recognize that patterns of E-coding may vary over time, by geographic region and by hospital type and coding practices. Gathering cause of injury data from different databases requires attention to the scope and direction of E-code reporting bias that each system may introduce.

Hospital discharge data represent an important and usually the only source of population-based data on serious, nonfatal injuries. Systematic, uniform, and reliable reporting of E-codes in these databases would provide essential information for monitoring trends and patterns of injury, defining subgroups of the population at high risk of injury, and in developing and evaluating injury prevention programs.

ACKNOWLEDGMENTS

This work was supported in part by Department of Health and Human Services grant No. MCH-244001 from the Division of Maternal and Child Health. The authors acknowledge the assistance of Sharon L. Edelstein, ScM. This study was presented in part at the 117 annual meeting of the American Public Health Association, Chicago, October 1989.

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