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Injury Surveillance: A Statewide Survey of Emergency Department Data Collection Practices

[Injury Prevention/Original Contribution]

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Outline

- [Abstract](#)
- [INTRODUCTION](#)
- [MATERIALS AND METHODS](#)
- [RESULTS](#)
- [DISCUSSION](#)
- [REFERENCES](#)

Graphics

- [Figure 1](#)
- [Figure 2](#)
- [Table. Injury-relate...](#)

Abstract

Study objective: To assess current emergency department data collection practices in Pennsylvania and determine whether existing data sources can be used as part of a statewide injury surveillance system.

Methods: Separate survey questionnaires requesting information on current ED patient data collection

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| Email Article Text | |
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| <i>Links...</i> | |
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| Abstract | |
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| Help | |
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practices and attitudes were mailed to all directors of medical records, billing, and EDs in Pennsylvania (N=212).

Results: Of the medical records department respondents, 92% indicated that ED registration data are retained in a computerized information system; 94% of respondents from billing departments reported that their ED patient registration system is integrated with an ED billing system. A total of 36% of EDs surveyed use a computerized ED patient logbook, and another 27% plan to begin a computerized log within 2 years. Dictation and transcription services that permit electronic retrieval of text are being used by 26% of EDs for patient medical records.

Conclusion: Many elements for building a statewide ED injury surveillance system are in place in Pennsylvania, but they are as yet incomplete. Future studies should examine the feasibility of integrating existing ED data systems into statewide injury surveillance systems.

INTRODUCTION [↑](#)

Injury surveillance provides information on why, how, where, and to whom injuries occur through the ongoing collection, analysis and interpretation of data.^{1,2} Most injury surveillance systems have utilized mortality and hospital discharge data. Hospital emergency department data represent an important but underused source of information for injury-surveillance efforts. About one third of the 90 million patients receiving care in EDs in the United States annually are there because of injuries.³

In contrast to mortality and hospital discharge data, population-based ED data is infrequently available or used. Because only 5% to 13% of all injured persons treated in EDs are hospitalized,^{4,5} clinical data on the remaining injuries are not usually reported, aggregated, or analyzed. Consequently, a significant source of injury data is not available for surveillance purposes. Valid conclusions about injury epidemiology cannot be reached until ED data are included in injury surveillance efforts. The objective of this study was to assess current ED data-collection practices in Pennsylvania and to determine whether and how existing data sources can be used as part of a statewide injury-surveillance system. We describe ED data collection practices in three distinct but related departments of the hospital: medical records, billing, and the ED.

MATERIALS AND METHODS [↑](#)

In the fall of 1993, separate and distinct questionnaires were mailed to the director of medical records, the director of billing, and the ED of all nonfederal acute care hospitals offering at least basic ED service in Pennsylvania. The names and addresses of all 212 hospitals meeting these criteria were obtained from the Pennsylvania Department of Health's fiscal year 1991 annual hospital survey and from a telephone survey of hospital billing departments we conducted in the spring of 1993. Hospitals were grouped by level of ED capability (basic, general, comprehensive, trauma), annual number of ED patient visits (0 to 14,999; 15,000 to 29,999; 30,000 or more), and geographic region (rural, other urban, large urban).

The survey questionnaires, adapted from an instrument developed by one of the authors (HW) for a 1990 survey of EDs in New York City, were pretested at eight Pennsylvania hospitals and revised. Institutional review for this project was obtained through the University of Pittsburgh Institutional Review Board.

Three different questionnaires were used to target three different hospital departments. Hospital billing departments were included in the survey because ED patient billing records are a potential source of injury-surveillance data. This questionnaire focused on billing system details and integration with

other hospital data systems. Medical records personnel were surveyed to ascertain information about computerization of ED patient records as well as the coding and reporting of ED patient data. ED medical directors were surveyed to understand data-collection practices in the ED. Inquiries regarding the ED logbook, patient registration, and collection of injury data elements were the focus of the ED questionnaire.

The surveys were completed by the director, supervisor, or other qualified member of each department's staff. Topics covered by the surveys included ED patient registration and billing practices, the ED logbook, computerized patient record systems, collection of injury data elements, and attitudes of staff toward statewide ED data collection. After 5 weeks, a second copy of the survey was mailed to nonresponders.

Questionnaire responses were manually entered into a computerized database (Microsoft Access). A printout of the computerized data set was manually verified against the original survey responses before analysis.

We evaluated the representativeness of the three study population groups by comparing survey respondents and nonrespondents as to level of ED capability, annual number of ED patient visits, and geographic region using the $[\chi]^2$ test. We also performed a comparison of replies to the two mailings. Finally, summary statistics of the survey data were computed using Epi Info software (USD, Incorporated). Statistical significance was set at a *P* value of .05.

RESULTS [↑](#)

Of 212 surveys sent to each of the three departments, 178 (84%) were completed and returned by medical records departments, 164 (77%) by billing, and 148 (70%) by EDs. There were no significant differences between respondents and nonrespondents as to level of ED capability, annual number of ED patient visits, or geographic region for each of the three departments surveyed. Seventy-seven percent of the responses were from the first mailing, and 23% were from the second mailing.

All of the EDs surveyed use a log system to enter patient visit information. At least a handwritten log is used by 115 (78%) of the 148 respondents, and 54 (36%) use at least a computerized version of a logbook; 21 (14%) of EDs use both types of logs. More than half (53%) of responding EDs with 30,000 or more patient visits per year use a computerized log, compared with 35% of those with 15,000 to 29,999 annual visits and only 17% of those with fewer than 15,000 annual visits.

Of those EDs with a computerized logbook system, 40% use software that was developed in house and 40% use a commercial software package. The hospital mainframe is used by two thirds (66%) of these EDs; other types of computer hardware used are shown in [Figure 1](#).

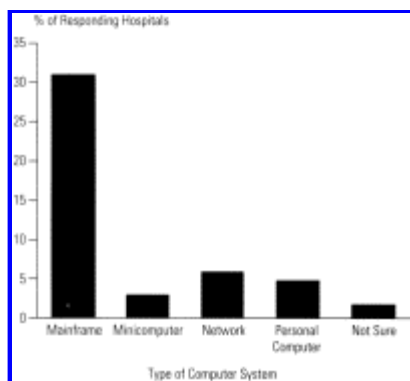


Figure 1. Types of computer systems used for ED patient logs in Pennsylvania, (1993 as reported by ED directors).

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Forty (25%) of the 159 of the billing department respondents reported that the billing system for ED patients is integrated with a computerized ED log system. Of EDs that currently use a handwritten log, 27% report that they plan to start using a computerized log within 2 years; 37% (36 of 98) do not plan to do so, and 37% were not sure.

Of the 145 ED respondents, 133 (92%) indicated that a computerized system is used for registering patients seen in the ED. Of 53 EDs that used both computerized registration and a computerized log system, 43 (81%) reported that the two systems are functionally integrated. Usually, the registration function is part of the gathering of information for billing purposes. Of billing department respondents, 95% reported that ED patient registration and billing systems are integrated. Similarly, 92% of medical records respondents indicated that ED patient registration data are retained in a computerized hospital information system.

When asked about the inclusion of ED patient clinical data (demographic information, diagnoses, and procedures) in the hospital's computerized information system, 75% of medical records respondents indicated that the main hospital information system includes such data on ED patients who are not admitted, and 73% include data on patients transferred to another facility.

According to respondents to the medical records questionnaire, only 20(12%) of 174 EDs used a computerized patient clinical record system (ie, a system characterized by the input and output of information on nurse and physician notes, procedures, diagnoses, and laboratory results). Of those who did not currently have a computerized clinical record system, 23% (34 of 150) planned to purchase such a system within 2 years.

The nationally adopted uniform bill, 1992 version (UB-92), is used by all hospitals for inpatient billing to the Health Care Financing Administration for Medicare patients. Many states use this data format to create statewide inpatient hospital discharge data sets. Our survey found that 99% of billing departments for EDs also use the UB-92 format.

One third of billing departments reported that ED patient billing information is retained on a computer system only until the account is paid; thereafter the account information is purged. Another 48% purge the data after 1 year. Only 16% of billing departments reported that billing information is retained on the computer system for 2 years or more (Figure 2). Almost two thirds of the hospitals reported that patient billing information is stored on either microfiche or microfilm after it is purged from the computer system. Other storage types include tape or disk (17%) and paper copies (17%).

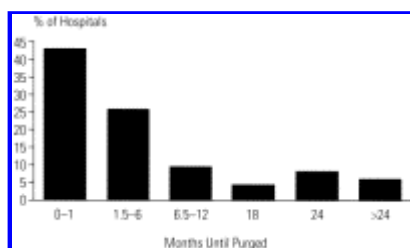


Figure 2. Purging of ED computerized billing data(as reported by billing administrators).

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Twenty-five percent of ED respondents reported using a dictation or transcription typing service that allows for dictated medical records to be retrieved in electronic form (ie, ASCII, word processing, or database). Another 14% reported using a computer system that allows clinicians to generate ED medical records and reports directly from voice input. However, the use of computer automation for ED

reporting varied significantly, with smaller-volume EDs less likely to use these types of systems. For example, EDs with fewer than 15,000 annual visits comprise 25% of the state's hospitals, but only 5% use a dictation or transcription typing service.

The proportion of injury-related data elements collected in the ED in any form (written or computerized) according to survey respondents is shown in the [Table](#). The [table](#) also presents the degree to which responding EDs value each data element for inclusion in an injury data system. For this question, respondents were asked to rate the value of each data element on a three-point scale, with 1 representing "useless," 2 representing a neutral response, and 3 representing "valuable."

| Data Element | No. Who Responded | % Who Collect the Data Element | Mean Value Ratings±SD* |
|------------------------------------|-------------------|--------------------------------|------------------------|
| Discharge disposition | 146 | 99 | 2.81±.39 |
| Chief complaint | 146 | 99 | 2.84±.43 |
| Mode of transportation to ED | 146 | 99 | 2.47±.57 |
| Whether injury occurred on the job | 146 | 96 | 2.73±.51 |
| Body part injured | 146 | 93 | 2.78±.46 |
| Employer | 145 | 92 | 2.15±.71 |
| Marital status | 145 | 92 | 2.15±.77 |
| Race/ethnicity | 145 | 89 | 2.13±.67 |
| Blood alcohol level | 145 | 88 | 2.83±.34 |
| Location of injury event | 145 | 88 | 2.70±.51 |
| Protective equipment used | 144 | 86 | 2.84±.39 |
| Alcohol or drug involvement | 146 | 86 | 2.87±.36 |
| Toxicologic tests | 145 | 86 | 2.79±.45 |
| Injury reported to law enforcement | 145 | 86 | 2.66±.48 |
| Therapeutic drug level | 146 | 86 | 2.76±.47 |
| Struck by object | 143 | 85 | 2.73±.53 |
| Type of other weapon (nonfirearm) | 144 | 74 | 2.78±.42 |
| Occupation | 145 | 69 | 2.33±.66 |
| Ambulance ID | 145 | 69 | 2.08±.77 |
| Glasgow Coma Scale score | 145 | 67 | 2.64±.59 |
| Whether injury was intentional | 146 | 66 | 2.72±.52 |
| Diagnosis codes (ICD-9) | 143 | 64 | 2.58±.67 |
| Assault relationship | 146 | 63 | 2.66±.59 |
| Type of firearm used | 144 | 58 | 2.72±.49 |
| FMS run number | 145 | 56 | 1.90±.79 |
| City of injury occurrence | 143 | 55 | 2.13±.72 |
| Address of injury occurrence | 143 | 48 | 2.14±.67 |
| Trauma score | 141 | 39 | 2.54±.64 |
| External cause codes (ICD-9) | 138 | 24 | 2.38±.72 |
| Revised trauma score (RTS) | 144 | 15 | 2.41±.66 |
| Other severity indicator scale | 113 | 14 | 2.34±.72 |
| Abbreviated injury scale (AIS) | 143 | 8 | 2.20±.70 |

Table. Injury-related data elements collected by Pennsylvania EDs (as reported by ED directors).

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According to medical records respondents, more than half of the hospitals submit outpatient data to the Pennsylvania Health Care Cost Containment Council, a state agency that collects and reports data on inpatient hospital discharges. Of those who submit outpatient data, 47% (43 of 92) include outpatient ED patient data; at the time of the survey, reporting of ED outpatient data was not required by the state. When medical records personnel were asked about use of *International Classification of Diseases-Ninth Revision* (ICD-9) external cause codes (E-codes) for coding of ED patient injuries, more than half (86/170) indicated that E-codes are recorded for all injuries.

Although ED respondents indicated a willingness to explore the benefits of working with other groups to create a statewide ED data collection system, only 9% reported that they have had positive experiences with government-sponsored data collection projects; 28% reported negative experiences, and 63% were either neutral or unsure. Approximately one third of respondents indicated interest in assisting in the design of an ED injury data collection system, including helping to select and define data elements for such a system.

DISCUSSION [↑](#)

Many researchers have called for injury surveillance programs that encompass ED data.^{6,7} Despite its utility for injury surveillance, few agencies have explored and implemented ED comprehensive injury data collection, except for those using the contents of the ED logbook ⁸⁻¹⁰ or injury-specific reporting systems.¹¹ Only Missouri, Utah, Louisiana, Connecticut, and Maine are known to have such systems under development or in operation, and most are still in the planning stages.

We found that slightly more than one third of Pennsylvania hospitals currently use computerized ED log systems. However, more than half of the state's hospitals indicated that they would have computerized logs within 2 years. Wider use of such systems may increase their potential importance for use in regional or statewide injury surveillance. As expected, our analysis shows that EDs with larger patient volume are more likely to use computerized log systems than are EDs with fewer patient visits.

Because 40% of computerized ED log systems are developed in house, there is a substantial lack of standard data elements and formats among hospitals. Implementation of national, regional, or statewide surveillance, requires standardization of definition, coding, and formatting schemes so that data from different sources can be merged and analyzed. This process was recently begun with a national workshop on emergency medical data (personal communication, Dan Pollack, MD, Centers for Disease Control and Prevention, October 1995), the goal of which was to design a uniform essential and desirable data dictionary for ED encounters.

Our study also confirms that many computerized log systems are integrated with patient registration and patient billing systems. Such use of hospital-wide, integrated databases may improve the accessibility of data. However, it may be difficult to develop surveillance systems based on standardized hardware and software, because many hospitals have already invested in in-house systems for computerizing their ED logs.

The UB-92 form is used by virtually all hospitals. The fact that this form is also used for ED claims is significant because it means that hospitals collect a standard computerized data set that includes information on demographics, diagnoses, treatments, and patient charges for patients treated in the ED. In theory, it should be possible to capture data on the nature, severity, and extent of injuries and related costs from billing systems that use ICD-9 codes. However, most hospitals purge these data from their computer system within a relatively short period after an account is paid. This finding underscores the difficulty of conducting population-based studies with ED billing data. However, advances in computer technology are leading to much less costly mass data storage, which, in turn, may help to overcome current barriers to retrieval of historical data. Otherwise, health officials and researchers will need to set up timely data retrieval and centralization efforts to archive this information before it is purged from each hospital's data system.

Fields for accident-related codes and E-codes are included on the UB-92 form. However, in Pennsylvania, as in most states, E-codes are required only for inpatients and may not be coded consistently for ED outpatients. We found that many hospitals already used E-codes for all ED patient injuries, although the quality of this coding could not be determined. Nonetheless, this fact is encouraging for any planned regional injury surveillance system, because it demonstrates the feasibility of use of E-codes for every appropriate record.

Most responding hospitals collected and maintained computerized data on ED patients who are not admitted. Some EDs used a dictation or transcription system to generate text of the clinical encounter that is retrievable electronically; others used a computerized clinical record system or a voice input system that produces either text or formatted input. Our survey suggests that the use of computerized patient data systems will increase in coming years. Such systems should be designed to collect specific types of information suitable for injury control; for example, by the use of data-collection prompts such as the "WWWWHP" (who, what, where, when, why, how, and prevention) mnemonic system.¹² Expanded use of new data entry technologies and transfer of text to electronic media will create sources of ED patient data that may be valuable for ED surveillance.

Some experts have recommended that injury surveillance focus on fatal and injuries and those requiring hospitalization injuries to ensure that prevention resources are directed to the most serious injuries and to reduce the cost of data collection.¹³ However, with regard to ED surveillance, these concerns can be ameliorated with adjustments for severity and selection by diagnosis and treatment

criteria-while maintaining acceptable costs by using data that are already mostly being collected.

Our study is subject to the typical limitations of a self-report survey, including the potential for bias in reporting by the individual completing the survey and the unknown effects of nonrespondents. The design of the survey and the involvement of three different departments at each institution should have reduced reporting bias. The response rate was high enough to minimize the problem of nonrespondents. Our survey indicates several areas for exploration and concerns that should be kept in mind when ED injury-surveillance systems are being developed.

Substantial benefits could accrue from use of an ED-based surveillance system. First, improved identification of costly and often debilitating nonfatal injuries not usually severe enough to require hospitalization (eg, dental injuries, eye injuries, mild brain trauma, hand injuries, and cervical strain or whiplash).

Second is more accurate measurement of prevention effectiveness. Evaluation of the effectiveness of preventive measures in reducing severity requires comparison of injury rates between persons using safety devices and those not using such devices. To avoid underrating of effectiveness, the less seriously injured and noninjured populations should be counted. It is difficult to show improvement in prevention efforts if the denominator is not appropriate. Third is the avoidance of confounding caused by the use of only inpatient surveillance to determine injury incidence and temporal patterns. Systematic administrative and fiscal decisions affect the likelihood of admission. For example, ED visits in the United States for all causes rose 19% between 1985 and 1990, but inpatient admissions dropped 7% during the same period.¹⁴ These changes probably were caused by ongoing structural modifications in the health care system as a result of cost control pressures, rather than changes in the seriousness of hospital visits. If injury-related visits are affected by the same system pressures, a decrease in admission rates may be falsely attributed to decreased incidence of ED visits.

Fourth, overall medical cost estimates can be improved as a result of taking ED costs into account.

The willingness of almost half of the ED respondents to explore the benefits of working with other groups on a statewide injury data collection system is a good sign. Because many ED personnel reported less-than-positive experiences with government-sponsored data-collection projects in the past, a dialog should be established to identify the concerns of those who do the actual work of data collection when establishing system requirements. Maintaining good communication with the staff who document, code, and provide data will help to ensure the successful development of ED injury-surveillance systems.

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