H·CUP

HEALTHCARE COST AND UTILIZATION PROJECT

HCUP Methods Series

Contact Information:

Healthcare Cost and Utilization Project (HCUP)
Agency for Healthcare Research and Quality
540 Gaither Road
Rockville, MD 20850
http://www.hcup-us.ahrq.gov

For Technical Assistance with HCUP Products:

Email: hcup@ahrq.gov

or

Phone: 1-866-290-HCUP

TABLE OF CONTENTS

INDEX OF TABLES

INDEX OF FIGURES

EXECUTIVE SUMMARY

Introduction and Purpose

The Agency for Healthcare Research and Quality (AHRQ) recently initiated the development of State Emergency Department Databases (SEDD) to support research on the cost, quality, and outcomes of emergency department (ED) care. These databases are part of the Healthcare Cost and Utilization Project (HCUP), which develops and maintains a family of inpatient and outpatient health care databases, as well as related software tools and products through a Federal-State-Industry partnership. HCUP Partner organizations, including state governments, hospital associations, and private data organizations, collect and maintain statewide data from individual hospitals. These state-level databases serve as the foundation for the HCUP databases.

The SEDD provide a new resource for large-scale population-based studies of ED services. The databases contain encounter-level hospital administrative data records that summarize individual visits. Each database includes all hospital-affiliated emergency department encounters within a state for patients that are not admitted for inpatient services. SEDD records are organized into annual, state-specific files that share a common set of data elements and a uniform structure designed to facilitate multi-state analysis. At present, AHRQ has completed multi-year research databases that contain ED visit data from 12 states. The SEDD data currently span 1996 - 2002, with the number of years of data varying by state. Additional states will be added to the SEDD for 2003 and future data years. SEDD from four states were recently made available to analysts outside AHRQ through the HCUP Central Distributor with permission from these HCUP Partner states.

This study assesses the data quality and completeness of the first multi-state HCUP SEDD, created for the 1999 data year. It also examines the ED data collection practices of hospitals and statewide data organizations that provide data for the SEDD. This initiative comes in response to AHRQ's request that Medstat: (1) investigate processes for requesting, collecting, and maintaining ED data, and (2) evaluate the quality of HCUP SEDD data for health services research. Examining these issues is important because collection of ED data by statewide data organizations is relatively new. The ED data have not been used as widely as inpatient data, and thus, little is known about their strengths, weaknesses, and opportunities for improvement.

Methods

The study was conducted between February and September 2002 by Medstat, AHRQ's primary contractor for the development and maintenance of the HCUP databases. The study team performed a three-step evaluation. First, analysts completed a literature and Internet search to locate information on methods and practices for collecting ED data. Next, the team evaluated the HCUP data by comparing statistics across the five states in the 1999 SEDD (Connecticut, Maine, Maryland, Missouri, and South Carolina) and by comparing the SEDD with ED data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) and the American Hospital Association (AHA) Annual Survey of Hospitals. Finally, in-depth interviews were conducted with three groups of industry experts selected for their knowledge of ED data collection practices and standards: (1) HCUP Partners collecting ED data at the time of the interviews; (2) HCUP Partners planning new ED data collection programs; and (3) hospital industry experts outside of the HCUP Partnership.

Quantitative data analyses were performed using two alternate definitions of ED visits, depending on the comparison database: (1) "outpatient ED" visits, which exclude patients admitted to the hospital from the ED, and (2) "all-encounter ED" visit counts, which include all patients admitted to the ED, regardless of their destination on discharge. All-encounter ED visits were calculated from the HCUP data by combining outpatient ED visits, contained in the SEDD, with visits for patients hospitalized following admission to the ED, which are contained in the HCUP State Inpatient Databases (SID).

Quantitative Findings

Hospital Inclusiveness

The SEDD adequately capture the intended target universe of community hospitals with EDs:

- In three of five states, the SEDD appear to capture data from all community hospitals with an ED, when compared with the AHA Annual Survey of Hospitals (Figure 1). In the two other states, small discrepancies in hospital composition between the SEDD and the AHA Annual Survey are explained by reporting practices specific to the HCUP Partner organizations that provide data for the SEDD.

Visit Inclusiveness

The SEDD, AHA Annual Survey of Hospitals, and NHAMCS represent a similar volume of ED visits per state or region in all cases where it was possible to make comparisons between the same types of visits:

- Compared with the AHA state-level data, the HCUP all-encounter ED data contain between 87% and 95% of the total reported annual ED visits to community hospitals in each state (Table 1).

- Compared with the NHAMCS data, the HCUP state-level all-encounter ED visit rates approach their corresponding regional and national estimates. The HCUP rates range from 30.5 to 38.6 ED visits per 100 persons across states (Table 2). The NHAMCS national estimate falls within this range, at 37.8 ED visits per 100 persons across the entire United States.

- The NHAMCS regional rates are also within two visits of the HCUP all-encounter ED visit rates for all but one state (Figure 2). The single deviation is explained by state-specific interventions that have kept ED utilization rates below the average for that region.

SEDD Data Element Characteristics

In general, the ED data elements selected for comparison have similar distributions and little missing data across the five states in the 1999 SEDD.

Patient Financial and Linkage Reporting:

- Patient characteristics (mean age and proportion female) fall within expected ranges for each state and contained little missing data (Tables 3 and 4). Patient race, collected in four of the five states, matches the expected distribution except in one state where 20% of records reported patient race as "other."

- Financial data for ED visits (average charge, total charge, expected primary payer) are also within expected ranges and are reported for virtually all visits (Tables 3 and 5).

- The presence of linkage variables (encrypted medical record number, encrypted person number, and ZIP Code) varies across states (Table 3). All five SEDD include encrypted medical record numbers, which can be used to track patients within a particular institution. One SEDD also contains encrypted person numbers (encrypted Social Security Numbers), which can be used to link patient records across institutions. In addition, essentially all records in each SEDD contain patient ZIP Code. This data element is useful for linking encounter-level records to external data to obtain information about the community in which the patient resides.

Procedure Code Reporting:

The lack of adequate procedure coding is the one notable exception to data element completeness in the 1999 SEDD:

- Four of the five SEDD report ICD-9-CM[1] procedure codes. Fewer than 22% of SEDD visits in these states contain a recorded ICD-9-CM procedure code (Table 6). This finding falls far short of the NHAMCS national estimate that indicates treatment procedures are recorded for 45% of visits. (This published NHAMCS statistic excludes screening and diagnostic procedures and should be regarded as a lower-bound benchmark.)

- Three states report CPT/HCPCS[2] procedures codes (Table 6). In two states, 55% and 95% of visits respectively include CPT/HCPCS procedures. These states routinely collect and edit CPT/HCPCS codes from the line item detail portion of the hospital billing records.

Diagnosis Code and E Code Reporting:

- Principal diagnosis was present and valid on virtually all SEDD records (Table 8).

- Similar to the NHAMCS national estimates, external cause of injury codes (E codes) are reported on approximately one-third of all ED visits in each SEDD (Figure 3). E code reporting is limited to one or two E codes; almost no records contain a third E code.

Qualitative Findings

The interviews and literature search indicated that there is greater variability in outpatient data collection and flow within the hospital system than is the case for inpatient records. Specifically, in the inpatient data arena, universally applied uniform billing specifications result in consistent coding and code sets; professional medical record coders assure complete, accurate, and detailed diagnosis and procedure coding; and industry-wide standardization has been emphasized for more than a decade. Highlights of the interview results are presented here; detailed information is available within the report.

---

[1] International Classification of Diseases, Ninth Revision, Clinical Modification
[2] Current Procedural Terminology/Healthcare Common Procedure Coding System

Hospital Development and Storage of ED Visit Data

The industry experts interviewed for the study described a system in which data capture and information flow are heavily dependent on several factors, including: the specific software, computer systems, medical records coding resources, and organizational structure within a hospital. Hospital reliance on lists of services provided to patients, called "charge masters," automates billing for outpatient services by assigning CPT/HCPCS codes and other payment-related data. Each hospital develops and maintains its own charge description list, which results in variation across hospitals. In addition, charge masters apply different rules for different payers, introducing potential variation across patients within the same hospital. Study participants reported that during the period encompassing the 1999 SEDD, prior to Medicare's transition to use of Ambulatory Payment Classification (APC) for outpatient payment, widespread incentives to assign CPT/HCPCS codes to all ED records were absent.

Data flow within hospital information systems may also contribute to variability in the types of information on ED records. EDs and other functional areas in the hospital collect distinct components of a patient record within separate systems. These are later integrated into a single administrative record for each ED visit. However, in some cases, information system incompatibilities may not allow for all data (e.g., laboratory results) to reside in a centralized electronic patient record. In other cases, aggregate facility data (such as reports by hospital administrators to the AHA Annual Survey), may combine records from urgent care centers with the ED visit record.

Information about ED services is also minimized when patients are admitted to inpatient services. Hospitals uniformly re-directed the ED portion of services into inpatient records, where a patient's ED encounter is summarized into a single revenue code 450-459 (or 45x) and a single ED charge.[3] Details about ED encounters for patients admitted to the hospital (including the specific services rendered in the ED and line item costs) are irretrievable once this status reclassification is completed: the information is available in charts but does not carry over to the hospital information or billing systems.

When requesting ED records for reporting purposes, statewide data organizations generally allow individual hospitals to determine the criteria for extracting ED records from their systems. Hospitals utilize diverse record identification practices, including internal record flags; a special value within the patient account number; "type of service" code; source of admission through the emergency room; and UB-92 revenue codes 45x. When criteria are specified by data organizations, they customarily require that hospitals identify ED records by revenue codes 45x (three states) or internal flags that denote place of service or type of encounter (two states).

Statewide Data Organization Collection and Handling of ED Visit Records

Interviews with HCUP Partners confirmed that statewide data organizations provide hospitals with required specifications for ED data file layout and content; specifications in most states mirror UB-92 layouts for inpatient data; and hospitals are reluctant to modify established inpatient data extraction programs to collect ED-specific elements. HCUP Partners employ data quality control measures, but these practices vary across the states. Some HCUP Partners delete records with zero or low charges.

---

[3] Under Medicare's "72-hour" reimbursement rule, hospitals cannot separately bill for care provided in the ED immediately prior to admission.

HCUP separates inpatient, ambulatory surgery, and ED data in its contractual agreements with participating statewide data organizations and in the resultant HCUP databases. For this reason, data organizations customarily provide extract files to HCUP that contain only ED data for development of the SEDD, although the data organizations' internal files may combine all outpatient data.

Improving Future SEDD Data

Some hospitals and statewide hospital data systems collect additional clinical procedure measures that would enhance the research uses of the SEDD. Specifically, line item detail records containing CPT/HCPCS codes may provide needed data to fill shortfalls in procedure code reporting. Potential improvement in CPT/HCPCS reporting may become evident as a result of Medicare's transition to the APC-based payment system in August 2000.

Participants emphasized the need for improved E code reporting and unique or innovative data elements for ED research, including registration date and time, discharge date and time, and a homeless indicator. Future opportunities for strengthening the SEDD may arise as health data organizations augment their statewide data sets with ED-oriented data elements and provide expanded data to HCUP.

Discussion

Several aspects of the findings from this evaluation should be encouraging for SEDD data users. In the five states examined, the SEDD contained data from virtually all community hospital EDs in each state and ED visit rates were comparable to NHAMCS regional visit rates. Patient diagnosis, age, gender, and encrypted medical record number were available on all records. Distributions of patient race generally varied across states in ways that are consistent with population-based racial distributions. In addition, interview findings suggested that hospitals and statewide data organizations employ standard methods to manage records for patients seen in the ED and then admitted to the hospital; these records reside in the inpatient files.

On the other hand, variability in data collection practices by hospitals and statewide data organizations can affect comparisons across states, and to some extent, across hospitals. Several issues emerged from this evaluation that warrant specific attention by SEDD data users, including: absence of a standardized process for collecting ED data within hospitals; non-uniform specifications for extracting data for statewide ED databases; considerable variation in the reporting of procedures across states; and insufficient patient linkage numbers. In addition, interview results revealed other practices that drive differences in data content, such as: inconsistent protocols for retaining, removing, and performing edit checks for records with non-significant or "zero charges"; the potential that hospitals may combine data from urgent care centers with the ED visit data; and the universal practice of reporting ED service information for patients admitted to the hospital through the ED on the inpatient service records. This later practice requires that SEDD users combine the SEDD with inpatient data (SID) if their analyses require a complete set of records for ED users in the state.

At present, the two greatest challenges for SEDD development and analytic use are adequate representation of patient linkage numbers and procedures in the data. The absence of patient linkage numbers limits the use of the SEDD for certain quality and access studies, such as examining ED use after an inpatient stay and identifying patterns of ED use (e.g., for individuals with frequent ED visits). With the introduction of the Centers for Medicare and Medicaid

Services' (CMS) outpatient prospective payment system (OPPS) in August 2000 and HIPAA[4] transaction regulations for ED claims, which became effective in October 2003, hospitals will have stronger incentives to collect better and more complete CPT/HCPCS coding. Both require that hospitals report CPT/HCPCS codes in the line item detail portion of the bill.

Overall, emergency department data collection practices currently appear to be at the point where inpatient data collection practices were 15-20 years ago. Statewide ED collection in the present decade faces a host of challenges including still-evolving data collection standards, diverse collection practices, and lack of a cohesive, unifying vision. These challenges present obstacles to collecting ED data that are comparable across hospitals, states, time periods, and payers.

Finally, it is important to note that the present study was conducted in 2002, when fewer established ED data programs existed. The processes described in this paper reflect statewide ED collection practices as understood and reported by industry representatives during the study period. Since that time, several states initiated or are planning new ED databases and practices have likely evolved. Observed variation among state ED databases will diminish as data organizations adopt standards and practices based on longer-established programs. To the extent that hospitals are able to collect data of interest and are willing to invest in system modifications, lessons learned from the "pioneers" will translate into stronger, more useful research-oriented ED databases.

---

[4] Health Insurance Portability and Accountability Act

INTRODUCTION

Emergency departments (EDs) provide readily available health care services to surrounding communities, offering treatment for emergent, urgent, and non-urgent conditions. They offer care for patients whose conditions are serious enough to lead to hospital admissions, as well as patients who can be treated and released without hospitalization or referred for follow-up treatment in outpatient settings. Increasingly, EDs also function as safety nets for vulnerable patient groups having limited access to physician offices or clinics where illness or injuries could be treated more appropriately. By some accounts, EDs are also used as the reception area for other services (e.g., when physicians instruct patients to meet them in the ED). Despite the unique role of EDs, large-scale administrative health care databases focusing on ED care are relatively scarce, often newly established, and largely untested.

Trends in ED utilization — such as increases in annual ED visits, increased case loads, ED closures, overcrowding, longer wait times, and concerns about inappropriate use — emerged as new and pressing issues during the 1990s (Carpenter, 2001; Government Accounting Office, 2003; Grumbach et al., 1993; Maryland Health Care Commission, 2002; McCaig & Burt, 2001 and 2003; McCaig & Ly, 2002). ED resources were stressed despite only moderate growth in population-based visit rates over the decade (McCaig & Burt, 2001). The health care industry, including state and national data programs, actively recognized the need for new information sources to evaluate ED utilization trends. These forces spurred the development of new ED databases.

Among the new initiatives, the Healthcare Cost and Utilization Project (HCUP) created a series of State Emergency Department Databases (SEDD). Funded and sponsored by the Agency for Healthcare Research and Quality (AHRQ), HCUP develops and maintains a family of health care databases, related software tools, and products that describe hospital-based inpatient and outpatient care. HCUP is a voluntary Federal-State-Industry partnership that builds on the data collection efforts of state government agencies, hospital associations, and private data organizations.

The SEDD represent an important expansion of the overall HCUP project. They are designed to support studies on a broad range of health policy issues, including research on the cost, quality, access, and outcomes of ED care. In combination with the existing HCUP State Inpatient Databases (SID) and State Ambulatory Surgery Databases (SASD), the SEDD expanded HCUP's capacity for health care analysis across settings and within states.

The SEDD contain encounter-level hospital administrative data records that summarize individual ED visits. Each database includes ED encounters from all hospitals within a state for patients that are not admitted for inpatient services. The databases are organized into annual, state-specific files that share a uniform structure and a common set of data elements designed to facilitate multi-state analysis. During the development of the HCUP databases, the data are subject to a standard set of edits. The SEDD contain administrative encounter-level clinical, resource, and demographic information on all patients regardless of payer, including persons covered by Medicare, Medicaid, private insurance, and the uninsured.

At present, AHRQ has completed multi-year research databases that contain ED visit data from 12 states. The SEDD data currently span 1996-2002, with the number of years of data varying by state. A pilot ED database was constructed for 1996-1998 data from one state. Beginning with 1999 data, AHRQ initiated the multi-state database, which included ED encounters from five states: Connecticut, Maine, Maryland, Missouri, and South Carolina. Within the last year,

AHRQ released the SEDD from four states to analysts outside of AHRQ through the HCUP Central Distributor with permission from these HCUP Partner states. Additional states and new data years will be included in future releases of the SEDD.

This study will evaluate the data quality and completeness of the first multi-state HCUP SEDD, created for the 1999 data year. It also will examine the ED data collection practices of hospitals and statewide data organizations that provide data for the SEDD.

Purpose of Emergency Department Data Evaluation

A deeper understanding of the HCUP SEDD is important because these databases are among the few national resources providing information about the use, cost, and quality of ED care in the United States. They are also the only resource that brings together all-payer, population-based data (from entire states) specifically designed for national- and state-level analyses (through multi-state combinations of individual databases).

In AHRQ's initial work with the newly developed databases, staff encountered characteristics of ED data that sparked concerns about the quality of the data for research and prompted questions about data collection processes. Further discussions with AHRQ staff underscored the fact that little was known about processes for requesting, collecting, and maintaining ED data at the hospital- and state-level. Unlike inpatient administrative data — which are collected using uniformly applied standards-based procedures that generate consistently high quality data across states and years — the ED data were not generally well understood. Given how few statewide ED data collection programs existed at the time and the number of newly initiated databases, AHRQ questioned whether ED data systems and data collection procedures might vary widely by hospital and by state.

These considerations are critical because the HCUP SEDD build upon the databases collected by statewide data organizations (known as HCUP Partners) which, in turn, depend on the statewide data systems in individual hospitals and EDs. As information about ED visits is collected and passed along the data stream — from EDs into hospital information systems, then to health data organizations, and ultimately into the HCUP SEDD — variations in collection practices influence the content and quality of the SEDD and impact research use of the data.

Emergency Department Data Collection

AHRQ's decision to support the multi-year, multi-state HCUP SEDD falls within a broader movement to create new state and national databases to support research on ED utilization. Until recently, the health care research and policy community lacked sufficient resources to investigate emerging issues related to ED utilization, despite the pressing need for research data from this health care setting.

Statewide ED data collection can be considered "uncharted territory." Challenges associated with the development of new ED data programs include design issues unique to this type of data, technical and political barriers, and development efforts that occur "in isolation [from other states] or in partnership with only a few other states" (National Association of Health Data Organizations, 2003). HCUP Partners reported receiving requests from legislators, policy analysts, and other decision-makers that could not be fulfilled because their organizations lacked the ED data to respond.

Visit-level statewide ED databases are relatively new. ED data collection emerged in the 1990s but spread slowly throughout the decade. In the Nationwide Data Inventory (NDI) of statewide encounter-level health data collection programs, conducted in 2002, AHRQ discovered that only nine states had an established ED data set as of 1998. Four more states began collecting in 1999 and two additional data programs started in 2001, resulting in only 15 statewide ED data programs during the inventory target year (Agency for Healthcare Research and Quality, 2003).

Currently, approximately half of the state-level health care data organizations in the U.S. collect ED data, and most of these databases were established within the last five years. The pace of ED database development is anticipated to accelerate. By 2005, statewide data organizations in 28 states expect to collect ED visit data (Agency for Healthcare Research and Quality, 2003). Because ED databases were uncommon until recently, the research and policy community and health data organizations themselves are still becoming familiar with the quality and characteristics of ED data.

Study Goals

For these reasons, the study team conducted an evaluation of statewide ED encounter databases. The overall goal of the analysis was to develop a better understanding of (1) the data collection methods that precede development of the HCUP SEDD, (2) SEDD data quality, and (3) measures that can be taken to improve ED data reliability and completeness. At the time the study was initiated, AHRQ had just completed the 1999 SEDD; consequently, the 1999 SEDD are the focus of the data exploration in this report.

The specific objectives of this study were to:

- Evaluate *hospital inclusiveness*, defined as the presence of all hospitals with EDs within the SEDD.

- Evaluate *visit inclusiveness*, defined as full representation of ED visits in the SEDD.

- Examine *data element characteristics*, by confirming the presence of data elements critical for research and policy analysis and by evaluating distribution of data values and data completeness (amount of missing and invalid data).

- Gain an *understanding of ED data collection and storage* in hospital information systems by exploring factors such as the existence of industry-standard criteria for defining ED visits, ways of handling ED data, and the influence of payment incentives on the types of data collected.

- Illuminate *statewide data organization submission processes,* including whether data organizations provide hospitals with specifications for ED data submission, use uniform data specifications across states, and employ a common data element set.

- Describe processes that influence content and quality of ED data files supplied to HCUP.

The remainder of this report is divided into three sections that describe: (1) methods used to explore each study objective; (2) results of the literature search, quantitative analysis, and qualitative analysis; and (3) ED data collection challenges and recommendations.

Appendix A includes a sample Emergency Department Patient Data Form used in the National Hospital Ambulatory Medical Care Survey (NHAMCS) survey. Appendix B presents the data elements contained in the 1999 SEDD. Appendix C includes the discussion guide for the in-

depth expert interviews. Appendix D lists the HCUP Partners and other hospital industry experts interviewed for this study. Appendix E provides additional reference materials identified during the literature search.

METHODS

The evaluation of ED data collection involved three steps: a literature search, an examination of the HCUP SEDD, and interviews with HCUP Partners and other hospital industry experts. The study team conducted this work from February to September 2002.

Literature and Internet Search

The study included a quick survey of the literature to supplement information gathered during analyses of the SEDD and the interviews. Background information was collected prior to industry expert interviews using literature and Internet searches. Following the interview phase, additional searches were conducted to investigate and elaborate specific themes that emerged during the interviews. Search parameters included:

- Standards for ED data collection — existing, proposed, or needed

- Types of information and specific data elements collected for ED visits

- ED data storage in hospital information systems

- ED data quality — including quality checks and issues of data completeness

- Anticipated effect of Ambulatory Payment Classification (APC)[5] groups on ED data completeness

- Impact of charge masters[6] (hospital charge description lists which automate billing for outpatient services).

The team initially performed Internet searches using several search engines and combinations of key words such as: "emergency department," "emergency room," "emergency medicine," "data," "software," "collection," "quality," "need," "requirement," "APC," and "charge masters." This produced references to data collection standards, existing ED databases, software for collecting ED data, limitations of existing software and collection practices, CMS' new outpatient prospective payment system (OPPS), APC groups, and journal articles.

Next, analysts used MEDLINE® to conduct a literature search for articles published in the last 15 years related to ED data collection practices, data quality, ED data standards, and existing ED databases. For publications on specific databases or payment systems, we visited individual Websites. For example, the Centers for Disease Control and Prevention (CDC) Website contains valuable information about the methodology and findings related to the NHAMCS data.

---

[5] APCs were introduced as part of the Centers for Medicare and Medicaid Services (CMS) Outpatient Prospective Payment System (OPPS) and went into effect in August 2000.

[6] Charge masters contain lists of CPT/HCPCS codes, revenue codes, modifiers, APC groups, and charge amounts associated with procedure and supply descriptions.

Data Sources for the Quantitative Analysis

The quantitative analysis compared SEDD data quality and completeness in two ways:

- Across the five states in the 1999 SEDD

- Against two national sources of ED data: (1) the American Hospital Association (AHA) Annual Survey of Hospitals; and (2) the National Hospital Ambulatory Medical Care Survey (NHAMCS).

Descriptions of each data source and the measures used in the analysis are presented below. Key aspects of the data that impact the direct comparability of the data sources are also discussed.

HCUP SEDD

The HCUP SEDD are a set of multi-year, multi-state databases that capture hospital-affiliated ED encounters. They include patients seen in the ED and discharged to home, as well as those transferred to other hospitals or to outpatient care. The SEDD exclude patients admitted to the hospital following ED services, and therefore represent only "outpatient" ED visits.

The 1999 HCUP SEDD contain annual all-payer statewide data from five states: Connecticut, Maine, Maryland, Missouri, and South Carolina. Each HCUP Partner had between two and four years of experience collecting ED data, with the exception of Missouri, which began collecting ED data in 1999. These five states comprise the only complete set of annual year-specific HCUP SEDD databases available during the study period.

Data analyses were performed using alternate definitions of ED visits, depending on the comparison database:

- "Outpatient ED" visits include only those patients that were admitted to the ED and later discharged from the ED to home, transferred to other facilities for further care, or died in the ED. These statistics exclude patients admitted to the hospital from the ED. Outpatient ED visits are contained in the HCUP SEDD.

- "All-encounter ED" visit counts include all patients admitted to the ED, regardless of whether or not they were transferred to an inpatient unit of the hospital. All-encounter ED visits were calculated from the HCUP data by combining outpatient ED visits contained in the SEDD with inpatient records contained in the HCUP SID[7] where source of admission was the ED. (Ideally, UB-92 revenue codes for ED services would be used to identify SID records for inclusion in the "all-encounter" file, however not all states provide HCUP with revenue code information).

AHA Annual Survey of Hospitals

The AHA conducts annual surveys of all hospitals in the U.S., collecting over 600 pieces of information from more than 6,000 hospitals and other health care services. Hospitals report characteristics of their facilities and services, and supply summary information about utilization, financial data, and staffing (Health Forum, 2003).

---

[7] The HCUP State Inpatient Databases (SID) contain the universe of the inpatient discharge abstracts in participating States, translated into a uniform format to facilitate multi-state comparisons and analyses.

The AHA Annual Survey of Hospitals differs from the HCUP SEDD in three ways:

- Annual reporting periods vary by hospital, depending on each hospital's fiscal year cycle. This means that for many hospitals, the 1999 reporting periods in the AHA and SEDD differ. For example, hospitals that ended their fiscal years in June or September 1999 will report some 1998 data to the AHA that is not present in the SEDD and will omit records for later months in the year.

- The AHA Annual Survey database includes non-Federal general medical and surgical hospitals (community hospitals). Other hospital types are also included such as children's, rehabilitation, psychiatric, institution-affiliated, and specialty hospitals. In contrast, the HCUP SEDD generally include only community hospitals. Consequently, the subset of community hospitals in the 1999 AHA Annual Survey database was selected for analysis in this study. This includes 83 percent (more than 6,100) of the hospitals in the AHA database.

- The total number of ED visits in the AHA Annual Survey includes both outpatient ED visits and ED visits for persons admitted to the hospital.[8] Therefore, comparisons were made between the AHA data and the HCUP "all-encounter" ED data.

- In each survey year, some hospitals either do not respond to the survey or do not supply data for specific questions. The AHA imputes the number of annual visits from previous survey submissions when hospitals fail to provide complete data for the current survey year. The average response rate to the annual survey has been 82% for the past five years (Health Forum, 2003).

National Hospital Ambulatory Medical Care Survey (NHAMCS)

The NHAMCS, conducted by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention, is a national probability survey of visits to EDs and hospital outpatient departments in non-Federal, acute care general hospitals. The survey employs a four-stage probability design, with sampling taking place within: (1) geographic segments (such as counties); (2) hospitals within geographic segments; (3) EDs within hospitals; and (4) patient visits within emergency and outpatient departments (McCaig & Burt, 2001).

Hospital staff record information for each sampled visit on a survey form using a combination of "check-box" and narrative methodologies. A sample Patient Record form is included in Appendix A for reference. The form includes check boxes for 10 different treatment procedures plus open-ended spaces for two additional procedure entries. The form also includes information on diagnostic and screening services and patient diagnoses.

The NHAMCS can be used to produce national and regional estimates of ED utilization (counts and rates of visits); patient, provider, hospital, and payer characteristics; and information about the type of care provided in the ED. For this study, we obtained published statistics for the ED component of the 1999 NHAMCS from an NCHS report (McCaig and Burt, 2001). Because the report separates treatment procedures from diagnostic/screening procedures, we were not able to get a complete picture of the extent of procedure use from this source (this would require special analysis of the NHAMCS data files to combine information on treatment procedures and

---

[8] The AHA instructs facilities to count all ED visits in the total, including patients who were admitted to the hospital. The survey form states: "Emergency room visits should reflect the number of visits to the emergency unit. Emergency outpatients can be admitted to the inpatient areas of the hospital, but they are still counted as emergency visits and subsequently as inpatient admissions."

diagnostic/screening procedures for each visit). Instead we consider the statistics on use of treatment procedures as a lower bound benchmark of the extent of all procedures performed during ED visits. In addition, we were not able to compare NHAMCS information on patient diagnoses to the SEDD because the NHAMCS publication groups diagnoses into 20 categories that do not correspond to Clinical Classifications Software (CCS) groupings used in the HCUP data. Comparisons with the SEDD would have required analysis of the visit-level NHAMCS data files to generate diagnosis groupings comparable to HCUP's CCS groupings.[9]

The NHAMCS differs from the HCUP SEDD in two important ways:

- Geographic areas represented by the NHAMCS and SEDD are not directly comparable. The NHAMCS was designed to provide national and regional estimates based on U.S. Census regions. It cannot be used to produce state estimates. However, in the absence of directly comparable data sources, we chose to compare SEDD states to NHAMCS regions as a validity check for the SEDD visit counts.

- The total number of ED visits in the NHAMCS includes both outpatient ED visits and ED visits for persons admitted to the hospital. Therefore, NHAMCS ED utilization counts were compared with HCUP "all-encounter" ED data.

Comparability Across Data Sources

Exhibit 1 summarizes key characteristics that vary across the SEDD, NHAMCS, and AHA Annual Survey.

Exhibit 1: Comparison of SEDD, NHAMCS, and AHA Database Characteristics

Characteristics	HCUP SEDD	NHAMCS	AHA Annual Survey
Reporting Period	Entire calendar year	Sample of time periods weighted to represent the calendar year	Hospital fiscal year reporting (a mix of calendar and other reporting periods)
Reporting Unit	Visit	Visit	Hospital
Collection Method	Census of individual administrative records	Survey of sampled EDs and visits	Summary reports at hospital-level
Geographic Units	Selected states, county, local	National and regional	National, regional, state, county, local
Definition of Emergency Department Visit	SEDD exclude patients admitted to the hospital through the ED. An "all-encounter" file combines the SEDD with records from the SID.	All patients seen in the ED, including patients admitted to hospital through ED.	All patients seen in the ED, including patients admitted to hospital through ED.

---

[9] The AHRQ Clinical Classifications Software (CCS) is described under "Measures Used in the Quantitative Analysis" on page 10.

As noted, the three data sources differ in their reporting periods, reporting unit, and data collection methods. The data sources also vary by geographic areas represented (state, region, and nation), and definitions of ED visits. Nevertheless, when comparing the SEDD to other data sources, any observed differences in data distribution and completeness are valuable. They can reveal the scope or limitations of the data or even raise cautions about ED data collected from administrative records. In this study, care was taken to compare data sources along comparable dimensions wherever possible, and to treat comparisons as informative rather than statistically meaningful or indicative that one source is more accurate than another.

Measures Used in the Quantitative Analysis

Hospital Inclusiveness

To assess how well the SEDD represent the universe of hospital EDs in each state, we compared the number of hospitals in the SEDD and the AHA Annual Survey for each state. The AHA statistics were constructed by selecting hospitals that reported any ED discharges during the year. If a hospital did not meet these conditions, then it was classified as not having an ED.

AHA hospital counts were represented in two ways: (1) as the total number of hospitals with an ED for a specific state, which includes community and non-community hospitals, and (2) as the subset of community hospitals with an ED. This distinction makes it possible to determine if differences in hospital composition between the SEDD and AHA databases (e.g., inclusion or exclusion of non-community hospitals) drives observed differences in visit rates.

Comparisons to the NHAMCS were not possible because the NHAMCS is weighted to the national and not the state level.

Visit Inclusiveness

To assess how well the SEDD represent ED visits in each state, we selected three measures to compare the SEDD with the AHA Annual Survey and with the NHAMCS:

- "Outpatient ED" Visit Counts

- "All-encounter" ED Visit Counts

- Population visit rates.

Outpatient ED visit counts exclude patients admitted to the hospital from the ED. For the HCUP data, these counts are equal to the number of visits in each SEDD.

All-encounter ED visit counts include all patients admitted to the ED, regardless of their destination on discharge. These statistics include patients admitted to the hospital. All-encounter ED visits are defined for each data source as follows:

- For HCUP, this is the number of ED visits in the SEDD and SID.

- For AHA, this is the number of visits to EDs in community hospitals for each state.

- For NHAMCS, this is the weighted number of visits in the U.S. census region that corresponds to each SEDD state (Northeast, Midwest, South, and West).

Population visit rates were defined as the number of all-encounter ED visits per 100 persons living in each state or region:

- For the HCUP and AHA data, we calculated rates using the outpatient and all-encounter visits counts. We obtained state-specific population counts for the 2000 Census from published statistics on the U.S. Census Bureau Website.

- For the NHAMCS, population visit rates were calculated as the number of ED visits per 100 persons in each census region.

Data Element Completeness and Distributions

In this step, data element statistics from the SEDD were compared two ways: (1) across states, and (2) with statistics from the NHAMCS. No comparisons were possible with the AHA Annual Survey because the database does not contain individual visit-level data. Two types of analyses were performed:

- Rates of missing and invalid data were used to assess data element completeness.

- Distributions of data element values were used to assess reasonableness in terms of expected range of values.

Only those data elements central to an administrative discharge record and supporting common research use were selected for analysis. A complete list of HCUP SEDD data elements is included in Appendix B.

For diagnosis and procedure comparisons, AHRQ CCS groupings were used instead of individual diagnosis and procedure codes. Developed for health policy analysis, the CCS clusters the thousands of ICD-9-CM patient diagnoses and procedures into a manageable number of clinically meaningful categories. These clinical groupings are useful for presenting descriptive statistics and make it easy to quickly identify patterns.

The following elements were compared across states in the SEDD:

- Patient characteristics – age, sex, race

- Financial measures – total charges, expected primary payer

- Clinical measures – ICD-9-CM[10] diagnosis codes, ICD-9-CM and CPT/HCPCS[11] procedure codes, external cause of injury codes (E codes), and CCS groups

- Linkage elements – encrypted medical record number, encrypted person number (links within and across institutions), patient ZIP Code.

These data elements were examined in the comparison between the SEDD and NHAMCS:

- Patient characteristics – age, sex, race

- Financial measures – expected primary payer

- Clinical measures – percent of records that include at least one procedure.

---

[10] International Classification of Diseases, Ninth Revision, Clinical Modification
[11] Current Procedural Terminology/Healthcare Common Procedure Coding System

Qualitative Analysis

The study team conducted a qualitative analysis of ED data collection practices and standards by contacting HCUP SEDD Partner representatives and other hospital industry experts outside the HCUP partnership. The team obtained information about ongoing and planned ED data collection efforts from HCUP Partners and gathered information specific to hospital data collection practices from a broader group of industry experts. Participants discussed their experiences and perspectives in guided telephone interviews.

Hospital Industry Expert Groups

The study team approached three groups of hospital industry experts:

1. HCUP SEDD Partners — consisting of representatives of HCUP Partner organizations that were contributing ED data to HCUP at the time of the interviews.

2. Other HCUP Partners — consisting of representatives of HCUP Partner organizations that were planning or implementing new ED collection efforts.

3. Non-HCUP Hospital Industry Experts — consisting of professionals from outside of the HCUP partnership. This group possesses specialized knowledge of data collection capabilities, practices, and limitations in ED settings and, more generally, in hospital information systems. The study team further divided the Non-HCUP Hospital Industry Expert group into three areas of expertise: health information management (coding), financial incentives (billing), and hospital information systems (computer operations).

Each group contributed a unique perspective to ED data collection issues.

*   HCUP SEDD Partners helped us understand how hospitals collect and store ED data, how the data are obtained from hospitals, and how ED data are handled in state-level data systems.

*   Other HCUP Partners discussed issues their organization faced in developing an ED data collection program, including how hospitals collect and manage data, how the data organization planned to obtain the data from hospitals, and how they intended to maintain the data in their state-level data systems.

*   The health information management group included individuals who are directly involved in medical records coding (e.g., able to discuss the type of information collected for ED visits and contribute extensive knowledge of record coding practices).

*   The financial incentives group had a broader knowledge of billing and reimbursement requirements (e.g., able to discuss variations in coding and data capture, broader policies and requirements, and the potential for improvement, such as the anticipated effect of APCs on ED record completeness).

*   The hospital information systems group possessed specialized knowledge of computer systems (e.g., able to discuss how well the different information systems within a hospital interrelate and to identify the types of data that can be captured and relayed from point to point within hospital data systems).

<u>In-Depth Expert Interviews</u>

In association with AHRQ researchers, the study team developed and field-tested a discussion guide that included questions addressed to knowledge areas common to all three groups, as well as questions specific to each group. The discussion guide is presented in Appendix C.

The study team delivered a copy of the discussion guide to participants prior to the scheduled telephone interviews so they could consider answers in advance and consult others in their organization. Each interview was recorded and the answers were later transcribed for analysis. A total of 15 expert interviews were conducted: seven with HCUP SEDD Partners, four with Other HCUP Partners, and four with Non-HCUP Hospital Industry Experts. The list of the persons interviewed for the evaluation is contained in Appendix D.

FINDINGS

The findings are presented in three sections. First, results of a quick survey of the literature summarize published information about ED data collection. Second, results of the quantitative data analysis provide an assessment of HCUP SEDD data quality. This analysis also highlights issues central to the discussion of data capture and flow. Third, the qualitative findings section summarizes the in-depth guided interviews and clarifies hospital and ED data collection processes. These processes indirectly affect data quality of state-level ED databases, and consequently, the HCUP SEDD.

Literature and Internet Search

The literature and Internet search confirmed the absence of universal data standards and underscored the lack of systematic knowledge concerning ED data collection practices. Methodological descriptions of ED data systems — in the hospital and at the state-level — were rare and largely anecdotal. No formal investigations of data system methodologies were identified in the literature. Appendix E includes a listing of publications found as part of the literature and Internet search.

Two publications discuss the diversity of electronic data systems used in hospital-based EDs and both propose adopting standards for ED data systems. The Data Elements for Emergency Department Data Systems (DEEDS) workgroup, sponsored by the National Center for Injury Prevention and Control, noted that "variations in the way that data are entered in different ED record systems, and even within individual systems, impede the use of ED records for patient care and deter their reuse for multiple secondary applications." In addition, paper-based ED records were still in wide use as recently as the late 1990s throughout the U.S.; movement toward paperless record systems is advancing at an uneven pace across facilities (National Center for Injury Prevention and Control, 1997).

In the second publication, Righini describes two commonly used methods of integrating electronic information systems in the ED and other areas of the hospital. First, hospitals may employ systems designed to function as a comprehensive unit across separate modules. Hospitals may purchase these systems from a single vendor or develop them in-house. Second, hospitals may adopt a "best of breed" system that melds together modules from separate vendors or development processes. This approach is limited because modules may work well in independent environments, but not in concert with each other (Righini, 2002).

Finally, the Internet search located numerous vendor sites. The proliferation of ED software vendors and the content of their marketing materials is a testimony to the reality that ED data systems are often oriented to hospital-specific needs and tailored to the ED environment. And in this context, vendors cite the interface between ED and other hospital information systems — including registration, lab and radiology, and financial systems — as a specific challenge for systems integration.

Quantitative Analysis

The quantitative analysis results address three overarching data quality concerns:

- Hospital inclusiveness in the SEDD
- Visit inclusiveness in the SEDD and SID
- Data element characteristics.

Hospital Inclusiveness

The SEDD adequately capture the intended target universe of community hospitals with EDs in each of the five SEDD states. Figure 1 demonstrates this comparison:

- In three of the five states examined, the SEDD and the AHA include the same number of community hospitals (comparing the first and second vertical bar for each state). Differences between the SEDD and the AHA for the remaining two states are explained by reporting practices: (1) in State B, some community hospitals fail to report to the HCUP Partner that provided the SEDD data, and (2) in State E, one non-community hospital ED was included in the SEDD.

- Adding non-community hospitals to the AHA data (shown in the third vertical bar for each state) reduces the comparability of data sources. The SEDD contain between 85% and 97% of the total hospital population of the 1999 AHA Annual Survey of Hospitals. Excluding non-community hospitals from comparisons of the SEDD and the AHA Annual Survey data is therefore an appropriate and necessary filter.

Visit Inclusiveness

The number of ED visits in the SEDD is similar to external data sources where comparisons between similar types of visits could be made:

- The HCUP all-encounter ED data include between 87% and 95% of the annual ED visits reported by community hospitals in the AHA Annual Survey (Table 1). Similar to the hospital inclusiveness findings, State B visit rates varied most from the AHA Annual Survey visit rates because some hospitals did not report data to the HCUP Partner organization in State B.

- The HCUP all-encounter ED data have approximately the same population-based visit rates as the NHAMCS regional rates in four of the five SEDD states (Table 2 and Figure 2). HCUP all-encounter ED visit rates are generally within two visits per 100 persons of the census region-based NHAMCS rates.

- Utilization rates for ED encounters that do not involve inpatient admissions (outpatient ED visits) range from 25.5 to 36.4 visits per 100 persons across the SEDD (Table 2). Rates for all-encounter ED visits, including persons hospitalized following admission to the ED, range from 30.5 to 38.6 visits per 100 persons. By comparison, the rate of ED visits across the U.S., as estimated from the NHAMCS, was 37.8 visits per 100 persons (McCaig & Burt, 2001).

Discrepancies from the comparison data sources for two SEDD states are again likely explained by practices for reporting data to statewide data organizations. State B reports noticeably fewer ED visits than the state-specific AHA report (87%), most likely because the SEDD for this state omits some community hospitals. State D, on the other hand, has maintained an ED utilization rate well below the NHAMCS regional average because of state-specific interventions. The representative from this Partner organization reported that this state's data organization intentionally and successfully addressed escalating ED utilization and thereby reduced the pace of annual increases in ED visit rates.

Figure 1. Comparison of Hospital Composition: HCUP SEDD and AHA, 1999
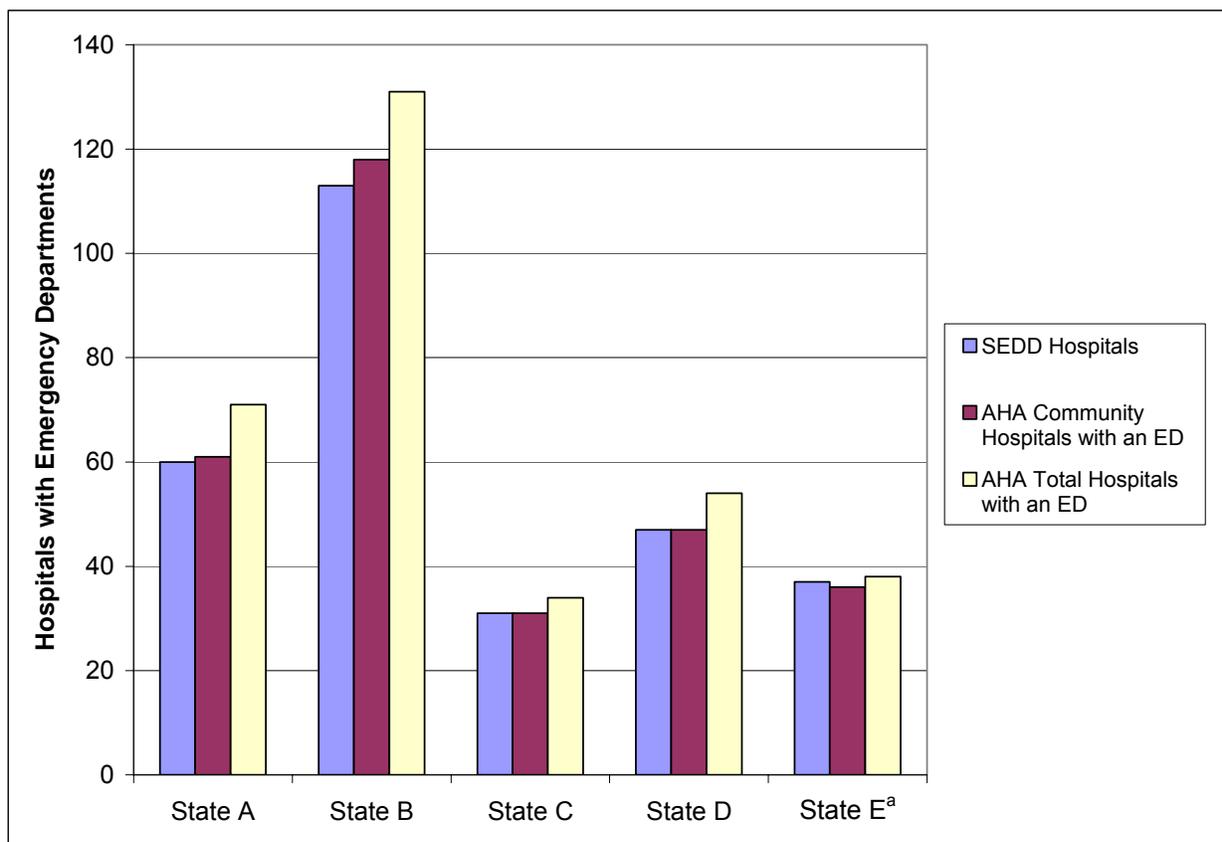
Sources: HCUP State Emergency Department Databases (SEDD), 1999.

American Hospital Association (AHA) Annual Survey of Hospitals, 1999.

Notes: [a] The SEDD contain only community hospitals, except in State E where one non-community hospital is present in the SEDD

Table 1. Number of Emergency Department Visits:
HCUP Outpatient, HCUP All-Encounter, and AHA Databases, 1999

	HCUP				AHA
	Outpatient ED		All-Encounter ED		Community Hospitals with EDs
	Visits	Compared to AHA	Visits	Compared to AHA	Visits
State A	1,328,563	79%	1,500,948	90%	1,675,252
State B	1,838,407	76%	2,095,050	87%	2,411,820
State C	1,051,557	78%	1,197,441	89%	1,344,816
State D	1,318,165	79%	1,579,921	95%	1,667,655
State E	456,260	79%	a	a	579,803

Sources: HCUP State Emergency Department Databases (SEDD), 1999.

HCUP State Inpatient Databases (SID), 1999.

American Hospital Association (AHA) Annual Survey of Hospitals, 1999.

Note: [a] All-encounter statistics for State E are not available. Admission source is not included on its 1999 SID, and therefore, inpatient admission through the emergency department could not be identified in the SID.

Table 2. Number of Emergency Department Visits per 100 Persons:
HCUP, AHA, and NHAMCS, 1999

	Number of visits per 100 persons				HCUP All-Encounter Compared with	
	HCUP Outpatient ED	HCUP All-Encounter ED	AHA Community Hospitals	NHAMCS (by region)	AHA	NHAMCS
State A	34.2	38.6	43.1	40.4	90%	96%
State B	33.6	38.3	44.1	40.1	87%	96%
State C	32.0	36.5	41.0	37.0	89%	99%
State D	25.5	30.5	32.2	40.4	95%	76%
State E	36.4	a	46.3	37.0	a	98%

Sources: HCUP State Emergency Department Databases (SEDD), 1999.

HCUP State Inpatient Databases (SID), 1999.

American Hospital Association (AHA) Annual Survey of Hospitals, 1999.

McCaig & Burt, *National Hospital Ambulatory Medical Care Survey, 1999 Emergency Department Summary.* June 2001.

U.S. Census Bureau, Statistical Abstract of the United States, 2000.

Notes: [a] "All-encounter ED" visit rates for State E are not available. HCUP outpatient ED visit rates were compared with the NHAMCS rates, in place of the HCUP all-encounter ED rates.

Figure 2. Comparison of Emergency Department Visits per 100 Persons: HCUP, AHA, and, NHAMCS, 1999
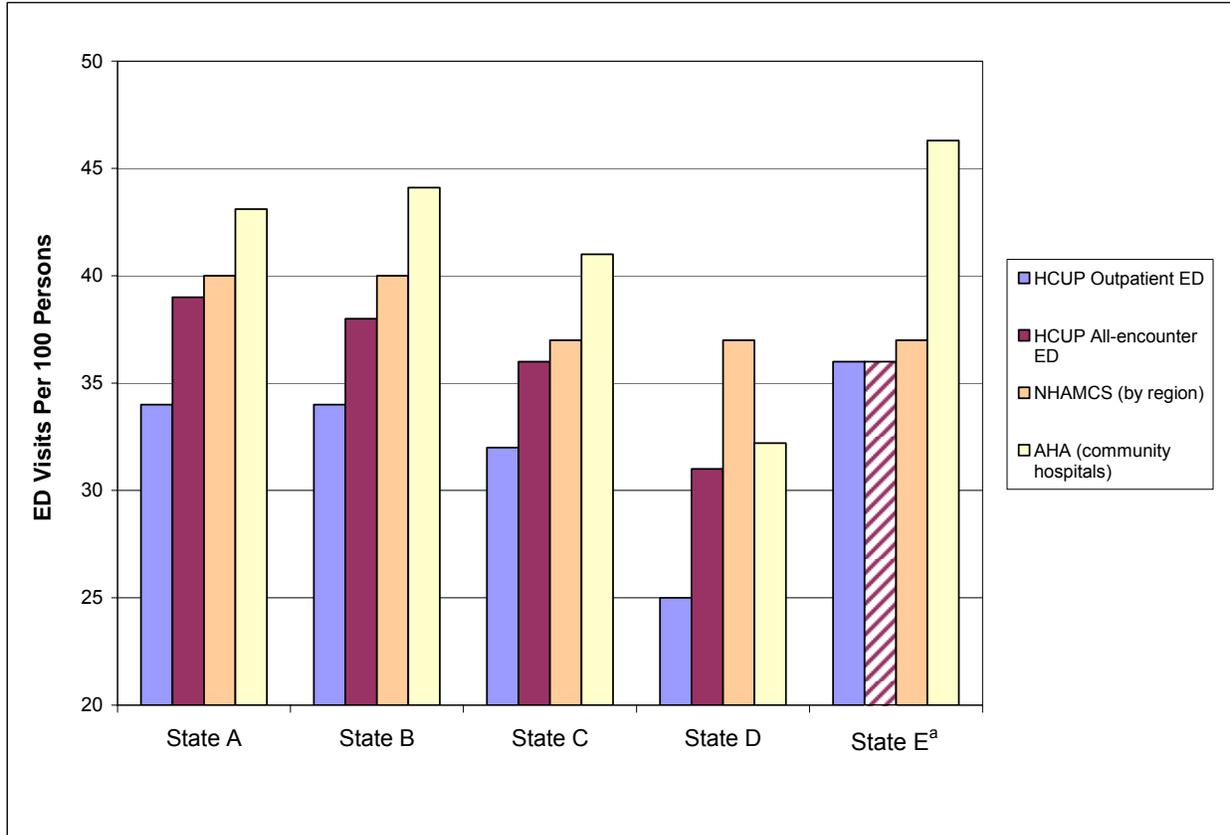
Sources: HCUP State Emergency Department Databases (SEDD), 1999.

HCUP State Inpatient Databases (SID), 1999.

American Hospital Association (AHA) Annual Survey of Hospitals, 1999.

McCaig & Burt, *National Hospital Ambulatory Medical Care Survey, 1999 Emergency Department Summary*, June 2001.

U.S. Census Bureau, Statistical Abstract of the United States, 2000.

Note: [a] All-encounter statistics for State E were omitted from Figure 2. Admission source is not included on its 1999 SID, and therefore, inpatient admission through the emergency department could not be identified.

SEDD Data Element Characteristics: Patient Financial and Linkage Reporting

Overall, the selected data elements compared across the five states in the SEDD have similar distributions and little missing data. Detailed results of these comparisons are presented in Tables 3-5:

- *Patient Characteristics* — The distributions are within expected ranges for each state and contain little missing data. The SEDD consistently report patient age and sex (missing on fewer than 0.1% of records) and patient race (missing on only 0.75% of records in the four states that collect race). Distributions of patient race vary across states as a result of population-based racial distributions; patient race appears unrealistic only in State C, where 20% of patients are recorded as "other" races.

- *Financial Data* — These data, including average charge, total charge, and expected primary payer, are also within expected ranges and are reported for virtually all records on the SEDD. State C stands alone as the only state missing financial data –- and even then, total charges are absent at a relatively low rate of 4 percent.

- *Linkage Elements* — The presence of linkage variables, including encrypted medical record numbers (MRNs), encrypted person numbers (encrypted Social Security Numbers), and ZIP Codes, varies across the SEDD:

  o All five SEDD contain encrypted MRNs on virtually all records. MRNs can be used to track patient records within a particular institution. They are of limited use in research, however, because they cannot track patients across institutions.

  o One SEDD also contains encrypted Social Security Numbers, which can be used to link patient records across institutions, though this variable is missing on 15% of records.

  o All SEDD also contain ZIP Code of patient residence on virtually all records. ZIP Codes are useful for linking encounter-level records to external geographic data, such as the Area Resource File (ARF) and U.S. Census data, to obtain information about the community in which the patient resides.

Comparisons between the NHAMCS national estimates and individual SEDD statistics reveal similarities in the distributions for patient characteristics and expected payers. Financial data (mean total charges) are not available in the NHAMCS.

Table 3. Data Element Completeness: HCUP SEDD, 1999

	HCUP Outpatient ED				
	State A	State B	State C	State D	State E
Patient Characteristics	Percent Missing (%)				
Age in Years	0.00	0.00	0.00	0.01	0.00
Sex	0.00	0.00	0.00	0.10	0.00
Race	0.09	0.73	0.00	0.36	n/a*
Financial					
Total Charges	0.00	0.44	3.99	0.48	0.23
Expected Primary Payer	0.99	0.32	0.00	0.88	0.74
Linkage					
Medical Record Number (encrypted)	0.00	1.34	0.00	0.00	0.00
Person Number (encrypted)	n/a	14.50	n/a	n/a	n/a
Patient ZIP Code	0.05	0.26	0.01	0.23	0.73

Source: HCUP State Emergency Department Databases (SEDD), 1999.

Note: * n/a indicates data element not available in this state's 1999 SEDD.

Table 4. Distribution of Emergency Department Visits by Race, Sex, and Age: HCUP SEDD and NHAMCS, 1999

	HCUP Outpatient ED					NHAMCS
	State A	State B	State C	State D	State E	U.S.
Race	Percent Distribution (%)					
White	50.3	79.0	52.8	54.2	n/a*	76.5
Black	47.2	18.0	11.45	41.9	n/a	20.6
Hispanic	0.96	0.97	14.66	0.0	n/a	n/a
Asian or Pacific Islander	0.2	0.3	0.4	0.98	n/a	2.0
Native American	0.2	0.0	0.0	0.13	n/a	0.90
Other	1.1	1.4	20.3	2.4	n/a	n/a
Sex	Percent Distribution (%)					
Female	55.2	53.8	51.7	53.3	47.9	52.8
Male	44.8	46.2	48.3	46.6	52.1	47.2
Age	Mean (Years)					
Age in years	31.8	31.7	34.9	33.3	35.5	n/a

Sources: HCUP State Emergency Department Databases (SEDD), 1999

McCaig & Burt, *National Hospital Ambulatory Medical Care Survey, 1999 Emergency Department Summary*, June 2001.

Note: * n/a indicates data element not available in this state's 1999 SEDD.

Table 5. Distribution of Payment Information for Emergency Department Visits: HCUP SEDD and NHAMCS, 1999

	HCUP Outpatient ED					NHAMCS
	State A	State B	State C	State D	State E	U.S.
Expected Payer[a]	Percent Distribution (%)					
Medicare	13.95	13.61	14.77	11.13	16.24	15.00
Medicaid	23.27	23.13	22.15	13.15	21.38	17.40
Private Insurance	34.87	39.85	42.28	47.15	44.89	38.90
Self pay	23.12	16.38	15.29	23.56	12.44	16.20
No charge	0.00	0.27	0.04	0.07	0.43	0.50
Other payer	3.80	6.46	5.46	4.05	3.89	6.20
Missing	0.99	0.32	0.00	0.88	0.74	5.80
Total Charges	Average Charge ($)					
Average charge per visit	$392	$533	$429	$280	$353	n/a*

Sources: HCUP State Emergency Department Databases (SEDD), 1999.

McCaig & Burt, *National Hospital Ambulatory Medical Care Survey, 1999 Emergency Department Summary*, June 2001.

Notes: [a] Payer categories are derived from the HCUP data element PAY1.

* n/a indicates data element not available in this state's 1999 SEDD.

SEDD Data Element Characteristics: Procedure Code Reporting

The lack of adequate procedure coding is the one notable exception to data element completeness in the SEDD. Most of the ED records do not include procedure codes. This varies substantially by state and is somewhat related to the methods use to capture the information. The most complete procedure reporting occurs in two of the three states that collect CPT/HCPCS codes from the line item detail portion of the bill.

To understand how line item detail influences reporting, some background information on procedure coding in the UB-92[12] — the foundation for the ED visit records — is helpful. During the study period, the UB-92 Manual (AHA, 2004) indicates that procedure codes can be recorded in two areas on the UB-92: (1) "procedure" fields for principal and other procedures, and (2) line item detail fields. The "procedure" fields, for principal and secondary procedures (UB-92 Form Locator numbers 80 and 81) were required for billing of inpatient stays that involved a procedure. They could also be used for ED bills.[13] Most payers required ICD-9-CM

---

[12] National Uniform Billing Committee UB-92 Data Specifications Manual

[13] Under the Health Insurance Portability and Accountability Act (HIPAA) regulations for electronic transmission of encounter claims, effective October 2003, these fields are used for inpatient claims but not for hospital outpatient

procedure codes on the billing record, although some commercial payers accepted CPT/HCPCS codes in these fields. The line item detail fields (Form Locator numbers 42 through 49) provided the detailed information for each service billed, including revenue code, CPT/HCPCS, procedure date, service units, and charge information. A separate line was recorded for each service billed, with the fields repeated in each line. (Also, note that in the line item detail area of the UB-92, there was no designated field for "principal procedure.")

It is also important to recognize differences between ICD-9-CM procedures and CPT/HCPCS procedures when examining the SEDD. One major difference is that the CPT procedure coding system provides a field for the type of visit (e.g., code 99202 under the evaluation and management section, labeled "office visit for new patient, including expanded history, expanded examination, and straightforward decision-making"). The ICD-9-CM procedure coding system does not include types of visit codes. Thus, one could expect that virtually all encounters should include a CPT code for level of visit. On the other hand, fewer records would include ICD-9-CM procedure codes because this coding system is limited to diagnostic and therapeutic procedures. ED patients may not all receive such procedures.

The percent of SEDD records with valid data for ICD-9-CM and CPT/HCPCS procedure codes within each state is presented in Table 6. This table also includes NHAMCS regional rates for treatment procedures performed during ED visits. As noted previously, we relied on NHAMCS published statistics that are restricted to the percent of ED visits that required treatment procedures. These statistics do not reflect patients receiving screening and diagnostic procedures that may be included in the SEDD. Thus, the NHAMCS statistics may be regarded as a lower-bound benchmark for assessing the adequacy of procedure reporting in the SEDD.

Table 6. Emergency Department Visits With at Least One Procedure Reported: HCUP SEDD and NHAMCS, 1999

	HCUP Outpatient ED		NHAMCS[a]
	CPT/HCPCS	ICD-9-CM	Treatment procedure
	Percent of records with one or more procedures		
State A	n/a*	10.9	41.3
State B	5.4	9.2	40.5
State C	n/a	21.2	43.6
State D	54.5	n/a	43.6
State E	94.6	17.5	43.6

Sources: HCUP State Emergency Department Databases (SEDD), 1999.

McCaig & Burt, *National Hospital Ambulatory Medical Care Survey, 1999 Emergency Department Summary*, June 2001.

Note: [a] NHAMCS statistics include treatment procedures only: NHAMCS collected a separate indicator of diagnostic and screening services, which was not included the procedure statistics noted in this table.

* n/a indicates data element not available in this state's 1999 SEDD.

---

claims. It is unclear at this time whether hospital outpatient claims that include procedures in these fields will be rejected by the payers when submitted for payment, or if the payers will simply ignore the field.

ICD-9-CM and CPT/HCPCS procedure code reporting in the SEDD is as follows:

- Four of the five SEDD report ICD-9-CM procedure codes. Fewer than 22% of SEDD visit records in each of these states contain an ICD-9-CM procedure code. This finding falls far short of the NHAMCS lower-bound national benchmark of 45 percent.

- Three states in the 1999 SEDD report CPT/HCPCS procedures codes. States D and E have substantially more complete coding than the other SEDD states; 55% and 95% of visit records, respectively, include CPT/HCPCS procedures. In State B, only 5% of the records have CPT/HCPCS codes (the reason for the low level of reporting is unknown).

Thus, the most complete procedure coding occurs in states capturing CPT/HCPCS codes from the line item detail fields of the UB-92.

Table 7 presents the 10 most frequent CCS procedure groupings in each state:

- The most commonly reported procedures are similar across states. Six CCS groupings occur in the top 10 across states, including:
    - Suture of skin and subcutaneous tissue
    - Traction, splints, and other wound care
    - "Other" diagnostic procedures (interview, evaluation, and consultation)
    - "Other" therapeutic procedures
    - Non-operative removal of foreign body
    - "Other" non-operating room therapeutic procedures on skin and breast.

Table 7. Rank Order of Clinical Classification Software (CCS) Procedure Category by Percent of ED Visits, HCUP SEDD 1999

Rank	State A CCS category number and label		Visits (%)	State B CCS category number and label		Visits (%)	State C CCS category number and label		Visits (%)	State E CCS category number and label		Visits (%)
1	171	Suture	3.20	171	Suture	3.04	227	Other Dx (eval, etc.)	6.14	227	Other Dx (eval, etc.)	3.66
2	214	Traction/splints	1.95	214	Traction/splints	1.62	171	Suture	4.30	171	Suture	3.23
3	231	Other Ther PRs	0.42	231	Other Ther PRs	0.59	226	Other radiology DX	1.67	214	Traction/splints	3.16
4	229	Rem Foreign Body	0.39	229	Rem Foreign Body	0.34	214	Traction/splints	1.67	231	Other Ther PRs	1.38
5	227	Other Dx (eval, etc.)	0.36	227	Other Dx (eval, etc.)	0.27	231	Other Ther PRs	0.80	229	Rem Foreign Body	0.63
6	108	Indwell catheter	0.30	19	Other Eye Ther	0.25	183	Chest X-ray	0.59	228	Vaccine	0.53
7	226	Other radiology DX	0.27	32	Mouth/Nose PRs	0.19	229	Rem Foreign Body	0.55	174	Skin/breast PR	0.36
8	168	Incise/drain	0.27	174	Skin/breast PR	0.17	202	EKG	0.38	217	Other RT	0.32
9	19	Other Eye Ther	0.26	145	Fracture/disloc arm	0.16	174	Skin/breast PR	0.37	168	Incise/drain	0.30
10	174	Skin/breast PR	0.25	148	Fracture/disloc other	0.15	168	Incise/drain	0.36	177	CT scan, head	0.26
Total	Any valid ICD-9-CM procedure		11.00	Any valid ICD-9-CM procedure		9.00	Any valid ICD-9-CM procedure		21.00	Any valid ICD-9-CM procedure		18.00

L E G E N D

CCS category number	CCS category description	CCS category number	CCS category description
19	Other therapeutic procedures on eyelids; conjunctiva; cornea	183	Routine chest XRAY
32	Other non-OR therapeutic procedures on nose; mouth and pharynx	202	Electrocardiogram
108	Indwelling catheter	214	Traction; splints; and other wound care
145	Treatment; fracture or dislocation of radius and ulna	217	Other respiratory therapy
148	Other fracture and dislocation procedure	226	Other diagnostic radiology and related techniques
168	Incision and drainage; skin and subcutaneous tissue	227	Other diagnostic procedures (interview; evaluation; consultation)
171	Suture of skin and subcutaneous tissue	228	Prophylactic vaccinations and inoculations
174	Other non-OR therapeutic procedures on skin and breast	229	Non-operative removal of foreign body
177	Computerized axial tomography (CT) scan head	231	Other therapeutic procedures

Sources: HCUP State Emergency Department Databases (SEDD), 1999.

Clinical Classifications Software. 2004 Software and User's Guide. February 2004. Agency for Healthcare Research and Quality, Rockville, MD. http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp#download.

Note: State D is omitted from this table because it does not report ICD-9-CM procedure codes.

SEDD Data Element Characteristics: Diagnosis Code and E Code Reporting

Table 8 lists the 10 most frequent types of CCS diagnosis groupings in each state. Virtually all records contain a valid principal diagnosis grouping.

- The most common diagnoses assigned during ED visits are similar across states. Eight CCS groupings occur in the top 10 across states, including:

    - Sprains and strains
    - Superficial injury/contusion
    - Other upper respiratory infection
    - Open wounds of the extremities
    - Abdominal pain
    - Open wounds of the head, neck, and trunk
    - Other injuries and conditions due to external causes
    - Spondylosis/intervertebral disc disorders/other back problems.

Finally, because injuries and poisoning represent a significant proportion of ED visits — estimated in the NHAMCS to occur nationally in 36.6% of all ED visits in 1999 (McCaig & Burt, 2001) — we examined the prevalence of E codes in the SEDD. Consistent with national estimates, E codes were reported on approximately one-third of all ED visits in each SEDD (Figure 3). E code reporting appears limited to one or two E codes: almost no records contained a third E code.

Figure 3. Percent of ED Visits with 1, 2, or 3 E Codes, 1999
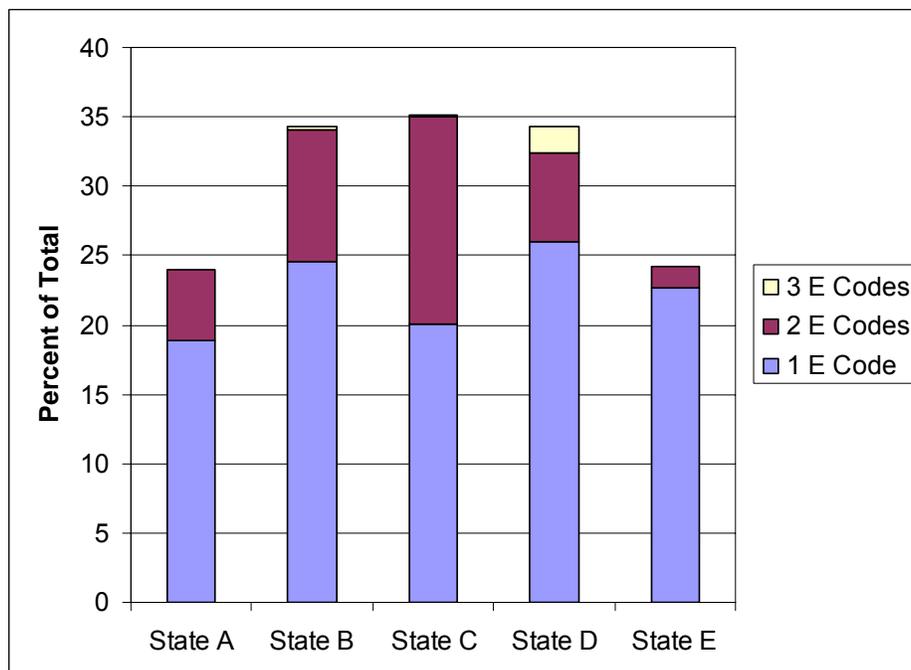
Source: HCUP State Emergency Department Databases (SEDD), 1999.

Table 8. Rank Order of Clinical Classification Software (CCS) Principal Diagnosis Category by Percent of ED Visits: HCUP SEDD 1999

Rank		State A CCS category number and label	Visits (%)		State B CCS category number and label	Visits (%)		State C CCS category number and label	Visits (%)
1	126	Oth Upper Resp Infection	7.2	239	Superficial injury/Contusion	7.4	232	Sprains/strains	8.0
2	232	Sprains/strains	7.0	232	Sprains/strains	7.2	239	Superficial injury/Contusion	7.5
3	239	Superficial injury/Contusion	6.9	126	Oth Upper Resp Infection	7.0	126	Oth Upper Resp Infection	5.2
4	251	Abdominal pain	3.8	236	Open wounds/ extremities	4.4	236	Open wounds/ extremities	4.8
5	236	Open wounds/ extremities	3.5	235	Open wounds head, neck, trunk	3.3	251	Abdominal pain	3.5
6	92	Otitis media	3.1	92	Otitis media	3.2	235	Open wounds head, neck, trunk	3.5
7	84	Headache, incl. migraine	2.8	251	Abdominal pain	3.2	244	Other injuries/conditions	2.7
8	205	Spondylosis/back problems	2.8	244	Other injuries/conditions	2.8	205	Spondylosis/back problems	2.4
9	244	Other injuries/conditions	2.6	84	Headache, incl. migraine	2.7	92	Otitis media	2.4
10	235	Open wounds head, neck, trunk	2.6	205	Spondylosis/back problems	2.5	128	Asthma	2.3
Total		Any valid ICD-9-CM diagnosis	99.4		Any valid ICD-9-CM diagnosis	98.5		Any valid ICD-9-CM diagnosis	98.4

Rank		State D CCS category number and label	Visits (%)		State E CCS category number and label	Visits (%)
1	232	Sprains/strains	8.7	239	Superficial injury/Contusion	7.8
2	239	Superficial injury/Contusion	7.3	232	Sprains/strains	7.8
3	126	Oth Upper Resp Infection	4.9	126	Oth Upper Resp Infection	6.0
4	236	Open wounds/ extremities	4.4	236	Open wounds/ extremities	4.6
5	251	Abdominal pain	3.4	92	Otitis media	3.4
6	235	Open wounds head, neck, trunk	3.4	251	Abdominal pain	3.4
7	244	Other injuries/conditions	3.0	235	Open wounds head, neck, trunk	3.0
8	102	Nonspec. chest pain	2.7	205	Spondylosis/back problems	2.4
9	128	Asthma	2.6	244	Other injuries/conditions	2.3
10	205	Spondylosis/back problems	2.4	239	Superficial injury/Contusion	7.8
Total		Any valid ICD-9-CM diagnosis	98.5		Any valid ICD-9-CM diagnosis	99.3

L E G E N D

CCS category number	CCS category description	CCS category number	CCS category description
84	Headache; incl. migraine	232	Sprains and strains
92	Otitis media and related conditions	235	Open wounds of head; neck; and trunk
102	Nonspecific chest pain	236	Open wounds of extremities
126	Other upper respiratory infections	239	Superficial injury; contusion
128	Asthma	244	Other injuries and conditions due to external causes
205	Spondylosis; intervertebral disk disorders; other back problems	251	Abdominal pain

Sources: HCUP State Emergency Department Databases (SEDD), 1999.

Clinical Classifications Software. 2004 Software and User's Guide. February 2004. Agency for Healthcare Research and Quality, Rockville, MD. http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp#download.

Qualitative Findings

This section summarizes findings from the literature search and from interviews with industry experts. The findings address these issues:

- Hospital Development and Storage of ED Visit Data
- Statewide Data Organization Collection and Handling of ED Visit Records
- Improving Future SEDD Data.

Industry experts provided information about collecting and moving patient related information, including diagnoses, treatments, and payments through data systems. They described the flow of data as it moved through EDs, hospitals, and statewide health data systems, and then on to HCUP.

Hospital Development and Storage of ED Visit Data

The hospital industry experts confirmed the findings from the literature search, which is that data capture and information flow are heavily dependent on the specific software, computer systems, medical records coding resources, and organizational structure within a hospital. The hospital information systems group described wide variation across outpatient administrative data systems, especially compared with contemporary inpatient information systems.

The industry experts revealed that EDs and other functional areas in the hospital collect distinct components of a patient record within separate systems, which are later integrated:

- In a typical scenario, physicians and nurses record certain clinical components of the ED record, but registration personnel enter "patient identifiers" (name, address, sex, race, and person numbers, including medical record numbers and Social Security Numbers). In addition, hospital information management professionals code and classify data for reimbursement, adding diagnostic, procedure, and revenue code information to the ED record (National Center for Injury Prevention and Control, 1997).

- In some cases, information system incompatibilities may prohibit or delay transfer of some types of data (e.g., laboratory results) into a centralized electronic patient record.

Industry experts cautioned that hospitals often do not differentiate ED records within their information systems. For instance, hospitals customarily pool all inpatient and outpatient records into a single information or billing system. These aggregate files are the source of data extracts that hospitals submit to statewide health data organizations, and that the data organizations provide to HCUP. In addition, when reporting aggregate facility data (such as reports to the AHA Annual Survey), hospital administrators may combine data from urgent care centers with the ED visit data.

Charge Masters

The use of charge master list to facilitate billing is the most important feature of hospital outpatient data management. Charge masters assign CPT/HCPCS codes, revenue codes, charge amounts, and more recently, APCs to the administrative billing records based on procedure and supply descriptions (or check boxes). Charge master lists are complex and require frequent and detailed review to remain current with changes in reimbursement rules. Each hospital develops and maintains its own charge description list, which introduces variation

across hospitals (American Health Information Management Association, 1999; Nycomed Amersham Imaging, 2000).

Hospital information management experts indicate that the most common model of assigning billing information occurs as follows: (1) medical record coders assign the ICD-9-CM diagnosis codes for ED visits and ICD-9-CM procedure codes if applicable; and (2) charge masters are then used to fill in other clinical coding measures (e.g., the CPT/HCPCS and revenue center codes, if required). At the time of this study, because Medicare required CPT/HCPCS codes for billing and other payers had adopted this standard, ICD-9-CM procedure codes were rarely required for outpatient billing and so hospitals populated ICD-9-CM procedure fields at their discretion.[14]

The process for using charge masters is as follows:

- Physicians and nurses may record narrative descriptions or notes about diagnoses, treatments, and services provided during an ED encounter.

- Personnel then create "tickets" by filling in check-boxes or selecting charge code descriptions on a patient form or on a data entry screen.

- When the record passes to the financial system for billing, the master list is used to assign revenue codes and charge amounts associated with the checked procedure and supply descriptions.

Until the advent of APCs, charge masters most likely did not assign CPT/HCPCS codes to ED records, at least not on a consistent basis.

Effects of Payer Requirements

Interview participants elaborated further on the impact of payer requirements on ED visit data completeness. Health information management experts noted that charge masters essentially report ED records differently for different payers:

- One payer may expect to receive HCPCS codes, while another may expect revenue codes, charge amounts, or no code at all.

- If a payer does not require clinical codes that were added to a record prior to billing (e.g., ICD-9-CM and HCPCS codes), the data can be overwritten by the charge master or dropped entirely.

- Differing payer requirements mean that some hospitals may retain only the information explicitly required by each payer. In other cases, hospitals may code and retain a consistent set of data elements for all ED records. The prevalence of each practice was unknown to our contacts. The potential variation is critical and needs to be addressed for research purposes.

- Physician billing practices vary by payer. On the Medicare side, hospitals will have both a facility bill and a physician bill. Most non-Medicare payers do not draw a distinction

---

[14] As mentioned earlier, under the Health Insurance Portability and Accountability Act (HIPAA) regulations for electronic transmission of encounter claims, effective October 2003, the procedure fields for ICD-9-CM codes are used for inpatient claims, but not hospital outpatient claims. It is unclear at this time whether hospital outpatient claims that classify procedures using the ICD-9-CM coding system will be rejected when submitted for payment, or if the payers will simply ignore the field.

between these bills. This variation impacts consistent reporting of procedure codes in administrative ED records to the extent that procedures are reimbursed through physician billing. Even total charges can be affected. For example, if an ER physician is on salary, the hospital bills separately to Medicare, but for other payers, the hospital may combine the physician fee into the total charges on the facility bill.

For statewide health data organizations, an important implication is that hospitals may code the organization's specifications into the charge master as if it were another payer. This means that data extract specifications may apply only to files sent to the state. When this occurs, extract files are subject only to quality control processes within the hospital information system or quality reports and feedback from the state, not necessarily feedback that was obtained from health plans. Our contacts noted that, unlike insurance carriers, which can withhold payments if hospitals incorrectly implement specifications or provide poor quality data, state organizations generally lack such compelling incentives.

ED Record Storage

ED Patients Admitted to Inpatient Service: Information on ED patients admitted to inpatient services is uniformly included on inpatient records. Under Medicare's "72-hour" reimbursement rule, care provided in the ED immediately prior to admission cannot be billed separately.

By convention, these patients are not classified as ED visits; instead, the organization of records within hospital information systems reflects the patient's status on discharge:

- Details about the ED encounters (including the specific services rendered in the ED and line item costs) are unavailable on the inpatient record because hospital information systems are not organized to link ED detail.

- In these cases, inpatient records summarize the ED encounter into a single revenue code (45x) and a single ED charge. The interview group indicated that detail-level information about the ED encounter is irretrievable once this status reclassification is completed: the information is available in charts but does not carry over to the hospital information or billing systems.

Bundling of Visit Records: We were also concerned with another aspect of data management, specifically, that hospitals might collapse, or bundle, records because of the impact on charges. Bundling occurs when hospitals collect all administrative data from multiple visits that occur within a short time period onto a single record, similar to the 72-hour rule. Bundled bills could overstate per-visit charges and inflate the average charges for specific services.

The interview group confirmed that hospitals maintain separate records for each ED visit, with some exceptions:

- Smaller or low-volume EDs may bundle visits within a short time period simply because medical records from the previous visit remain accessible (this is likely to be a rare occurrence).

- For a series of visits, hospitals may bundle charges onto one record to facilitate billing. Charges on the remaining records are set to zero, but the zero charge records retain important information related to treatment and services that is not bundled with the charges. This can distort average per-visit charges. More important, this practice can cause zero charge records to be dropped from ED files because they fail edit checks when the data are passed to external parties, including health data organizations.

Other Data Element-Specific Issues

For some data elements collected in ED records, issues arise regarding content and quality that are notable because they differ from issues faced with inpatient data.

- The ICD-9-CM diagnosis and procedure coding for ED visits may not receive the same close attention as inpatient records. In an era of medical record coder shortages, hospitals make rational choices to use their medical record staff for inpatient billing, where the payoff is greatest. In comparison, accurate and complete diagnosis and procedure coding is not required to bill successfully for outpatient visits.

- Admission type and admission source are not customarily collected for ED visits. When they are collected, data organizations are often unsure how to interpret their meaning in the context of ED services.

- Inpatient-based physician classifications (attending, operating, and other physician) are inappropriate for the ED, where patients receive care from the ED physician on shift. Patient care passes among physicians depending on rotation. Additionally, the "other physician" field may include a mix of provider types and may not include the consulting physician.

- The accuracy of coding time of admission is suspect because it could be assigned as the arrival time, triage time, admission time, the time when a physician signs off on a patient, or as the time when the unit clerk logs the data. In one state, the value "00" can be used as both a missing value and midnight.

- Inclusion of ambulance charges will vary by hospital. For example, charges are more likely to be included on the ED record if a hospital has its own ambulance corps.

For other data elements, ED and inpatient settings share common data quality issues. Patient race and ethnicity data were cited as potentially incomplete or inaccurate. Undercoding or miscoding of patient race may be the result of staff members' discomfort in inquiring, objections to the question itself, or the practice of assigning race of patient by observing physical appearance. One state that collects patient race for inpatient stays has not included race and ethnicity on its planned ED database because of provider resistance.

Identifying ED Visit Records for Submission to Statewide Data Organizations

No clear standard for identifying ED visit records emerged during the course of the industry expert interviews. This lack of consistent methods for defining and flagging ED visits suggests that the file composition of the ED data received by HCUP might vary from state to state.

Across the entire interview group, specific knowledge of hospital ED record identification practices was limited. This is consistent with the previously reported observation that differentiation of ED records is not usually required for normal hospital operations. Some hospitals therefore categorize ED visits (and other types of outpatient encounters) using criteria

that are meaningful only within the hospital system. Other hospitals employ more universal classifications defined in the UB-92 coding standards.

The various record identification practices utilized within hospital systems include flagging records or assigning special values, such as:

- An internal flag that indicates an ED record

- A "type of service" code that indicates locale of care, including inpatient, ED, ambulatory surgery, clinic, and other departments

- A special value or "tag" within the patient account number

- Revenue codes 450-459 (or 45x)

- UB-92 source of admission (admitted through the emergency room).

Statewide data organizations have not reached consensus regarding criteria for hospitals to extract ED records:

- Close to one-third of the organizations in the evaluation provide no definition of an ED record, allowing individual hospitals to determine the criteria.

- When criteria are provided, organizations customarily require that hospitals identify ED records by:
  - o Revenue codes 45x (three states)
  - o Internal flags that denote place of service or type of encounter (two states).

Several other types of ED visits may be excluded from ED files provided to statewide data organizations:

- It is unclear whether persons who died in transit to the ED are included in ED files. Level of consistency in reporting such cases and variation by state are both unknown.

- Patients who are transferred to observation status from the ED may be excluded from ED files. The type of bill may depend on the last site of care. Therefore, without the addition of observation service records, the number of ED visits may be understated (Coffey et al., 2002).

Statewide Data Organization Collection and Handling of ED Visit Records

Collection of ED Visit Records from Hospitals

Interviews with HCUP Partners assured us that statewide data organizations provide hospitals with required specifications for ED data layout and content. Data organizations also employ industry standard practices for validating and reviewing data. Beyond this, some specific challenges to collecting additional data that is applicable to ED settings emerged from the interviews. For example, hospitals may resist investing additional costs needed to adapt their information systems to collect data that is relevant to ED settings but not required for inpatient records and billing. Additionally, states may lack mandates that would support the collection of high quality ED data.

The HCUP Partners interviewed for the study used the following practices when collecting ED data:

- Data organizations provide data specifications and submission standards to hospitals.

- The majority of Partners collect ED data under a state mandate.

- Each receives hospital outpatient files that contain ED visits and other types of encounters.

For practical reasons, most of the HCUP SEDD Partners provide specifications and layouts that mirror inpatient UB-92 data layouts.[15] This practice leaves gaps where ED-specific data elements, such as ambulance run numbers, fall outside of the data specifications needed to describe an inpatient stay. Specifically, hospital systems with established inpatient data extraction programs are reluctant to collect additional fields required only for ED visits. The interview participants explained that Healthcare Information Systems (HIS) administrators may resist the expense and effort required to adapt software to collect the data because the potential collection burden is considered unacceptable.

HCUP Partners report full compliance with data submission requirements in their states: nearly all non-Federal acute care hospitals submit data, and from their perspective, the files represent the full annual census of ED visits. Some statewide data organizations can apply sanctions, such as monetary fines, to assure that hospitals provide complete and timely data submissions.

Data Quality Control

HCUP Partners employ various measures to verify the accuracy of the number of submitted records:

- Four of the seven HCUP Partners interviewed for this study compare data submissions to the previous month, quarter, or corresponding time period in the previous year.

- Three Partners compare record counts to regulatory reports, such as the joint annual report of hospitals.

- Two perform no verification, largely because of recent changes in data submission specifications that disrupted the comparisons.

HCUP Partners monitor the quality of their ED databases in several ways:

- HCUP Partners verify the quality and completeness of ED data (or outpatient data, more generally) by performing edit checks for missing and invalid values, relational consistency checks between data elements, and, frequently, validity checks for diagnosis and procedure codes.

- Partners frequently edit outpatient data using programs built upon existing inpatient edits.

- Partners employ various measures to assure data quality: (1) requiring that hospitals resubmit data to meet edit thresholds; (2) accepting voluntary data corrections; or (3) restricting quality reports to internal data organization review only. Partners cautioned

---

[15] Most states collect data using the Uniform Billing (UB-92) format or the Uniform Hospital Discharge Data Set (UHDDS).

that unless the required revisions affect charge amount fields, or unless entire fields are missing from the data set, there are few incentives for hospital to correct outpatient data.

Providing Data to HCUP

HCUP separates inpatient, ambulatory surgery, and ED data in its contractual agreements with participating statewide data organizations and in the resultant HCUP databases. For this reason, HCUP Partner organizations customarily provide extract files that separate ED data from other outpatient data. Six of seven HCUP Partners interviewed provide files to HCUP that contain only ED data.

Interview participants reported greater consistency among statewide data organizations in regard to internal file management practices for identifying ED records than among hospitals:

- HCUP Partners customarily use UB-92 revenue codes 45x to extract data for HCUP (five states).

- Partners may assign an ED place of service indicator to patient records or maintain a separate ED data file in the form it was submitted by hospitals (two states).

- Organizations anticipating future data collection expect to identify ED records in outpatient files either by revenue codes 45x or by using as-yet-undetermined header information accompanying a HIPAA-compliant transaction record.

The practice of deleting records with zero or low charges varies by state:

- One HCUP Partner excludes records with charges under $50 when extracting ED records from outpatient files.

- One HCUP Partner accepts zero charge records in three specific scenarios: (1) patients registered but not seen in the ED (elopements); (2) patients who left against medical advice; and (3) patients meeting their personal physician in the ED. Hospitals flag these records by assigning departure status codes defined by the data organization.

- One HCUP Partner explicitly notes that system edits will fail zero charge records where the charges were bundled with other records. This Partner's system will also fail records that do not include a billable service (e.g., suture removal).

- One HCUP Partner will collect zero charge records for ED visits in order to evaluate reporting patterns.

Improving Future SEDD Data

First, interviews with HCUP Partners explored the possibility of collecting additional clinical procedure measures to enhance the research uses of the SEDD. This strategy would address the observed shortfalls in reporting ICD-9-CM and CPT/HCPCS procedures. Discussions focused on measures that may exist already in statewide data systems (e.g., not submitted to HCUP) or that could be requested from hospitals.

Participants identified several sources of additional clinical procedure measures in statewide and hospital data systems:

- One organization collects additional CPT/HCPCS data (in line item detail) not currently supplied to HCUP.

- Another organization envisions collecting CPT/HCPCS codes in the future, although this will require a lengthy, involved revision of their collection regulations. The process was initiated during the study period; however, implementation is uncertain at this time.

- A third organization will require CPT/HCPCS codes. They learned the value of CPT/HCPCS data through experience with their observation database and added the elements to ED specifications late in their planning process.

- A fourth organization will collect ICD-9-CM, CPT, and HCPCS procedure codes, as available; the procedure coding system will be indicated with a flag.

Second, the interviews included discussion of the anticipated impact of the CMS' OPPS on CPT/HCPCS coding. On one hand, industry experts were encouraged by the fact that the APC groupings in the OPPS require HCPCS as supporting documentation for payment. Miscoding and under-coding of procedures should decrease as hospitals adapt to the new requirements and place greater emphasis on accurate and complete coding.

Despite this optimistic forecast, participants relayed two cautions: (1) the industry has not yet achieved high standards for coding ED records; and (2) APCs could result in hospitals over-reporting HCPCS codes and other elements required by the classification software. Some facilities already code accurately and completely, while others need improvement.

It is important to note that any influence of APCs on coding completeness — and on HCPCS reporting, in particular — will not be reflected in the 1999 data evaluated in this report. APCs replaced cost-based reimbursement for outpatient services in August 2000. In one SEDD state that required CPT/HCPCS procedures in 1999 and which plans to employ CPT for rate setting, beginning in 2003, the proportion of records with CPT/HCPCS codes rose steadily from 54% to 66%, to 84%, and then to 100% between 1999 and 2002. This example demonstrates the potential for improvement in CPT coding completeness that may be expected with the introduction and strong enforcement of HCPCS-based payment classification systems.

Third, participants emphasized the need for improved E code reporting. These codes are useful for reviewing the types and causes of trauma, especially in urban environments. Comments from study participants underscored industry concerns about the accuracy and completeness of current E code reporting practices. For example, in a review of statewide trauma databases, the American Public Health Association reported obstacles to achieving "a high level of external cause of injury coding in statewide hospital-based data systems" (American Public Health Association, 1998). At the same time, an urgent need exists for better injury-related data (just as there is unmet need for more and improved ED data). HCUP is evaluating the reporting of E codes in HCUP data under another task. This effort should lead to improved collection and use of E codes in the future.

Finally, participants discussed additional information specific to ED visits that would enhance the data for research uses. The Massachusetts HCUP Partner has incorporated a number of unique or innovative data elements into its ED database. These include registration date and time, discharge date and time, and a homeless indicator. Future opportunities for strengthening the SEDD may arise as health data organizations add ED-oriented data elements to their statewide data sets.

DISCUSSION

Several aspects of the findings from this evaluation should be encouraging for SEDD data users. In the five states examined, the SEDD contained data from virtually all community hospital EDs in each state and ED visit rates were comparable to NHAMCS regional visit rates. Patient diagnosis, age, gender, and encrypted medical record number were available on all records. Distributions of patient race generally vary across states in ways consistent with population-based racial distributions. In addition, interview findings suggest that hospitals and statewide data organizations employ standard methods to manage records for patients seen in the ED and then admitted to the hospital; these records reside in the inpatient files.

On the other hand, discussions with HCUP Partners and hospital industry experts revealed the lack of a standardized process for collecting ED data within hospitals. This contrasts with the strong practice standards employed for collecting inpatient data. The quantitative analyses also revealed considerable variation across states in the proportion of records where at least one procedure was coded. The presence of procedure codes apparently depends on whether the data organization collects and edits procedures from the line item detail portion of the UB-92. The variability in data collection practices by hospitals and statewide data organizations is likely to affect comparability of analyses across states, and to some extent, across hospitals. In addition, the lack of patient linkage numbers significantly restricts the usefulness of these data, as many potential studies would need to examine patients' use of health care services across facilities and time.

Analysts and organizations collecting ED data now face the challenge of stepping back from individual databases to learn more about the characteristics of ED data in general. Specifically, the challenges include how state-level ED databases compare with each other, how they compare with national data on ED use, and how they compare with inpatient databases. Lessons learned from these initial data collection programs will highlight design issues for state and national projects initiating similar efforts.

Considerations for Using the SEDD

Several issues emerged from this evaluation that warrant specific attention by SEDD data users.

Defining and Identifying ED Visit Records

There is no standard or uniform method for identifying ED visit records for inclusion in statewide ED databases. Hospitals and statewide data organizations most often used the presence of UB-92 revenue center codes 451 through 459 to identify ED records. Other methods include flagging ED records in patient registration systems, flagging records by place of discharge (both hospital-specific indicators), and identifying ED records by admission source (a UB-92 data element).

Each method presents limitations or contingencies. For example, hospital-internal flags and type of service codes can be unreliable. In some instances, they may reflect the location of patient registration systems (in the ED) rather than the location where service is provided. This could occur when patients register in the ED because the location is the preferred entrance to hospital outpatient departments. Or hospitals, particularly smaller or non-urban ones, may operate only one registration desk after hours or on weekends, thereby admitting all patients though the ED registration system.

A second methodological concern is that visits to the ED could be recorded without significant charges or with "zero charges." When this occurs, database management rules place these records at risk of being edited out of the database. However, the records can contain important clinical information providing otherwise useful information about care and services provided during the ED visit. Statewide data organizations have different protocols for retaining, removing, and performing edit checks for zero charge and low charge submissions. (HCUP retains zero charge records in the SEDD if they are provided by HCUP Partner organizations. However, the HCUP data element "total charges- cleaned" will be set to missing, and the "total charges- as received from source" will retain the zero charge value.)

A third concern relates to hospital practices that emerged in discussion with industry experts. When reporting aggregate facility data (such as reports to the AHA Annual Survey), hospital administrators may combine data from urgent care centers with the ED visit data. It is unclear if this practice carries over to identifying ED visits within hospital information systems as well. Data from hospital-based clinics, urgent care centers, and other services should have been excluded from the SEDD. The extent to which encounter-level databases such as the SEDD include outpatient services that are not routinely performed in association with ED visits needs further investigation.

Patient Linkage Numbers

The HCUP SEDD lack an important data element for analysis of patient care over time. Patient linkage numbers such as Social Security Numbers or other identifiers assigned across health care settings and visits are present for only one state in the 1999 SEDD. Therefore, complete ED and inpatient services cannot be tracked for patients who use different hospital EDs at different times or who choose one hospital for their inpatient services and another for their ED services. This limits the use of the SEDD for certain quality and access studies, such as examining ED use after an inpatient stay and identifying patterns of ED use (e.g. for individuals with frequent ED visits).

Procedure Codes

Procedure codes are reported with reasonable frequency for only two of the five 1999 SEDD. The most complete reporting occurs in the two states that collect and edit CPT/HCPCS codes from the line item detail portion of the UB-92. Differing payer requirements influence how charge masters populate ED records; fields not required for reimbursement may remain blank. The industry expert group anticipates improved CPT/HCPCS coding as hospitals respond to the introduction of the Medicare OPPS in August 2000. It is important that AHRQ and SEDD users examine data collected after the implementation of APCs for outpatient reimbursement. It is also important to monitor the impact of the HIPAA transaction regulations for ED claims, which became effective in October 2003. These regulations require that hospitals report CPT/HCPCS codes in the line item detail portion of the bill.

ED Patients Admitted to the Hospital

ED data users will need to remain alert to the standard practice of reporting patients admitted to the hospital through the ED in the inpatient databases and not in the ED databases. For these patients, information about ED services is merged with their inpatient services resulting in just one administrative record. Approximately 13% of patient visits to the ED result in a hospital admission (McCaig & Burt, 2001). This finding suggests the degree to which the HCUP SEDD

and other administrative ED data sources would under-represent the universe of ED visits without the addition of records from inpatient databases (e.g., the SID).

This practice has two major implications for SEDD users. First, they will need to use the inpatient data (SID) if their analyses require a complete set of records for ED users in the state. Second, for patients admitted to the hospital, detailed information about services provided in the ED is not available in hospital information or billing systems. The ED encounter is summarized into a single revenue code (45x) and a single ED charge on the inpatient record. For states where the HCUP SID contain detail charge information associated with revenue centers, users will be able to obtain the total ED charge for a visit but cannot retrieve separate charges or information for individual services performed in the ED. For states where the SID do not provide charge detail, there will be no information on ED charges.

Hospital-Level Variation in Reporting

Evaluations of hospital-level missing data and data distributions were not conducted for this report. The interview findings suggest that there may be hospital variability in ED data collection practices, such as data entry practices, software setup, or data extraction methods. Analysts who use the SEDD are encouraged to examine hospital-specific summary statistics to detect anomalous reporting practices, especially if state-level statistics indicate significant missing data.

Additional Data from Statewide Data Organizations

At present, the two greatest challenges for SEDD development and analytic use are adequate representation of procedures and patient linkage numbers in the data. Active discussion with HCUP Partners may identify additional resources, such as additional line item detail and CPT/HCPCS codes that can be collected from hospitals. In consultation with HCUP Partners, we can determine if specific feedback to hospitals might improve procedure reporting rates in the statewide databases, either by updating the specifications used in charge masters, revising data extraction programs, or by improving quality control processes. Similar discussions can take place concerning barriers to collecting person numbers for linkage across encounters.

Challenges to ED Data Standardization

Emergency department data collection practices currently appear to be at the point where inpatient collection was 15-20 years ago. Many states began developing hospital discharge data systems in the 1980s. By 1988 (the first year of HCUP statewide discharge databases), almost 20 states had assembled discharge-level research data, usually based on Uniform Billing Data Element Specifications, 1982 (UB-82) or Uniform Hospital Discharge Data Set (UHDDS) reporting standards (Conklin et al., 1992). In the early 1990s, most statewide data organizations using proprietary or "home grown" specifications transitioned to new UB-92 standards. Statewide inpatient data programs now have advanced, well tested, and firmly established data collection systems. Public and private researchers and policy-makers at local, state, and national levels actively tap into these rich resources.

Statewide ED collection in the present decade faces a host of challenges including still-evolving data collection standards, diverse collection practices, and lack of a cohesive, unifying vision. There is a clear need to provide incentives and quality control feedback to the primary sources of the data — the hospitals and EDs themselves. These challenges present obstacles to collecting ED data that are comparable across hospitals, states, time periods, and payers. The

industry is actively discussing and moving to establish standardized processes for ED data collection.

These constraints mean that the composition of ED data sets collected by statewide data organizations and projects like HCUP is currently limited by two factors: (1) hospital information system software capabilities, and (2) data content that is collected in the course of normal business operations. Given these constraints, it is important to continue to collect and evaluate available data to ensure that it is of high quality and meets the needs of the research and policy community.

Finally, it is important to note that the present study was conducted in 2002, when fewer established ED data programs existed. Since then, several states initiated new ED databases. In addition, many health data organizations have begun planning for future ED data collection. The degree of diversity in data collection methods may diminish as more states gain experience with ED data collection. Observed variation among state ED databases will lessen as data organizations adopt standards and practices based on longer-established programs. To the extent that hospitals are able to collect complete data from ED encounters and are willing to invest in system modifications to report ED-specific information, lessons learned from the "pioneers" will translate into stronger, more useful research-oriented ED databases.

REFERENCES

Agency for Healthcare Research and Quality. *Nationwide Data Inventory of Statewide Encounter-Level Data Collection Activities.* Contract No. 290-00-0004. June 2003.

American Health Information Management Association. Practice Brief: The Care and Maintenance of Charge Masters. *Journal of the American Health Information Management Association.* July/August 1999.
http://library.ahima.org/xpedio/groups/public/documents/ahima/pub_bok1_000046.html.

American Hospital Association (AHA). *National Uniform Billing Data Element Specifications as developed by the National Uniform Billing Committee*. Chicago: AHA. 2004.

Carpenter, D. Our Overburdened ERs. *Health and Hospital News Magazine*. March 2001:45-47.

Coffey RM, Barrett ML, Steiner S. *Final Report Observation Status Related to Hospital Records*. HCUP Methods Series Report #2002-4. ONLINE September 27, 2002. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov.

Conklin, J, Spirka, C, Davidson, B, Blakley, J. *Final Report on Hospital Cost Feasibility Data Base*. SysteMetrics/McGraw-Hill. January 1992.

Grumbach, K, Keane, D, Bindman, A. Primary Care and Public Emergency Department Overcrowding. *American Journal of Public Health*. 1993; 83:372-378.

Health Forum, LLC. *Data Sources for AHAData.com*. 2003.
http://www.thirdwaveresearch.com/ahadata/ahalp.asp?content=datasource.

McCaig, LF and Burt, CW. *National Hospital Ambulatory Medical Care Survey: 1999 Emergency Department Summary*. Advance Data from Vital and Health Statistics; Number 320. Hyattsville, MD: National Center for Health Statistics. 2001.

McCaig, LF and Ly, N. *National Hospital Ambulatory Medical Care Survey: 2000 Emergency Department Summary.* Advance Data from Vital and Health Statistics; Number 326. Hyattsville, MD: National Center for Health Statistics. 2002.

McCaig, LF and Burt, CW. *National Hospital Ambulatory Medical Care Survey: 2001 Emergency Department Summary*. Advance Data from Vital and Health Statistics; Number 335. Hyattsville, MD: National Center for Health Statistics. 2003.

Maryland Health Care Commission, Health Services Cost Review Commission. *Trends in Maryland Hospital Emergency Department Utilization: An Analysis of Issues and Recommended Strategies to Address Crowding*. April 2002.

National Association of Health Data Organizations. *Conference Proceedings from the April 2002 Emergency Department Data Conference (EDDC)*. April 2003.

National Center for Injury Prevention and Control. *Data Elements for Emergency Department Systems, Release 1.0 (DEEDS).* Atlanta, GA: Centers for Disease Control and Prevention.1997.

Nycomed Amersham Imaging. *Charge Description Master: A Key Hospital File.* 2000. www.us-nai.com/reimb/charge.htm.

Righini, N. *Information Systems in the Emergency Department*. Boston University School of Management. 2002. http://www.nehimss.org/new/InformationSystemsintheED.PDF.

U.S. General Accounting Office. *Hospital Emergency Departments: Crowded Conditions Vary Among Hospitals and Communities*. GAO-03-460. March 2003.

APPENDIX A:
NHAMCS SURVEY FORM

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Center for Health Statistics

OMB No. 0920-0278
Expires: 05/31/2001
CDC 64.136

501511

PATIENT'S RECORD NO.:

NATIONAL HOSPITAL AMBULATORY MEDICAL CARE SURVEY
1999–2000 EMERGENCY DEPARTMENT RECORD

PATIENT'S NAME:

1. PATIENT'S ZIP CODE

2. DATE OF VISIT
Month | Day | Year

3. TIME OF VISIT
☐ Military
☐ AM
☐ PM

4. DATE OF BIRTH
Month | Day | Year

5. MODE OF ARRIVAL – Mark (X) one.
1 ☐ Ambulance (air/ground)
2 ☐ Public service (nonambulance, e.g., police, social services)
3 ☐ Walk-in
4 ☐ Unknown

6. SEX
1 ☐ Female – **Is patient pregnant?**
  1 ☐ Yes 2 ☐ No 3 ☐ Unknown
2 ☐ Male

7. ETHNICITY
1 ☐ Hispanic or Latino
2 ☐ Not Hispanic or Latino

8. RACE
Mark (X) one or more
1 ☐ White
2 ☐ Black/African American
3 ☐ Asian
4 ☐ Native Hawaiian/Other Pacific Islander
5 ☐ American Indian/Alaska Native

9. PRIMARY EXPECTED SOURCE OF PAYMENT FOR THIS VISIT
Mark (X) one.
1 ☐ Private insurance
2 ☐ Medicare
3 ☐ Medicaid
4 ☐ Worker's Compensation
5 ☐ Self-pay
6 ☐ No charge
7 ☐ Other
8 ☐ Unknown

10. DOES PATIENT BELONG TO AN HMO?
1 ☐ Yes
2 ☐ No
3 ☐ Unknown

11. IMMEDIACY WITH WHICH PATIENT SHOULD BE SEEN
1 ☐ Unknown/no triage
2 ☐ Less than 15 minutes
3 ☐ 15 – 60 minutes
4 ☐ > 1 hour – 2 hours
5 ☐ > 2 hours – 24 hours

12. PRESENTING LEVEL OF PAIN
1 ☐ Unknown
2 ☐ None
3 ☐ Mild
4 ☐ Moderate
5 ☐ Severe

13. TIME SEEN BY PHYSICIAN
___ : ___
☐ Military
☐ AM
☐ PM
☐ Not seen by physician or unknown

14. PATIENT'S COMPLAINT(S), SYMPTOM(S), OR OTHER REASON(S) FOR THIS VISIT Use patient's own words
1. Most important: _____
2. Other: _____
3. Other: _____

15. IS THIS VISIT RELATED TO INJURY OR POISONING? Refers to all types of injury or poisoning, including adverse drug experiences, medical misadventures, etc.
1 ☐ Yes (Answer a, b, c, and d.)   2 ☐ No (Skip to item 16.)

a. Place of occurrence – Mark (X) one.
1 ☐ Residence
2 ☐ Recreation/sports area
3 ☐ Street or highway
4 ☐ School
5 ☐ Other public building
6 ☐ Industrial places
7 ☐ Other
8 ☐ Unknown

b. Is this injury intentional?
1 ☐ Yes (self-inflicted)
2 ☐ Yes (assault)
3 ☐ No, unintentional
4 ☐ Unknown

c. Is this injury work related?
1 ☐ Yes   2 ☐ No   3 ☐ Unknown

d. Cause of injury Describe events that preceded injury (e.g. reaction to penicillin, wasp sting, driver in motor vehicle traffic accident involving collision with parked vehicle, shot with a handgun during a brawl, heroin overdose, etc.)

16. PHYSICIAN'S DIAGNOSES FOR THIS VISIT As specifically as possible, list diagnoses related to this visit including chronic conditions (e.g. depression, obesity, asthma, etc.)
1. Primary diagnosis: _____
2. Other: _____
3. Other: _____

17. DIAGNOSTIC/SCREENING SERVICES – Mark (X) all **ordered** or **provided** at this visit.
1 ☐ None
2 ☐ Mental status exam
3 ☐ Blood pressure
4 ☐ EKG
5 ☐ Cardiac monitor
6 ☐ Pulse oximetry
7 ☐ Urinalysis
8 ☐ Pregnancy test
9 ☐ HIV serology
10 ☐ Other STD test
11 ☐ Blood alcohol concentration
12 ☐ CBC
13 ☐ Other blood test
14 ☐ Other – Specify _____

IMAGING:
15 ☐ Chest X-Ray
16 ☐ Extremity X-Ray
17 ☐ Other X-Ray
18 ☐ MRI
19 ☐ Ultrasound
20 ☐ CAT scan
21 ☐ Other diagnostic imaging

18. PROCEDURES – Mark (X) all **provided** at this visit.
1 ☐ None
2 ☐ Endotracheal intubation
3 ☐ CPR
4 ☐ IV fluids
5 ☐ NG tube/gastric lavage
6 ☐ Lumbar puncture
7 ☐ Bladder catheter
8 ☐ Wound care
9 ☐ Eye/ENT care
10 ☐ Orthopedic care
11 ☐ OB/GYN care
12 ☐ Other – Specify _____

19. MEDICATIONS/INJECTIONS List names of up to 6 medications that were **ordered, supplied, administered** or **continued** during this visit. Include Rx and OTC medications, immunizations, allergy shots, and anesthetics.
☐ None
1. _____ 4. _____
2. _____ 5. _____
3. _____ 6. _____

20. PROVIDERS SEEN THIS VISIT – Mark (X) all that apply.
1 ☐ Staff physician
2 ☐ Resident/intern
3 ☐ Other physician
4 ☐ Physician assistant
5 ☐ Nurse practitioner
6 ☐ R.N.
7 ☐ L.P.N.
8 ☐ Medical/nursing assistant
9 ☐ E.M.T.
10 ☐ Other

21. VISIT DISPOSITION – Mark (X) all that apply.
1 ☐ No followup planned
2 ☐ Return to ED, P.R.N./appointment
3 ☐ Returned to referring physician
4 ☐ Referred out from triage without treatment
5 ☐ Referred to other physician/clinic for followup
6 ☐ Left before being seen
7 ☐ Admitted to hospital
8 ☐ Admitted to ICU/CCU
9 ☐ Transferred to other facility
10 ☐ DOA/died in ED
11 ☐ Referred to social service
12 ☐ Other – Specify ↗

501511

FORM NHAMCS-100(ED) (8-19-98)

**APPENDIX B:
SEDD DATA ELEMENTS**

HCUP State Emergency Department Databases
Data Elements in 1999 SEDD

SEDD DATA ELEMENT	SEDD INTRAMURAL FILE DESCRIPTION
AGE	Age in years at admission
AGEDAY	Age in days (when < 1 year)
AGEMONTH	Age in months (when AGE is less than 11 years)
AMONTH	Admission month
ASOURCE	Admission source, uniform coding
ASOURCE_X	Admission Source, as received from source
ATYPE	Admission type
AWEEKEND	Admission day is on a weekend
CHARGE	Line item charge as received from source
CHGn	Charges, detailed
CPTHCPCS	Line item CPT or HCPCS procedure code as received from source
CPTn	CPT-4/HCPCS procedures
DIED	Died during hospitalization
DISP_X	Disposition of patient, as received from source
DISPUB92	Disposition of patient, UB92 coding
DISPUNIFORM	Disposition of patient, uniform coding
DQTR	Discharge quarter
DSHOSPID	Data source hospital number
DSRECNUM	Data source record number
DXCCSn	Clinical Classifications Software (CCS): diagnosis classification
DXn	Diagnosis
FEMALE	Indicator of patient sex
HISPANIC_X	Hispanic ethnicity, as received from source
HMOPPO1	HMO/PPO indicator for expected primary payer (PAY1)
HMOPPO2	HMO/PPO indicator for expected secondary payer (PAY2)
HOSPST	Hospital State postal code
KEY	Unique record identifier
LOS	Length of stay, cleaned
LOS_X	Length of stay, as received from source
MDID_S	Synthetic attending physician number
MDSPEC	Attending physician specialty, as received from source
MRN_S	Synthetic medical record number
NCPT	Number of CPT/HCPCS procedures for this discharge
NDX	Number of diagnoses on this discharge
NEOMAT	Neonatal and/or maternal DX and/or PR
NPR	Number of procedures on this discharge
PAY1	Expected primary payer, uniform
PAY1_X	Expected primary payer, as received from source
PAY2	Expected secondary payer, uniform
PAY2_X	Expected secondary payer, as received from source
PAYER1_X	Expected primary payer identifier, plan specific
PAYER2_X	Expected secondary payer identifier, plan specific
PNUM_S	Synthetic person number
PRCCSn	Clinical Classifications Software (CCS): procedure classification

SEDD DATA ELEMENT	SEDD INTRAMURAL FILE DESCRIPTION
PRDAYn	Day of procedure
PRn	Procedure
PSTCO	Patient state/county FIPS code
RACE	Race
RACE_X	Race, as received from source
REVCDn	Revenue code
REVCODE	Line item revenue code as received from source
SERVDAY	Line item days from admission date
SURGID_S	Synthetic primary surgeon number
SURGSPEC	Primary surgeon specialty, as received from source
TOTCHG	Total charges, cleaned
TOTCHG_X	Total charges, as received from source
UNITn	Units of Service
UNITS	Line item units as received from source
YEAR	Calendar year
ZIP_S	Synthetic patient zip code

SEDD DATA ELEMENT	SEDD DATA DEVELOPMENT FILE DESCRIPTION
ADATE	Admission date
DDATE	Discharge date
DOB	Date of birth
KEY	Unique record identifier
MDID	Attending physician number, as received from source
MRN	Medical record number, as received from source
PNUM	Person number, as received from the data source
PRDATEn	Date of procedure
SURGID	Primary surgeon number, as received from source
ZIP	Patient zip code

**APPENDIX C:
DISCUSSION GUIDE FOR CONVERSATIONS WITH
PARTNERS AND OTHER INDUSTRY EXPERTS**

HCUP Special Analysis
Evaluation of Emergency Department Data
Discussion Questions
Revised: September 20, 2002

Introduction for SEDD PARTNERS

The topics and questions included in this document are presented as a guide for the discussion of emergency department data collection in your state. We are primarily interested in learning more about data collection capabilities in the ER, in hospital information systems in general, and within state-level databases, such as those that ultimately culminate in the data that is supplied to HCUP and other researchers. Data collection and coding practices in each of these locales, and factors related to systems capabilities can influence the set of data elements available for inclusion in research databases. These considerations can also influence the data quality, completeness and representativeness of ED databases.

In this discussion, we are interested in your perspective and knowledge of potential gaps or challenges in capturing ED data, in passing information from one system to the next, and any other collection, coding or systems capability information of which HCUP and AHRQ should be aware.

Thank you for your time and interest in discussing emergency department data collection for this special analysis for the Agency for Healthcare Quality and Research.

Introduction for PARTNERS WITH NEW ED COLLECTION

The topics and questions included in this document are presented as a guide for the discussion of planned emergency department data collection in your state, and what you learned in the process of planning your ED data collection system. We are primarily interested in learning more about data collection capabilities in the ER, in hospital information systems in general, and then within state-level databases, such as those that ultimately culminate in the data that is supplied to HCUP and other researchers. Data collection and coding practices in each of these locales and systems capabilities can influence the set of data elements available for inclusion in statewide emergency department databases. These considerations can also influence the data quality, completeness, comparability, and representativeness of research databases derived from administrative data, such as the HCUP databases.

In this discussion, we are interested in lessons learned in planning your emergency department data collection system, your perspectives and knowledge of potential gaps or challenges in capturing ED data, in passing information from one system to the next, and any other collection, coding or systems capability information of which HCUP and AHRQ should be aware.

Thank you for your time and interest in discussing emergency department data collection for this special analysis for the Agency for Healthcare Quality and Research.

Introduction for NON-HCUP HOSPITAL INDUSTRY EXPERTS

Thank you for your time and interest in discussing emergency department data collection for this special analysis for the Agency for Healthcare Quality and Research. This information will help the Healthcare Cost and Utilization Project (HCUP) better understand and use our newly developed State Emergency Department Databases.

The topics and questions included in this document are presented as a guide for the discussion of emergency department data collection practices and the interrelationship of information systems in the ER, in overall outpatient databases, and in the general hospital information system.

We are primarily interested in learning more about data collection capabilities, what information is coded for ED visits, variations in coding and data capture due to payer incentives (e.g., Medicare rules or private payer requirements), how much variation in ED visit records results from hospital or payer variations, and other data completeness and data capture considerations.

For this discussion, we would like to focus on administrative encounter data, such as HCUP collects for our statewide discharge and encounter databases. For more than a decade, HCUP has focused on development of inpatient discharge abstract databases from statewide data sources (such as departments of health and hospital associations). Recently, HCUP began development of the State Emergency Department Databases (SEDD), and has completed several statewide databases for the 1999 and 2000 calendar years. Similar to the HCUP inpatient databases, the SEDD are based on administrative data collected by state-level data organizations from all hospitals with an emergency department in participating states. These data are typically derived from billing data with additional variables included, such as patient race, when the state requires or requests them.

The project itself encompasses numerous state-level and nationwide databases that include inpatient discharges and outpatient visits:

The Healthcare Cost and Utilization Project (HCUP) is a family of health care databases and related software tools and products developed through a Federal-State-industry partnership and sponsored by the Agency for Healthcare Research and Quality (AHRQ). HCUP databases bring together the data collection efforts of state data organizations, hospital associations, private data organizations, and the Federal government to create a national information resource of discharge-level and visit-level health care data. HCUP includes the largest collection of longitudinal hospital care data in the United States, with all-payer, encounter-level information beginning in 1988. These databases enable research on a broad range of health policy issues, including cost and quality of health services, medical practice patterns, access to health care programs, and outcomes of treatments at the national, state and local market levels.

Background Information on ED Planning Process	SEDD Partners	Other HCUP Partners	Non-HCUP Experts
As background for our discussion, would you describe what was learned in the process of designing your state's ED data collection: • What is the status of planning and implementation for your ED data collection system? (for instance, introducing the idea to stakeholders, getting "buy in," establishing regulations and specifications, and initiating collection) • How were the major stakeholders in your state involved (site visits, public hearings, technical advisory committees, review of materials distributed for comment)? • Which stakeholders were involved? • What recommendations were made by facilities and stakeholders coming out of the planning process? E.g., related to data elements that can be collected? That are collected in systems other than the ones used to generate data submissions to the state? Burden of reporting specific types of data?		X	

Respondent Background	SEDD Partners	Other HCUP Partners	Non-HCUP Experts
As background, please describe your current responsibilities and how you developed your knowledge of emergency department data collection?			X

Data Flow - Data Capture in the ED		SEDD Partners	Other HCUP Partners	Non-HCUP Experts
1	When hospitals store records for ED visits in their systems, how are the records stored? That is, do they have *one record per visit* (or bundle multiple visits into one record if they are within, say, one day or a few days)? Do hospitals store ED *records in same files as other outpatient* service records? Or separately from other outpatient records? How are ED visits *identified* within the hospital information system – what flags or indicators show that an ER visit occurred (may be different from methods used to extract/send data to the state)?	X	X	X
2	If a patient is admitted from the ED to the hospital, is the record *reclassified as an inpatient stay*? Is a *complete record* of the ED encounter still available within the hospital IS? Is any information about the ED visit "lost" to subsequent users? Does this vary by hospital?	X	X	X
3	What *payment incentives* exist that would affect the type or amount of data are collected from the ED (for instance, for procedures or other information)? Or how it is stored or classified in the HIS? Did the introduction of CMS' APC system improve (decrease) rates of underreporting?	X	X	X

Data Flow - Data Capture in the ED		SEDD Partners	Other HCUP Partners	Non-HCUP Experts
3a	We are interested in the use of *charge masters* to look up charges, revenue codes, and procedure codes (ICD-9-CM and HCPCS) and populate these items on outpatient bills. How does the use of charge masters affect the completeness and comparability of administrative billing data – that is, in comparing bills across all types of payers? Are some fields only coded for specific payers? Undercoded or not required for all payers? What cautions should users of ED administrative billing data (especially when using multi-hospital database) be aware of concerning use of data generated by charge masters?			X
4	Is there *anything else* that HCUP/AHRQ should be aware of concerning the capture and flow of ED visit information within hospital systems *that might affect research use of the data?* Would you like to highlight any issues related to ED data elements (not) available in administrative data that would impact research uses?	X	X	X

Data Flow - Submitting ED data to the State		SEDD Partners	Other HCUP Partners	Non-HCUP Experts
5	Is collection of ED data mandated in your state? Is your organization or agency operating under a mandate to collect the data?	X	X	
6	(Does/will) your organization or agency provide specific instructions or regulations that tell hospitals how to extract ED encounter records from their ISs? (if so, may we obtain a copy of those instructions)?	X	X	
6a	(Unless ED record identification was already described:) *When preparing data files for submission to the state,* what criteria are (will) hospitals use to extract or identify ED encounter records hospitals in their ISs (what flags, data elements, or algorithms are used)?	X	X	
7	(Does/will) your organization or agency provide different submission specifications or layouts for ED data than for inpatient or other visit data? (Do/will) hospitals submit data to the state using the same layout for ED and IP (or ED and outpatient/AS)? Using a combined ED/IP or ED/OP file? (If not a separate data set): *In the data received by the state,* what indicators or criteria (are/will be) used to identify the ED records? Do hospitals add ED indicators to the data, other than what is present in the HIS? May we have a copy of the ED submission layout and/or manual?	X	X	
8	When preparing data for submission to the state, (do/will) hospitals include IP admissions from the ED in their inpatient data, in their ED data, or possibly in both files?	X	X	

Data Flow - Submitting ED data to the State	SEDD Partners	Other HCUP Partners	Non-HCUP Experts
9	On receipt of the ED data, (does/will) your organization exclude any records that were submitted by the hospital? For instance, due to invalid or out of range dates? Or due to bill type ("still a patient") or other checks?	X	X	
10	(Do/will) you exclude records indicating treatment in both the ED and observation units? Can ED records also include observation time	X	X	
11	(Do/will) you check for double counting or duplication of ED records, services, or charges in the submitted data	X	X	
12	Once the hospital files are combined into statewide files, (are/will) ED records (be) stored separately from other visit data? Stored in a combined outpatient file? Stored separately from inpatient records? As the data (are/will be) maintained in your statewide files, is there possible double counting or duplication of ED records, services, or charges (same ED record appears in IP, AS, or other outpatient files)? (Do/will) you add any ED indicators to the data after receipt from hospitals? Retain the indicators submitted by hospitals?	X	X	
12a	(Unless ED record identification was already described:) In the statewide ED files, what criteria (are/will be) used to identify ED encounter records (what flags, data elements, or algorithms are used)? (Do/will) you add any ED indicators to the data after receipt from hospitals? Retain the indicators submitted by hospitals?	X	X	

	Data Quality and Completeness	SEDD Partners	Other HCUP Partners	Non-HCUP Experts
13	(Do/In the first year collection, do you anticipate that) all hospitals with an ER (can and will) report their full year data to the State? What types of hospitals with ERs (and how many) do not report full year data? What steps (does/will) your organization take to check that hospitals have submitted data for all ED visits (e.g. check aggregate counts of visits against another source of data such as previous year or month's data, hospital financial data, or AHA Annual Survey of Hospitals)?	X	X	
14	(Are/In the first year collection, do you anticipate that there will be) any data elements usually underreported or misreported by hospitals? By some hospitals? *(Do/Do you anticipate that) hospitals (will) report all the required data elements? Report all optional data elements?* Would you caution researchers about the quality or completeness of any specific data elements?	X	X	
15	How does your organization/agency monitor *data element completeness* for ED visits (by completeness we mean that the rate of missing values is not unreasonably high and data values fall in expected distributions)? What edit checks or other measures are (will be)used to see that the data are complete and reasonable?	X		

	Data Quality and Completeness	SEDD Partners	Other HCUP Partners	Non-HCUP Experts
15a	Has your organization or agency given thought to monitoring *data element completeness*? What measures are planned to monitor completeness (by completeness we mean that the rate of missing values is not unreasonably high and data values fall in expected distributions)? What edit checks or other measures are planned to verify that the data are complete and reasonable?		X	
15b	Do you recommend particular checks to monitor *data element completeness* for ED visits (by completeness we mean that the rate of missing values is not unreasonably high and data values fall in expected distributions)?			X
16	Does quality or completeness of any ED data elements differ by patient type or discharge status (e.g., when patient is seen only in the ED vs. referred to ambulatory surgery or admitted as an inpatient)?	X		
17	HCUP found that ____% of the 1999/2000 ED records supplied to HCUP from your state contain any procedure codes, which is lower than our benchmark of 45%. What would explain the lower rate of procedure coding on your ED data compared to the benchmark? Is additional procedure data available to the State (e.g., are CPTs or line item detail available from hospitals or available on supplemental files submitted to the State)?	X		

	Data Quality and Completeness	SEDD Partners	Other HCUP Partners	Non-HCUP Experts
17a	HCUP found that only 10-20% of records in most HCUP ED databases for 1999 and 2000 contain procedure codes, which is lower than our benchmark of 45%. Each of these databases report ICD-9-CM procedure codes versus (or in addition to) CPT/HCPCS codes. What could explain the lower rate of procedure coding in the HCUP ED databases?		X	X
18	Are there circumstances that you know of when services provided as part of an ED encounter may not be included on ED records (that you receive from the hospitals/that are submitted to the State)? • For example, *radiology services* ordered in the ED and provided by a hospital-based radiology practice that has a separate billing number from the hospital. • Or, *lab work* ordered in the ED but billed separately by the lab. • Or physician/professional bills, when hospitals contract with outside physicians? Please describe any such circumstance and the impact it would have on collecting a complete ED visit record. Is this practice common across all hospitals/all payers or specific to only some hospitals/payers?	X	X	X

Data Quality and Completeness		SEDD Partners	Other HCUP Partners	Non-HCUP Experts
19	Is there *anything else* that HCUP/AHRQ should be aware of concerning the type of data collected for ED visit *that might affect research use of the data?* Any gaps or limitations in the data as they are passed from system to system? Would you like to highlight any issues related to ED data elements (not) available from hospital ISs that would impact research uses? Is there additional information (e.g., data elements) available in the state ED databases that could be added to the HCUP data to enhance its research use?	X	X	
19a	Is there *anything else* that HCUP/AHRQ should be aware of concerning the type of data collected for ED visit *that might affect research use of the data?* Any gaps or limitations in the data as they are passed from system to system? Would you like to highlight any issues related to ED data elements (not) available from hospital ISs that would impact research uses?			X

At end of call:		SEDD Partners	Other HCUP Partners	Non-HCUP Experts
20	AHRQ would like to discuss ED data collection with some information system or industry experts. Is there someone you would recommend as a contact at a hospital in your state or in the hospital industry?	X	X	

For us to answer:		SEDD Partners	Other HCUP Partners	Non-HCUP Experts
21	Would data completeness be improved by merging ED patients from the SID and SASD with the SEDD?	X	X	
22	Is the State capturing sufficient data for analyses of ED costs and utilization?	X	X	

APPENDIX D:
INDIVIDUALS CONTACTED FOR INFORMATION ON
EMERGENCY DEPARTMENT DATA COLLECTION

Table 1. HCUP Partners Participating in State Emergency Department Databases (SEDD)

Name: Vicki Cunningham
Title: Consultant
Organization: Maine Health Data Organization

Name: Sandra Kelly
Title: Project Coordinator, Health and Demographics
Organization: South Carolina State Budget and Control Board

Name: Ken Kuebler
Title: Executive Vice President
Organization: Hospital Industry Data Institute (Missouri)

Name: Mary Lyon
Title: Vice President, Integrated Health Information
Organization: Chime, Inc. (Connecticut)

Name: John Morgan
Title: Information Analyst Supervisor, Office of Health Care Statistics
Organization: Utah Department of Health

Name: Charlotte Thompson
Title: Health Policy Analyst
Organization: Health Services Cost Review Commission (Maryland)

Name: Patrick Turri
Title: Director of Data Analysis, Information Services Department
Organization: Tennessee Hospital Association

Table 2. HCUP Partners Planning and Implementing Emergency Department Data Collection

Name: Starla Ledbetter
Title: Assistant Manager, Patient Discharge Data
Name: Ginger Cox
Title: Research Analyst II
Organization: Office of State Health Planning and Development (OSHPD) (California)

Name: Kathy Fuda
Title: Manager of Data Initiatives and Analysis
Organization: Massachusetts Division of Health Care Finance and Policy

Name: Bob Davis
Title: SPARCS Coordinator
Organization: SPARCS (New York)

Name: Judith Nugent
Title: Chief, Person-Level Data and Analysis Section
Organization: Wisconsin Department of Health and Family Services

Table 3. Other Hospital Industry Experts

Name: Julie Brucker
Title: Liaison to SPARCS
Organization: New York Health Information Management Association (NYHIMA)
Group: Hospital Information Management Expert

Name: Kia Earp
Title: Data Coding Specialist
Organization: Brigham and Womens Hospital, MA
Group: Hospital Information Management Expert

Name: Dean Farley
Title: Vice President, Health Policy and Analysis
Organization: HSS
Group: Financial Incentives Expert

Name: Bob Latham
Title: Health Policy and Analysis Consultant
Organization: HSS
Group: Hospital Information Systems Expert

APPENDIX E:
ADDITIONAL MATERIALS FROM LITERATURE SEARCH

ADDITIONAL MATERIALS LOCATED THROUGH LITERATURE AND INTERNET SEARCH
Current as of November 2003

American Public Health Association. *How States Are Collecting and Using Cause of Injury Data.* http://www.tf.org/tf/injuries/aphabk98.pdf, September 1998.

Baker, J.J. "Medicare Payment System for Ambulatory Surgical Centers." *J Health Care Finance* 2002:28(3):76-87.

Burt, C.W. and McCaig, L.F. *Trends in Hospital Emergency Department Utilization: United States 1992-99.* National Center for Health Statistics. Vital Health Stat 13(150). 2001.

Carpenter, D. "Our Overburdened ERs." *Health and Hospital News Magazine.* March 2001:45-7
CMS. "Overview of Outpatient Prospective Payment System." www.cms.hhs.gov/medlearn May 3, 2000.

Dohan, D. "Managing Indigent Care: A Case Study of Safety-Net Emergency Department." *HSR* Vol. 37, No. 2, 361-376, April 2002.

Fraser, I. *What Can Federal Agencies Contribute to ED Data Development*?, Presentation at the 2002 Emergency Department Data Conference, April 2003.

Grumbach, K., Keane, D., Bindman, A. "Primary Care and Public Emergency Department Overcrowding." *American Journal of Public Health*, 83:372-378, 1993.

Health Forum, LLC. *Data Sources for AHAData.com.* http://www.thirdwaveresearch.com/ahadata/ahalp.asp?content=datasource, 2003.

Karpiel, M.S. "Hospital's Emergency Department and APCs." Health Care Financial Management Association, Newsbrief Jr., Vol. 7, No. 9, November 2000.

Kushel, M.B., Perry, S., Bangsberg, D., Clark, R., and Moss, A.R. "Emergency Department Use Among the Homeless and Marginally Housed: Results from a Community-Based Study." *American Journal of Public Health*, Vol. 92, No. 5, 778-784, May 2002.

McCaig, L. F. and Burt, C.W. *National Hospital Ambulatory Medical Care Survey: 1999 Emergency Department Summary*. Advance Data from Vital and Health Statistics; Number 320. Hyattsville, Maryland: National Center for Health Statistics. 2001.

McCaig, L.F. and Ly, N. *National Hospital Ambulatory Medical Care Survey: 2000 Emergency Department Summary.* Advance Data from Vital and Health Statistics; Number 326. Hyattsville, Maryland: National Center for Health Statistics. 2002.

McCaig, L. F. and Burt, C.W. *National Hospital Ambulatory Medical Care Survey: 2001 Emergency Department Summary.* Advance Data from Vital and Health Statistics; Number 335. Hyattsville, Maryland: National Center for Health Statistics. 2003.

McEnroe, J.E. "Ambulatory Payment Classification – Happy Birthday???" http://www.healthsystemsdirect.com/article10.html, August 21, 2001.
Micheletti, J. "APC Environment Poses New Compliance Risk." Health Management Technology, June 2000.

Maryland Health Care Commission, Health Services Cost Review Commission. *Trends in Maryland Hospital Emergency Department Utilization: An Analysis of Issues and Recommended Strategies to Address Crowding.* April 2002.

National Association of Health Data Organizations. Conference Proceedings from the April 2002 Emergency Department Data Conference (EDDC). April 2003.

National Center for Injury Prevention and Control. *Data Elements for Emergency Department Systems, Release 1.0 (DEEDS).* Atlanta, GA: Centers for Disease Control and Prevention, 1997.

Nycomed Amersham Imaging. *Charge Description Master: A Key Hospital File.* www.us-nai.com/reimb/charge.htm , 2000.

Practice Management Information Corporation. "Health Care Procedure Coding System: National Level II Medicare Codes." Los Angeles, CA: Practice Management Information Corporation, 2001.

Righini, N. Information Systems in the Emergency Department. Boston University School of Management. http://www.nehimss.org/new/InformationSystemsintheED.PDF, 2002.

Schappert, S.M. "Ambulatory Care Visits to Physician Offices, Hospital Outpatient Departments, and Emergency Departments: United States, 1999." National Center for Health Statistics. Vital Health Statistics. To be published.

Schneider, D., Appleton, L., McLemore, T. "A Reason for Visit Classification for Ambulatory Care." National Center for Health Statistics. Vital and Health Stat 2(78), 1979.

U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Health Statistics, Data Evaluation and Methods Research. *Use and Interpretation of Diagnostic Statistics From Selected Data Systems.* Series 2, No. 107. January 1988.

U.S. General Accounting Office, *Hospital Emergency Departments: Crowded Conditions Vary Among Hospitals and Communities*, GAO-03-460. Washington, D.C. March 2003.