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Executive Summary

The Institute of Medicine's (IOM) Committee on the Future of Emergency Care in the United States Health System was convened in 2003 to examine the state of emergency care in the U.S., to create a vision for the future of emergency care, including trauma care, and to make recommendations to help the nation achieve that vision. Achieving the IOM vision will require a commitment to establishing and maintaining a data and reporting infrastructure to guide the policy decisions essential to improving the system and the care it provides.

States are well on the way, with a trend toward expanding their health care reporting systems. In 2008, 28 states have expanded beyond inpatient hospital reporting to include Emergency Department (ED) data from acute care hospitals. As ED data collection grows across the country, states are realizing the tremendous utility of this data set. ED data are being used for policy, planning, public health surveillance, market studies, and research.

This report provides an implementation framework for a statewide emergency department data collection system based on the experiences in establishing similar systems in other states. In doing so, it is intended to inform the planning and formation of data policies.

The report lays out options and recommendations for the following steps usually associated with the implementation of a statewide emergency department data collection system (EDDCS). Specifically, the report:

- Identifies the key stakeholders in the use and collection of emergency department data and associated key business requirements.
- Defines the scope of data collection initiatives to meet key stakeholder needs and leverage the capabilities of existing systems.
- Addresses and assesses the impact if some of the data elements necessary to fully answer stakeholder questions are clinical in nature and not currently supported by the UB-04 Data Design.
- Considers national data standards and reporting requirements to identify the most appropriate and efficient formats for submitting data across various data providers including the identification of possible linkage variables for use in linking inpatient stays with emergency department visits.

Finally, this report contains an analysis of the expected resource needs and costs associated with implementing and operating a statewide emergency department data collection system. The report also identifies and discusses the potential costs hospitals may incur in collecting and reporting these data to the state.

Summary of Recommendations

Based on the experience of the NAHDO Team and other states' experiences, NAHDO makes the following recommendations for statewide ED data reporting:

Recommendation 1: It is anticipated that the UB standards will continue to evolve as the needs of the nation's health care system evolve. The ED reporting policies should also evolve to meet changing needs in the state and to align with national standards.

Recommendation 2: It is recommended that the proposed ED reporting requirements include the collection of a personal identifier, possibly including part of the patient's name and a portion of the patient's social security number, to serve as a linkage variable between the ED and inpatient databases. In addition, NAHDO recommends the addition of patient medical record number (MRN) to inpatient and ED reporting requirements to help assure appropriate linkage and to provide the source number for the specific discharge for editing and retrieval purposes. The MRN can be encrypted to protect patient identity when used for external reporting purposes.

Recommendation 3: The agency should evaluate other states' documentation and tools for emergency department edits and analytic reports. In particular, NAHDO recommends evaluation of the edit processes from states with established emergency department collection systems. Potential candidate states are California, Massachusetts, New York, Florida, and Maine. This would also include reviewing the analytic reports to provide model approaches from those states with established emergency department collection systems

Recommendation 4: We recommend that the ED reporting leverage the existing infrastructure for operations. It will save money, reduce facility reporting burden, and allow for faster data sharing between programs.

Recommendation 5: NAHDO recommends that, ideally, the agency budget for additional FTEs to provide sufficient staffing to successfully implement their ED system. Based on the experiences of other states, adding staff is not always possible and ED data management may have to be absorbed by existing staff. This approach limits the agency's capacity to fully utilize their ED system. If adding staff is not an option, seeking partnerships with public health agencies to share analytic resources in return for ED data may be an alternative.

Recommendation 6: Consideration should be given to including the following UB-04 data elements: condition codes, value codes, occurrence codes, occurrence span codes, and street and city addresses. It should be noted that such an expansion to these national standard data elements would provide the vehicle to collect such data as a newborn's birth weight with minimal burden to provider systems.

Recommendation 7: The process used in assessing the feasibility of the ED reporting involves close collaboration with hospitals and the State Hospital Association.

Recommendation 8: It is recommended that a pilot data collection effort be considered as a way to test facility reporting capacity and internal agency capacity to capture ED data. A mix of facilities, for example urban/rural setting, for-profit/non-profit/public district hospital status, various levels of trauma system designation, and various bed-capacity sizes, may inform the eventual design/format of the statewide ED reporting system.

The lessons learned from the implementation of data systems in other states help us understand the steps necessary for a successful implementation of a statewide ED reporting system. Even though differences in the economic, political, and technical readiness in each state may result in different weighting of these steps, the actions listed below need to be accommodated during the design, development, and implementation phases. The steps listed below apply to all states implementing an emergency department data collection system.

- 1. Governance and submission policies should be consistent with any existing health care data collection system.*
- 2. Combination of state and vendor IT system development should be consistent with current state system.*
- 3. File formats for analysis and distribution should be consistent with current state system.*
- 4. Ideally, pilot testing should be done on a small but representative (large and small, rural and urban) group of hospitals. The objectives of this pilot would include testing the base ED system (IT and network infrastructure) capacity to support the anticipated increase in volume of an emergency department data collection system.*
- 5. Submission mode should be consistent with the current system.*
- 6. Ideally, funding would be allocated to hire at least one additional staff and also would include training of agency staff and hospitals.*

It is important that the ED data be used as soon as possible after data collection begins. This would require assessing stakeholder analytic needs for a limited number of reports to be available on system inception. A limited set of desired reports using ED data provides the best justification for creating the ED reporting system. This would provide further system justification to offset the data collection burden on the provider community.

Introduction

The Institute of Medicine's (IOM) Committee on the Future of Emergency Care in the United States Health System was convened in 2003 to examine the state of emergency care in the U.S., to create a vision for the future of emergency care, including trauma care, and to make recommendations to help the nation achieve that vision. The committee's findings and recommendations are presented in three reports:

Hospital-Based Emergency Care: At the Breaking Point explores the changing role of the hospital emergency department and describes the national epidemic of overcrowded emergency departments and trauma centers.

Emergency Medical Services at the Crossroads describes the development of EMS systems over the last forty years and the fragmented system that exists today.

Emergency Care for Children: Growing Pains describes the unique challenges of emergency care for children.

These recommendations include:

- Improving hospital efficiency and patient flow;
- A coordinated, regionalized, accountable system;
- Increased resources; and
- Paying attention to children¹.

Achieving the IOM vision will require a commitment to establishing and maintaining a data and reporting infrastructure to guide the policy and market decisions essential to improving the system and the care it provides. States are well on the way, with a trend toward expanding their health care reporting systems. As Emergency Department (ED) data collection grows across the country, states are realizing the tremendous utility of this data set.² Because it includes data on all patients and all payers in a state, the ED data provide a unique window into the performance

¹ <http://www.iom.edu/Object.File/Master/35/014/Emergency%20Care.pdf>

² Emergency Department Data: Emergency department care is the provision of surgical or non-surgical health services to individuals admitted to or registered in a non-Federal acute care hospital emergency department. Emergency department data are defined as all-payer data (including self and uninsured) for all patients admitted to the emergency department in non-Federal acute care hospitals, for a fiscal or calendar year period or by periods that can be collected into an annual database. Emergency department data ideally contain a complete collection of demographic, clinical, and billing data.

of the health system as a whole, as well as patient subgroups and communities within a state. States with ED data are able to research the following issues:

- Identify patterns of care including, but not limited to, injury or disease classes (asthma, heart attack, and stroke).
- Identify patients and high-risk groups receiving emergency department services distributed by age, race/ethnicity (if collected), gender, and payment source.
- Identify seasonal deviations and other patterns of change over time for emergency department utilization. This would also include disease or injury specific groupings.
- Identify high-risk groups and neighborhoods that have high emergency department visit rates.
- Identify the co-morbid conditions that impact care outcomes, including, but not limited to, injury or disease classes (asthma, heart attack, and stroke).
- Identify the distribution and potential financial implications of services provided to emergency department patients. This would include medication administration, ancillary services, and procedures that were administered or performed during the visit.
- Track patterns of care for emergency department visits distributed across geographic regions of the state over time and by hospital type.
- Identify discharges by source of admission for emergency department visits.
- Track the location of injury episode and exposure resulting in an emergency department visit as well as the source of admission for emergency department services.
- Track emergency department visits that lead to an inpatient admission or subsequent re-admissions for emergency or inpatient services.
- Identify other contributing factors (e.g., severity, secondary complications, specialist referral, etc.) impacting the cost of an emergency department visit.
- Analyze the composition and potential financial implications of resources consumed for emergency department visits for primary-care sensitive conditions that could be more cost-effectively treated in other settings.
- Identify the distribution of patients in (and across) payer groups, including the uninsured and homeless to detect differences in usage and charges for emergency care.

About This Report

The purpose of this report is to lay out an implementation framework for statewide ED reporting, based on the experience in other states. States that align their ED reporting with their inpatient reporting systems, reduce the hospital’s burden to supply the data. Twenty-eight states have based on claims or billing records with coded demographic, procedure, and diagnostic data from hospital emergency departments (ED) in the state.

This report was prepared by the National Association of Health Data Organizations (NAHDO) and draws from its work with state health data programs. Since 1986, NAHDO has promoted the uniformity, comparability, and public availability of statewide health care data. Using state-to-state transfer of technical assistance and lessons learned, NAHDO has built a national network or community of practice around the collection and use of hospital discharge data.

Since 2000, NAHDO has identified the promotion of ED data collection as a priority. In 2000, NAHDO collaborated with the National Center for Health Statistics of the Centers for Disease Control and Prevention to design and implement the Emergency Department Internet Query System (EDIQS) to support the dynamic query of the ED component of the National Hospital Ambulatory Medical Care Survey (NHAMCS)³. The EDIQS laid out a framework for states to analyze and disseminate their state ED data and facilitate access to national benchmarks for specific conditions and injuries.

In 2002, NAHDO convened the “Emergency Department Data Conference⁴”, the first national meeting devoted to the collection and use of ED administrative data for market, policy, research, and public health applications. Since then, NAHDO has actively worked to assist states to implement an ED reporting agenda. The lessons learned in states with mature programs which include ED data benefit those states that are in the beginning stages of planning and implementing ED statewide reporting.

³ NAHDO Emergency Department Internet Query System (EDIQS), <http://155.98.221.34/ediq/index1.htm>

⁴ NAHDO Emergency Department Data Conference, Washington D.C., April 2002, page viii, <http://nahdo.org/CS/forums/p/277/324.aspx#324>.

Methodology

States will differ in their approaches to developing an ED reporting system. The approaches have ranged from just expanding their inpatient and other facility reporting requirements to include ED data to implementation of a stakeholder planning and consensus-based process to guide their ED process.

Conduct a series of one-on-one and group key informant telephone interviews and solicit email input from those not participating in calls to identify priority information gaps and needs that ED data could potentially address.

Seek input on ED information needs and issues from key stakeholders in public and local health, trauma registry, hospital association, and military facilities.

Have NAHDO's National Standards Consultant, Robert Davis, conduct a "Listening Session" workshop to facilitate a discussion of ED data collection issues and priority applications of ED data. A copy of an agenda is included in Appendix 1.

Consolidate this information into key questions and issues.

Because data availability and reporting burden are important considerations, NAHDO can cross-walked these information needs to specific data elements to existing national standards or the core Uniform Bill 04 (UB-04).

If the information needs and ED reporting concerns of stakeholders are similar to those in other states, data reporting burden on providers will be a major consideration, along with strategies to fill important information gaps for public health, policy, community assessment, and market planning. Similar issues were raised by states attending NAHDO's 2002 Emergency Department Data Conference in Washington, D.C. Public and private data agencies identified consensus about the following ED reporting issues⁵:

- Balancing user needs with provider reporting capacity is essential;
- Administrative data have limitations, but their value is proven and most attendees affirmed that this is the starting place for statewide EDDCS development;
- Recognize the limitations of ED data and overcome the data gaps by linking data with other relevant data sets;
- Despite the limitations of ED data, the data support policy analysis, market evaluation, and access indicators;

⁵ NAHDO Emergency Department Data Conference, Washington D.C., April 2002, page viii, <http://nahdo.org/CS/forums/p/277/324.aspx#324>

- Assuring the value of the information to providers that supply the data is essential to ongoing support.

In 2008, there is ample evidence that states with ED data systems are filling critical information gaps. Leveraging ED billing data is a way to balance provider reporting burden with the need for system-wide, non-inpatient data. Further, states with ED reporting systems have gained valuable experience that can guide the planning and implementation process in states embarking on ED data collection in the future. The states' experiences are discussed in a later section in this report.

ED data, like any data set collected across providers, present technical challenges and have limitations. However, these challenges and limitations can be addressed so that the value of the data exceeds the cost to collect, as we have seen in many states. This report highlights the common technical issues and related solutions to advance statewide implementation of ED reporting.

Key Emergency Department Business Requirements

Key stakeholders of ED data include the providers, public health and other government agencies, researchers, purchasers, consumers, and the public. This section summarizes the business requirements for key stakeholders of ED data, including the data providers and users (facilities, including military) and data aggregators (e.g., departments of health, IT services, state hospital associations, departments of social and health services, state epidemiologists).

Process for Gathering Information

Identify key stakeholders (NAHDO has done this for some states in preliminary discussions between NAHDO staff and state staff). Employ multiple strategies, including telephone conferences, focused individual telephone calls, e-mail correspondence, and an in-person meeting, to gather information on the potential uses of emergency department data. These key business requirements are documented below.

Synthesis of Key Business Requirements

This section first describes nine general categories of applications for statewide ED data collections. Second, the expected benefits by general stakeholder groups are described. Next, there is a brief discussion of ED data strengths and limitations.. These business requirements are synthesized and described in a set of 19 categories of information, which are representative of how a proposed State Emergency Department Data Collection System (EDDCS) could be used.

Summary of Results

All ED stakeholders, including hospitals, will benefit from a comparable source of ED data from all providers statewide. Despite the limitations of ED data, there are many documented uses of statewide ED data supporting a wide range of applications. An ED reporting system would not replace existing trauma and syndromic surveillance activities, but would enhance these data systems with broad population-based information. While there are many cross-cutting issues or common issues, such as ED overcrowding, each stakeholder group has priority information needs—needs which ED data applications could potentially address. These are shown in Table 1.

Major Applications of ED Data

Based on information from the NAHDO Emergency Department Data Conference in 2002, and in NAHDO's experiences in working with other states to implement ED data collection, analysis, and presentation activities, we have identified the major applications for statewide ED data. Statewide ED data are useful for population-based and market studies. The large numbers of observations or events that discharge data represent provide statistical power to epidemiologic studies on morbidity and hospital use at the state, community, and hospital service-area levels. Because statewide hospital discharge data are based on national billing standards, they are comparable across states and providers. Uses of ED reporting in states can be categorized into the following nine applications.

1. Community Health Assessment

ED data provide a glimpse into the health care delivery system, revealing information about how certain populations enter the health care system and for which conditions. A growing number of states are using ED data to study primary care sensitive ED use, with ED serving as a proxy for assessing access to primary care (Utah Department of Health report⁶). Other community assessment applications include analysis for charges related to trauma cases, injury prevention initiatives, and mental health related ED visits. Some states, like South Carolina, use their ED data to evaluate the effectiveness and impact of public programs, by documenting reduced ED visits for target populations. The ED data permit the identification of high risk groups and neighborhoods that have high emergency department visit rates, distributed by age, race/ethnicity, sex, payment source, residence address including zip and county codes, all helpful when assessing community initiatives.

2. Health Policy and Planning

EDs are increasingly functioning as safety nets for vulnerable populations and for those with limited access to primary care or clinics, where illnesses and injuries could be treated more cost-effectively. Analyzing ED data provides a window into the functioning of our health care delivery system and informs planning decisions. ED overcrowding, hospital diversions, hospital closures, and ED wait times are issues brought to the forefront in three IOM reports.⁷

Health planners are interested in the number of ED beds available in the state for emergency triage and whether there are enough ED beds for normal use, including seasonal variation. The distance residents must travel for ED care in general and for special conditions, such as mental health conditions, can shed light on regional gaps in care. Trends in high ED use for special populations can illuminate the need for programs or policies to reduce or prevent future ED use.

3. Injury Surveillance and Traffic Safety

One of the most common applications of ED data is related to injury surveillance and prevention, including the linkage of ED data with motor vehicle crash and death data. ED data enable public health to understand the incidence and risk factors for injury in the state and sub-state areas as well as vulnerable populations such as children. ED data help shape policies to reduce injuries and to evaluate the effectiveness of injury prevention programs and materials.

The National Highway Traffic and Safety Administration (NHTSA) funds over 30 state Crash Outcome Data and Evaluation System (CODES) to link existing data sets, including ED data in states where it is available. By linking statewide population-based crash data to injury data, data quality improves and states benefit from state-specific injury and financial outcome information about motor vehicle crashes⁸. CODES funding provides resources to build capacity in states to institutionalize data linkage and establish local collaborations. When linked with other data sets,

⁶ Utah Health Status Update: Primary Care Sensitive Emergency Department Visits. Accessed at health.utah.gov/opha/publications/hsu/0406_ED_Visits.pdf, February 6, 2008.

⁷ Institute of Medicine: <http://www.iom.edu/Object.File/Master/35/014/Emergency%20Care.pdf>

⁸ Cook, L. J., Knight, S., Olson, L. M., et al. (2000). Motor vehicle crash characteristics and medical outcomes among older drivers in Utah, 1992-1995. *Annals of Emergency Medicine* 35(6):585-91.

such as motor vehicle (driver, vehicle, and crash characteristics), ED data provide information about the episode of care and outcomes related to motor vehicle accidents, including the cost of vehicle injuries to payers, including Medicaid, and identify the risk factors amenable to additional public safety policies.

4. Quality Improvement

Providers use ED data to measure baseline and trend utilization and outcomes and identify priorities for internal and external quality improvement activities. Patient wait times (time from admission to treatment), triage, stabilization, and transfers across hospitals, including rural hospitals, is key to understanding how to improve systems of care within and across the system.

5. Purchasing

Purchasers are seeking information to reduce overall costs, and reducing ED utilization can yield savings. ED use for preventable conditions that could be treated for less cost in an outpatient setting adds unnecessary costs, and the first step to reducing these visits is to analyze ED data. Comparing the ED use of specific populations (by age, gender, payer, geographic area) and comparing these trends with state and national norms for ED use, purchasers can begin to identify the variation, including ED care for specific chronic conditions such as diabetes or asthma. ED data can also illuminate potential duplications of services and appropriateness of care across providers and Medicaid can compare its enrolled population's use of the ED (including dual-eligibles) to that of commercially-insured patients.

6. Market and Strategic Planning

Providers benefit from statewide ED data and use the data for patient origin and destination studies and compare their patient mix with peer hospitals. Understanding the market of the ED helps the hospital design systems that address the priority needs of the community they serve and target outreach activities. Do patients who enter Inpatient via ED have longer inpatient stays? Do they have more or less procedures? Are they medical or surgical patients? How many enter with iatrogenic infections? Providers use ED data to analyze the correlation between patient discharge disposition (such as home, nursing home, left against medical advice), inpatient admissions, and the potential financial implications of the emergency department visit to assess health outcomes and identify the distribution of patients in payer groups, the uninsured, and the homeless to detect differences in usage and costs for emergency department services for these various populations. The Washington State Hospital Association commented during a telephone interview that they would likely use ED data to look at market share. The purpose for this use of the data would be to identify anomalies in care. Such use of the data would help evaluate if the appropriate level of care was being sought and delivered. Unexpected patterns of utilizations could be evaluated for appropriate future actions.

7. Population Health

ED data can be used to inform studies of the population's overall health status at different points in time. It can also provide information on patterns of ED use by certain sub-groups within the population or by geographic area. It can track environmental or health policy changes and their impact on the population as a whole or specific sub-parts. It can also estimate the impact on lives lost or saved by policy interventions related to access to care.

8. Consumer Information

Given the “emergent” status for many patients in the ED, generally there is little choice involved. However, for those patients without a medical home, without insurance, or with high deductibles, they may be able to select an ED based on the general information regarding utilization, payer source, and charges. Those individuals without insurance or with high deductibles may look at the charges for care and determine that a specific ED is more affordable for their care.

9. Data Linkage

The CODES projects mentioned earlier link ED data with a range of other statewide data sets, to measure the cost and outcomes of various motor vehicle crash episodes and identify opportunities to improve preventive policies, such as seatbelt use or graduated licenses for adolescents. States with ED data have been linking ED data with other data sets to fill information gaps, leveraging existing data. Examples of established linkages between ED data and other data sets include the following:

- Analysis of trauma cases and charges for trauma
- Mental health clinic enrollees with ED visits
- ED and environmental data (air quality, water quality) to research correlations between ED use for asthma or gastro-intestinal conditions and environmental factors (e.g., ascertain impact of sewage spill on the population in the affected area).
- Under the CDC’s Environmental Public Health Tracking Program, there is a growing interest in analyzing the relationship between an increase in emergency room visits during increases in air pollution from air stagnation, wildfires, or increased ozone levels and in pediatric asthma around traffic corridors. Interestingly, enough the “red flag” of increased emergency room visits in a particular region in a particular time period may help identify the air pollution event.
- ED/hospital discharge administrative data, linked to death certificate information, could provide an opportunity for data analysis to address “unsuspected” cases of an outbreak in the population, e.g., deaths resulting from *Cryptosporidium* in the water supply.

Summary of Expected Benefits by Stakeholders

Key stakeholders in ED data include providers (the data suppliers), purchasers (Medicaid and commercial), government agencies and policy makers, researchers, and the general public (or consumers). Each of these stakeholders have priority needs. The vertical axis of Table 1 below identifies the possible uses for emergency department data by the prospective stakeholders identified in the horizontal axis. The UB-04 data elements would provide valuable evidence or raise pertinent screens or “red flags” for each of the uses outlined below for each of the stakeholders.

Table 1. Summary of Key Expected Benefits for Major Stakeholders (based on stakeholder surveys in Washington State)

Benefits / Applications	Providers	Purchasers	Government/Policy	Research / Academic	Consumers and Public
Community Assessment	Need for specific services		Health care access, priority health needs	Population studies, disparities	
Health Policy and Planning	Patient origin-destination, patient mix	Benefit design	Mental health needs, travel distance for ED use		
Injury Surveillance	Trauma utilization		Prevention and program evaluation, policies to reduce risk	Disparities	Prevention
Quality Improvement, including utilization review reports.		Identify efficient providers, priorities for case management	Stimulation of measurement initiatives	Outcomes studies/research	Comparative performance reports
Purchasing		Duplication of services, appropriateness of care	Medicaid use of ED relative to commercial payer patients		
Market and Strategic Planning	Bed capacity, utilization studies				
Population Health			Environmental impact to health	Grant submission	
Consumer	Community assessment, outreach				
Linkages		Re-admissions and duplication of services	Outcomes and disparities in care	Link across traffic, MVA, hospital, ED, vital statistics data to identify risks (CODES)	

Military hospitals and the Veterans Administration Medical Centers (VA) serve important populations, but are exempt from state hospital reporting policies. Some states have approached the military facilities and VA hospitals to request voluntarily provided data, with mixed success. In NAHDO’s conversations with military facilities in the state of Washington, the utility of statewide ED data was acknowledged as it would permit comparing the individual facility’s case mix with that of the state as a whole; however, data reporting was not likely to happen without centralized approval from the Department of Defense. Apparently, this approval would be

necessary before the voluntary exchange of data could occur. We were not able to identify additional specific questions relative to ED reporting that could be answered by the system.

ED Data Strengths and Limitations

It is evident that statewide ED data have many strengths, including the relative uniformity of the data across providers and states. Because they are derived from national billing standards, most providers are able to report the data without undue burden. There are limitations to ED data, however, as there are with any data set, and agencies collecting, analyzing, and disseminating the data need to understand these limitations. Perhaps the greatest limitation of the data is that they lack clinical detail, because they are designed for billing and administrative functions, not clinical decision making. Coding practices vary across providers, with External Cause of Injury Coding (E-codes) and procedure coding practices varying the most across providers. Finally, because the data are coded after the patient is discharged, coded data are not as timely as some would prefer. These limitations do not outweigh ED data benefits however, and, with use, the quality of the data tends to improve over time.

Despite the limitations, the ED data are considered an essential data set in states that have established ED reporting. As ED data reporting expands across states, its utility can be expected to increase. Despite the limitations of ED data, there are many documented uses of statewide ED data supporting a wide range of applications. Table 2 summarizes these strengths and weaknesses.

Table 2. Strengths and Weaknesses of Hospital ED Discharge Data

Strengths	Weaknesses
Full census—all discharges from acute care hospitals.	Clinical data, such as laboratory results and pathophysiologic information, are not included
National standards increase consistency of data across hospitals	Discharge data lack timeliness due to coding, reporting, and validation of data
Large number of cases or observations from all acute care hospitals serving a population, providing estimates closer to current incidence of disease	Coding practices may vary across providers, especially procedure and External Cause of Injury Coding
Cost-effective to collect when compared to surveys and medical records abstraction	Does not directly measure the occurrence of an illness, but the type of treatment
Can be linked to other data sets or enhanced with clinical data to augment information	Migration of patients across state boundaries, requiring data sharing agreements between states
Provides baseline and trend information on health care cost, quality, and access	

Likely State Key Business Requirements

The following are 19 likely key business requirements.

- 1) Review emergency department visit by diagnosis and/or e-codes to identify patterns of care including, but not limited to, injury (traumatic brain injury and auto accident) and disease classes (asthma, cardiac, and stroke).

It should be noted that this would apply to any disease identified as an ICD-9-CM code. In particular this would apply to needs such as:

- respiratory diseases (e.g. chronic obstructive pulmonary diseases, bronchitis, emphysema, pneumonia and any other related condition);
- cardiovascular diseases (e.g. ischemic stroke, hemorrhagic stroke, congestive heart failure, angina, and any other heart conditions);
- incidence of carbon monoxide poisoning;
- incidence of skin and soft tissue infections possibly related to MRSA;
- tracking infectious diseases;
- incidence of diabetes;
- incidence of psychiatric disorders.

There may be interest in analyzing the relationship between an increase in emergency room visits when there are increases in air pollution from, amongst sources such as air stagnation, wildfires, or increased ozone levels. Interestingly enough, the “red flag” of increased emergency room visits in a particular region in a particular time period may help identify the air pollution event.

There may also be interest in tracking infectious diseases related to injection drug use related visits, either infections or abscesses, and drug overdoses. This would include information on the volume and type of prescribed drugs which could be abused (e.g. opiates and benzodiazepines by visit). This information would be supported on a UB-04 to the extent that the drugs administered are reported either with an HCPCS / CPT4 drug code or a National Drug Code (NDC).

The latency of the data will not allow for identification of events as they happen, only analysis after the fact.

- 2) Identify patients and high risk groups receiving emergency department services, distributed by age, race/ethnicity, sex, payment source. This would also include disease or injury specific groupings.

Of particular interest may be emergency department services provided to women’s health issues. This would include:

- *Identify women who have been pregnant in the last year;*

- *Identify services provided to reproductive age women related to reproductive health issues (e.g., UTIs, STDs, or pregnancy problems);*
- *Identify services related to pregnancy related problems (e.g. hemorrhage, associated strokes, deep vein thrombosis);*
- *Identify services to pregnant women seemingly not related to the pregnancy (e.g., traffic accidents, domestic violence, or suicide attempts).*

It is not clear that the data could be used to consistently identify women who have been pregnant in the past year.

- 3) Identify seasonal deviations and other patterns of change over time for emergency department utilization. This would also include disease or injury specific groupings.
- 4) Identify high risk groups and neighborhoods that have high emergency department visit rates, distributed by age, race/ethnicity, sex, payment source, residence address including zip and county codes. This would also include disease or injury specific groupings.
- 5) Identify the co-morbid conditions that impact outcomes of care including but not limited to injury or disease classes (asthma, HIV/Aids, rape/sexual assault, heart attack, and stroke).

The data might not allow identification of conditions that impact outcomes of care.

- 6) Identify the distribution and potential financial implications of services provided to emergency department patients, including medication administration, ancillary services, and procedures that were administered or performed during the visit.

Note: For all the services identified in Key Business Requirement 6, the data would provide charge information for the services performed in the emergency room as well as for any subsequent inpatient services. It is important to note that because of the HIPAA legislation HCPCS / CPT4 procedure codes are mandated for all outpatient services, including services provided in a hospital emergency department.

The proposed dataset can be useful in identifying the distribution of services, but cannot be used to analyze costs of services. (This would not preclude analyzing charges, which has some limitations.)

- 7) Track patterns of care for emergency department visits distributed across geographic regions of the state over time and by hospital type. This would also include frequencies of emergency room visits along with reasons for emergency room visits over time by age (children and adults), gender, race, primary language and type of existing genetic condition, as identified by ICD-9-CM diagnosis codes.

This Key Business Requirement is intended to raise a red flag about potential disparities of care based on gender, race, or age.

The UB-04 standard does not yet support the reporting of primary language, but maintenance of existing standards is in progress to support the reporting of this data element in the future.

In addition to the caveat about primary language noted above, there are questions as to whether the dataset will allow identification of existing genetic conditions.

- 8) Identify discharges by point of origin for emergency department visits. This could assist in understanding the geographic market distribution of ED visits. This would assist in understanding access issues as well as hospital market share issues. Proximity to, for example, ski hills, extreme sports centers, highways, and dangerous industry can impact market share in areas that are otherwise considered remote or with small populations.
- 9) Track the location of injury episode and exposure resulting in an emergency department visit as well as the point of origin for emergency department services.

The question of how the patient arrived at the emergency department (EMS, drove self, driven by other, walk-in, etc.) can be answered with standard UB data elements to the extent supported with ICD-9-CM external cause of injury (E-codes) codes. Further specificity beyond the capabilities of ICD-9-CM coding would require additional abstracting.

To respond to this category would require that the coded injury data be linked with information collected by a state as part of its Crash Outcome Data Evaluation System (CODES).

- 10) Track emergency department visits that lead to an inpatient admission or subsequent readmissions for emergency or inpatient services.

It should be noted that this question would address readmissions for asthma. Analysis to relate air quality with asthma would be possible depending on robustness of the linkage key in air quality and emergency department databases.

Some rural emergency departments may be doing a “drip and ship” model where they administer the drug then transfer the patient to a hospital with an ICU and equipped to provide the follow-up care needed. It is reasonable to assume that the rural emergency department and the hospital intensive care unit would have a record of services provided

to this patient. This example highlights the importance of being able to link episodes of care from different providers (by using a unique patient ID) to get a complete picture of the services provided patients.

- 11) Track emergency department visits for treatment of exposure to hazardous substances and cases of infectious diseases to identify infectious disease outbreaks, bio-terrorism, environmental exposures, or occupational situations, and to develop an appropriate public health response.

- 12) Identify the physician specialties treating patients in the emergency department to assess the utilization patterns by diagnosis.

This would include any type of provider consultation (internist, endocrinologist, psychiatrist, genetic counselor, etc.) received during emergency room visit, by age, gender, and type of genetic condition. It may require linkage to state physician licenses or other physician directory information.

The UB-04 data specifications support the reporting of an attending provider, an operating physician, an “other” operating physician, a referring provider, and a rendering provider. It is likely that a patient’s primary care physician would be the referring provider. In those cases, it would be possible from a UB based emergency department data collection system to identify a patient’s primary care physician, if not the patient’s “medical home.”

- 13) Identify emergency department services associated with billed charges that can be forecast over time for such categories as patient characteristics, principal diagnosis, procedure codes, and discharge diagnosis.

Outliers with the UB revenue data can raise a red flag as to potential areas for future cost saving for the hospitals.

- 14) Compare the patient’s reason for the emergency department visit with discharge diagnosis to more accurately forecast the potential financial impact of administering the necessary services.

- 15) Identify other contributing factors (e.g. severity, secondary complications, specialist referral, etc.) impacting the potential financial implications for emergency department visits.

- 16) Analyze the composition and amount of resources consumed for emergency department visits to compare or raise a red flag about potential patient care issues as well as potential financial implications of that care.

- 17) Examine the volume and billed charges of emergency department service across populations and geographic regions to evaluate utilization patterns.

This would provide the necessary information to determine differences in utilization bases on patient demographics.

- 18) Analyze the correlation between patient discharge disposition (such as home, nursing home, left against medical advice), inpatient admissions and the potential financial implications of the emergency department visit to assess health outcomes.

This would address a concern about knowing where the patient was “discharged” to (inpatient admission, home, extended care, or other) by the emergency department; could examine whether this was impacted by gender and type of existing genetic condition.

- 19) Identify the distribution of patients in payer groups, the uninsured, and the homeless to detect differences in usage and costs for emergency department services for these various populations.

This addresses the need to identify the type of health insurance coverage of patients who received services at the emergency room by type of genetic condition as well as any differences in the amount of resources consumed by payer source. In particular, this would include information about the lack of coverage, or inadequate coverage, for children.

This question would provide the necessary information to determine differences in utilization based on payer category.

There are important additional information needs, such as syndromic surveillance and continuous quality improvement studies, that extend beyond the existing national standard for an ED encounter. We have included some additional questions (20-24) below that would require manual abstraction of information from the medical record, as the data are not included in the standard UB-04 data elements. As such, this would require significant additional resources on the part of data suppliers. The following questions are important priority issues for future consideration if the data become more readily available either in electronic medical records or in the UB.

- 20) How much time passed from onset of symptoms to arrival and treatment?

If a date and time stamp for onset of symptoms, time of arrival, and time of treatment are provided, then answers to such questions as how much time passed between arrival and treatment could be derived. The UB-04 supports an admission / start of care date and hour along with a discharge date and hour. The standard UB-04 information is typically not complete enough to adequately answer this question.

- 21) Can the ED data fill gaps in baseline data for existing, or provide baseline for new, syndromic surveillance systems? (Hospital ID, time seen, date seen, patient zip code, age, gender, chief complaint, discharge diagnosis, disposition, medical record number)

An emergency department reporting system based on the UB-04 would provide baseline data for a surveillance system that would include the hospital ID, date seen, patient zip code, birth date (the age would be derived from that data), gender, discharge diagnosis, disposition, and medical record number.

The Patient's Reason for Visit on the UB-04 is an ICD-9-CM coded diagnosis code that would be the doctor's interpretation of the patient's chief complaint. Typically in syndromic systems the chief complaint is narrative text from the patient on why emergency department services were needed. The Patient's Reason for Visit and the Chief Complaint are not exactly equivalent, but theoretically should map well to each other.

The UB-04 data elements support a time (hour) when the patient is admitted and a time (hour) when a patient is discharged. These two concepts do not map well to the time seen concept. This would require additional abstracting to include this information in the database.

- 22) Are providers following CDC guidelines for routine HIV testing in the emergency room?

To determine whether providers are testing for HIV or not according to CDC guidelines would require integrating the UB-04 discharge data and the laboratory systems. That is the new frontier for future enhancements to state reporting systems. The development of the electronic health record (EHR) laboratory tests use case is the first national standards effort designed to answer this question. No standard solution for integrating the UB-04 discharge and the laboratory systems has emerged yet. (However, there is evidence that it is more cost effective to use electronic lab elements than to abstract additional clinical elements.)

- 23) Are providers testing for HIV during STD checks?

The UB-04 data elements can identify (through the use of coded ICD-9-CM codes) only patients with an HIV diagnosis. To determine whether providers are testing for HIV or not would require integrating the UB-04 discharge and the laboratory systems. That is the new frontier for future enhancements to state reporting systems. The development of the electronic health record (EHR) laboratory tests use case is the first national standards effort designed to answer this question. No standard solution for integrating the UB-04 discharge and the laboratory systems has emerged yet.

- 24) Are providers reporting conditions requiring notification (cross reference notifiable conditions with known reports)?

This question is out of the scope of a typical state discharge data reporting system.

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Patients with notifiable conditions would be identified by the ICD-9-CM diagnosis code, but whether the provider did the necessary reporting of such conditions could not be determined from a UB-04 based reporting system without manual linking of reporting information to a specific ED record.

Next, we discuss and then provide a crosswalk of the above Key Business Requirements with the UB-04 data standards which serve as the basis of ED reporting in other states. As this table demonstrates, the core UB-04 data elements can provide a great deal of information relevant to the majority of the Key Business Requirements. In other states with UB-based ED systems the UB data elements are very effective for raising “red flags” about areas of concern, including potential treatment and health policy issues.

UB-04 additional data elements, such as Race and Ethnicity and the Do Not Resuscitate Order, were added to the UB for the sole purpose of meeting state reporting requirements. The UB-04 now officially supports data necessary for institutional claims as well as state reporting purposes. This is a significant change in purpose. The electronic format designed to transmit the UB content is the ANSI ASC X12 837 institutional implementation guide. This standard implementation guide is mandated by HIPAA for institutional claiming purposes. This is significant because the ANSI ASC X12 837 institutional implementation guide was approved as a national standard by the ANSI consensus process as well as by the federal rule making process. For state reporting there is a companion ANSI ASC X12 approved implementation guide, the Health Care Service Data Reporting Guide (HCSDRG). Substantial efforts were focused on aligning the common data elements from the Institutional HIPAA Claim and the Health Care Services Data Reporting implementation guides.

In Table 3 below, the numbered columns across the top of this matrix correspond to the 19 Key Business Requirements; these requirements could be addressed through UB-04 data elements within the ED data system (noted in rows). For each data element addressing a key business requirement (numbered columns) there will be an (X) in the row. As experienced in New York State (NYS), maintaining alignment over time between the ED and the existing discharge data system requires tweaks to the existing inpatient system. The approach taken in NYS as well as other states is that such changes to the existing inpatient discharge system could be phased in over time. This phased-in alignment of the ED system with the existing inpatient system did not adversely impact the value of either the new ED system or the existing inpatient system.

Table 3. Emergency Department Data Elements Needed to Support Key Business Requirements

	Would the Key Business Requirement (1-19) require the data element? (X indicates the element would be needed to provide the required information)																		
UB-04 ELEMENTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
<i>PROVIDER / SUBMITTER INFORMATION</i>																			
Hospital Identification Number	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Processing Date	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Submitter Name	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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Table 3. Emergency Department Data Elements Needed to Support Key Business Requirements

	Would the Key Business Requirement (1-19) require the data element? (X indicates the element would be needed to provide the required information)																		
UB-04 ELEMENTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Type of Bill	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>IDENTIFIERS</i>																			
Unique Personal Identifier							X		X	X	X								
Patient's Control Number	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Medical Record Number	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>DEMOGRAPHIC INFORMATION</i>																			
Patient's Residence Address Line 1				X			X		X		X						X		
Patient's Residence Address Line 2				X			X		X		X						X		
Patient's City				X			X		X		X						X		
Patient's State				X			X		X		X						X		
Patient's Postal Service Zip Code and Ext. Code				X			X		X		X						X		
Patient's County Code				X			X		X		X						X		
Patient's Birth Date		X		X						X	X								
Patient's Ethnicity		X		X							X								
Patient's Race		X		X							X								
Patient's Sex		X		X							X								
<i>SERVICE INFORMATION</i>																			
Admission Date/Start of Care	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Admission Hour	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Type of Admission																			
Source of Admission								X	X										
Statement Covers Period - From Date	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Statement Covers Period – Through Date	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Discharge Hour	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Patient Disposition Status	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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Table 3. Emergency Department Data Elements Needed to Support Key Business Requirements

	Would the Key Business Requirement (1-19) require the data element? (X indicates the element would be needed to provide the required information)																		
UB-04 ELEMENTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
<i>DIAGNOSIS INFORMATION</i>																			
Admitting Diagnosis/Patient's Reason for Visit	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Principal Diagnosis Code	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Other Diagnosis Code 1-14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
External Cause-of-Injury Code	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Place-of-Injury Code	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>PROCEDURE INFORMATION</i>																			
Principal Procedure Code	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Principal Procedure Date	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Other Procedure Code 1-14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Other Procedure Date 1-14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Procedure Code - CPT-4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Procedure Coding Method	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>CHARGE INFORMATION</i>																			
Ancillary Revenue Code	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ancillary Total Charges						X					X		X	X	X	X	X	X	X
Ancillary Total Non-Covered Charges						X					X		X	X	X	X	X	X	X
<i>CLAIM INFORMATION</i>																			
Condition Information - Homeless Patients																			X
Occurrence Info. - Accident Related Codes and Dates	X		X		X														
Value Info. – Accident Hour	X		X		X														
<i>PAYER INFORMATION</i>																			
Source of Payment		X		X							X								X
Payer Identification		X		X															X
Provider Identification		X		X															X

Table 3. Emergency Department Data Elements Needed to Support Key Business Requirements

		Would the Key Business Requirement (1-19) require the data element? (X indicates the element would be needed to provide the required information)																		
UB-04 ELEMENTS		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
<i>PHYSICIAN INFORMATION</i>																				
Attending Physician Identifier													X			X				
Operating Physician Identifier													X			X				
Other Physician State Identifier													X			X				

Information needs requiring detailed clinical data and certain patient demographic information not captured by the billing system require additional data, either abstracted from the medical record or linked with other data sources, such as laboratory systems, vital statistics, etc. In an analysis done by a purchasing coalition, the cost of manual abstraction to a hospital is significant. Assuming that the retrieval of the medical record may take 86 minutes for a cost of \$26.00 per record, the abstraction may take 15 minutes at \$7.00, there is a total of 101 minutes to pull information from the patient record for a cost of \$33.00 per record. If the sample size is 100, the costs to the hospital are \$3,300 for one clinical data element or measure. If the cost of medical record preparation is factored in, the actual cost could triple to almost \$10,000 (see Table 4 below). Of course, costs would vary depending on the type of data element or clinical measure that is abstracted, but any manual abstraction is a costly endeavor.

Table 4. Clinical Data Element/Measure Abstraction Cost Estimates

Per Record Abstraction	Minutes	Cost	Minutes	Cost
Medical record preparation	---	---	143	\$66
Record retrieval	86	\$26	86	\$26
Abstraction	15	\$7	15	\$7
Total	101	\$33	244	\$99
Total for 100 cases/records	10,100	\$3,300	24,400	\$9,900

General Design and System Model

Standardization of data elements

Health data organizations that maintain statewide health data programs have proven that leveraging existing data flows from hospital automated billing systems is a cost-effective way to gather detailed data on hospital utilization. The de-facto national standard for state reporting systems is the UB data maintained by the National Uniform Billing Committee (NUBC). The UB-04 is the current version, which replaced the UB-92 in May 2007.

Assess feasibility of including electronic lab values to allow for severity adjustment

As of December 2008, a growing number of states were collecting the data in UB-04 format and were also including the Present on Admission (POA) indicator, following the lead of CMS and its requirement that providers report POA for Medicare reimbursement (effective October 1, 2007). It is important to note that the UB has been used historically for multiple purposes, most notably for institutional claims and state reporting. Over time, additions of diagnosis and procedure codes, external cause of injury codes, and most recently (in the UB-04) the present on admission indicator to the standard data elements were recommended by the National Committee on Vital and Health Statistics as necessary for state discharge systems. Gradually these elements have been added to the billing form and adopted by payers for both billing purposes and for additional analyses related to patient use of care.

Identify key variables for hospital decision support

A state emergency department data collection system would be useful for decision support related to utilization and market share analysis. The addition of ED data will provide additional value to hospitals. Critical to market share analysis is the address or zip code of the patient. Without these variables, hospitals could not use the data for market share analysis or conduct studies using important indices, such as the Hirschman Herfindal index (HHI), which measures the degree of market penetration.

Identify core dataset for end users

Many states, along with the federal government, make record-level de-identified data sets available to authorized users, governed by a data use agreement prescribing the uses and re-release of the ED data set. These public use data sets are designed to provide general healthcare information to a wide spectrum of users with appropriate, but minimal, controls. These data sets provide valuable information for public health illness/injury assessments and utilization studies. Considerable efforts are taken to ensure that individual patients cannot be identified from these data sets. The patient's age, diagnosis codes, and payers are grouped and several data elements are encrypted under specific conditions.

NAHDO monitors state ED data development initiatives, including reports and websites, and updates the inventory of information periodically. The NAHDO Interactive State ED Systems Map indicates which states have implemented statewide Emergency Department systems. In 2006, each health data agency was contacted by NAHDO to verify and update information about their ED system, including the date ED data was first collected, links to statutes and rules, links to technical documentation, and, finally, links to ED reports and query systems. Twenty-five

health data agencies were invited to complete a brief NAHDO inventory, with telephone follow-up by NAHDO.

Over 20 state responses have been compiled into information on this website at <http://www.nahdo.org/eddatatoolkit.aspx>

Many states also release identifiable data for bona fide research, as governed by their legal authority, with the proper restrictions and authorization. These research data sets are tightly controlled by the agencies.

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State health data agencies are challenged to produce timely, relevant measures for quality and market information, community assessment and CDC's 2010 goals, child health and vulnerable populations. As ED administrative data evolve as a source for morbidity and health systems performance data, the analytic infrastructure is often under-developed. The Agency for Healthcare Research and Quality (AHRQ), through its Healthcare Cost and Utilization Project (HCUP), collects statewide ED data from 25 states and makes the data available in several products, including the State Emergency Department Databases (SEDD). The SEDD contain more than 100 clinical and non-clinical variables included in a hospital discharge abstract, such as:

- All-listed diagnoses (e.g., Otitis Media, viral infection, chest pain, superficial injury)
- All-listed procedures (e.g., suture of skin, traction, splints)
- Patient demographics (e.g., gender, age, and, for some states, race)
- Expected payment source (e.g., Medicare, Medicaid, private insurance, self-pay; for some states, additional discrete payer categories, such as managed care)
- Total charges for the discharge
- Hospital identifiers that permit linkage to inpatient hospital databases, such as the AHRQ-sponsored State Inpatient Databases (SID), and to the American Hospital Association Annual Survey File

The State of California's Office of Statewide Health Planning and Development (OSHPD) recently expanded its inpatient reporting to include outpatient encounters, including Emergency Department visits. The data are edited and packaged into a variety of reports and products for public consumption:

Emergency Department and Ambulatory Surgery Data in California

Encounters: An outpatient encounter record is submitted each time a patient is treated in a licensed emergency department or ambulatory surgery center in California. These facilities report their encounter data via the [Medical Information Reporting for California System \(MIRCal\)](#). The reported data include patient demographic information, such as age, sex, county of residence, and race/ethnicity, diagnostic information, treatment information, disposition, and expected source of payment.

Public Data Set: The Public Sets on CD were developed using a technique that masks values for certain demographic data elements in unique patient records. The masking of selected demographic data elements occurs in a predetermined order. The emergency department (ED) and ambulatory surgery center (AS) data is available separately for visits occurring in each six month period, beginning January 2005. Due to their size, the *Public Sets* are available for purchase on CD-Rom only. [Documentation](#) (pdf) accompanies the datasets and is also provided here for viewing prior to purchase. To purchase a public dataset(s), complete the [Patient Level Data Request and Data Use Agreement Form](#) and fax the form to the Healthcare Information Resource Center (HIRC) at (916) 324-9242 or phone (916) 322-2814 for more information.

OSHPD makes a series of ED reports available online or in various downloadable formats:

Emergency Department (ED) Encounters – A listing, by hospital, of the number of ED encounters: includes both ED encounters and admissions through the ED.

Emergency Department (ED) – Top Ten Causes of Injury - A statewide listing of the top ten principal external cause of injury codes reported by Emergency Departments. This data is only from ED encounters that did not result in a hospital admission.

Emergency Department (ED) – Top Ten Diagnoses and Diagnoses Groups - A statewide listing of the top ten principal diagnosis codes reported by Emergency Departments. Also included is a statewide listing of the principal diagnoses groups (based on ICD-9-CM codebook chapters). This data is only from ED encounters that did not result in a hospital admission.

- For some States, *hospital* county identifiers that permit linkage to the Area Resource File⁹.

Describe the integration of these additional data elements into the 837 Institutional / Health Care Service Data Reporting Guide format

The current version (4010A1) of the 837 Institutional Guide is currently a HIPAA mandate for payment of all inpatient institutional claims. The Health Care Service Data Reporting Guide is a sister 837 Institutional Guide designed specifically for state reporting purposes.

The UB-04 contains a large number of data elements, not all of which are necessary for state health data programs. However, there are some data elements that state systems may find beneficial:

- Medical Record Number (For tracking patient records within an institution, and for locating mothers and infants—both records contain mother’s medical record number)
- Condition Codes (This is where Do Not Resuscitate (DNR) is located on UB)
- Value Codes (This is where newborn birth weight is located on UB)
- Occurrence Codes (This is where accident dates are located on UB)
- Occurrence Span Codes (This is where leave of absence dates are located on UB)
- Present on Admission Indicators (for all External Cause of Injury Codes, principle and secondary diagnoses)
- The UB and the 837 now break out Other Providers into Other Operating Physician, Rendering Provider, and Referring Provider.
- Address Lines, City, or State

Medical Record Number is very useful in identifying duplicate claims as well as assisting hospitals in locating the patient’s chart for edits and other requests. Value codes—available in the ICD-9-CM coding—include newborn birth weight and gestation, both are very useful to epidemiologists scanning large volumes of records for VLBW infants.

Describe mechanisms for transfer and storage of data

It has been the experience in other states that have augmented their inpatient data collection systems with either ambulatory surgery or emergency department outpatient data that the current mechanisms for transfer and storage of data can be utilized. Because of the increased volume of

⁹ AHRQ HCUP SEDD, “Overview of State Emergency Department Databases”, <http://www.hcup-us.ahrq.gov/seddoverview.jsp#Data>, accessed February 5, 2008.

data associated with outpatient data collection, it is necessary to assess and thoroughly stress test the transfer mechanisms to determine what additional band width might be necessary to process the additional data without overstressing the current system. It is likely that the current data storage systems will need to be upgraded to handle the additional volume of data expected to be received and used as a result of emergency department data collection.

It should be noted that one of the purposes/benefits of a pilot study would be to assess the infrastructure needs given the expected increases in volume. Discussions should be held between NAHDO and State staff members to relay the experience of other states—especially focusing on issues and solutions to additional load—to assure problems are resolved prior to statewide implementation.

Costs to Hospitals and to the State Department of Health

This section will estimate costs for design, development, and implementation efforts by hospitals.

Hospital Burden

In terms of hospital burden, one can expect that hospitals will have some upfront costs associated with submitting data via a secure server to the data agency. Much of the upfront cost will be incurred for programming and is somewhat dependent upon the complexity of the hospital's HIT infrastructure. If there are significant changes to the data elements (that is, they vary from the standard claim), in-house programming costs for designing the system and hospital abstraction and file loading costs will increase. Abstraction of clinical data elements may require either a medical records professional or RN, depending on the level of clinical detail requested. The least costly method is to require submission of standard claim data elements; however, as discussed above, it may be important to add several additional clinical and demographic data elements to meet the needs of public health and health policy stakeholders. Changes in the data elements submitted over time will also require re-programming; therefore, we strongly recommend that the program define, in advance, data elements to be phased in so that hospitals have time to prepare for these changes and can plan budgets accordingly.

ED Data Needs

In many cases, we just had to struggle with the tradeoffs between existing data and DEEDS. That was one of the hard things for our public health folks, too, because we couldn't get in all the data elements that we wanted for surveillance activities. So, sometimes you have to say no.

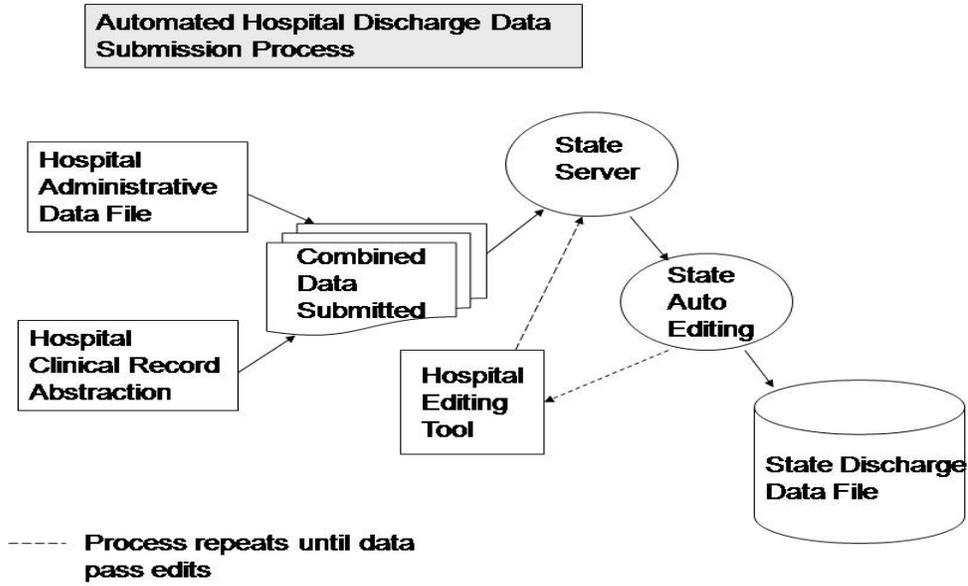
Gerald O'Keefe, Massachusetts Division of Health Care Finance and Policy, "Garnering Support for ED Data", NAHDO Emergency Department Data Conference, Washington, D.C, 2002.

There have been several efforts to document upfront and ongoing hospital burden related to data submission; many of those are based on some abstraction of data elements, not just submission of the standard claim form. For example, according to the report by Booz, Allen, and Hamilton for the Hospital Quality Alliance¹⁰, quarterly submissions for CMS hospital quality measures related to Acute Myocardial Infarction ranged from \$10 per record abstraction to a high of \$132 per record. The hospitals' data source in the sample ranged from 40% administrative claims data to 100% claims data. There are no comparative figures for cost of submission related to standardized claims data.

According to Booz, Allen, and Hamilton, primary cost drivers for hospitals include: ongoing hospital or contract staff time for monitoring submission of the data on a quarterly basis, as well as editing of the data as needed, and the application vendor fees. When new data elements are added hospitals will likely need vendor modification to their HIT infrastructure. Figure 1 below is an example of the data submission process for hospitals when both standardized data and some clinical data elements are submitted by hospitals. The specific data elements are discussed in the implementation section of this report, immediately following the schematic.

¹⁰ Booz, Allen and Hamilton. Hospital Quality Reporting in the United States: A Cost Analysis for the Hospital Quality Alliance. December 2006.

Figure 1. Data Submission Process



Cost estimates for design, development and implementation efforts for DOH

States vary in how they have approached the funding for ED data collection. Some states have sought and received additional appropriations or funding to support ED data collection, but other states with ED systems (e.g., Utah and New York) received no additional funding and have absorbed the cost into the existing agency budget, and this then required pricing the ED data products in a way that would offset a small portion of the costs. It should be noted that the lack of funding has hindered or stalled ED data collection activities in other states.

Placing the ED reporting system within an existing, in-house health data program presents savings by leveraging the HIT infrastructure and the analytic workforce. Inpatient and ED data systems are quite similar in terms of format and data suppliers, so the greatest impact on an agency that is adding ED data is the significant increase in volume.

How additional encounter volume is handled

States that conduct the data management in-house are able to incorporate the additional volume of information from the ED department, which tends to be about 3.5 to 5.0 times larger than the inpatient record volume, within the HIT environment and servers in place for inpatient data. In states that outsource data management to outside vendors, the additional volume of ED data may translate into significantly higher costs, since vendors often set charges based on number of records.

This additional volume has HIT considerations, such as data storage and impact on the servers within the HIT department. Staffing increases to accommodate the ED submissions and the attention to data quality will be necessary. Any editing programs will need to be modified to address data elements not already on the inpatient editing system. Edit programs check for data entry errors and inconsistencies of data reported within each record; these would have to be adapted for the ED format. Some states have implemented on-line reporting and sending corrections by secure e-mail to enable them to process records more efficiently, but even in these states additional staff has been added. In addition to trend edit checks (in which the data in the current report period is compared to the facility's historical data to identify uncharacteristic increases or decreases in percentages reported for certain data elements/categories), the state may want to borrow the edit logic from other states' ED edit protocols, which are posted on-line and publicly available. These, however, are not always "plug and play".

It is clear that additional software, hardware, and staffing resources will be necessary to implement the CEDDS system in Washington State. Since it is a recommendation of this report that the emergency department data collection system in Washington State be run on the current CHARS system, Washington State staff are currently developing cost and staffing estimates to

Getting Support for ED Data: Funding

We did try our best to look for grant funding, but we just really didn't find the support out there for infrastructure. There is a real unwillingness to invest in a database. Our inpatient database has been around for close to 20 years. Likewise with ED data, we anticipate a public health data set that has some utility. In the end, we got no external funding or budgetary increase. Nevertheless, we somehow have built the case internally, and have found the resources to move forward

Gerald O'Keefe, Massachusetts Division of Health Care Finance and Policy,
"Garnering Support for ED Data",
NAHDO Emergency Department Data Conference, Washington, D.C., 2002.

implement the CEDDS system extrapolated from current CHARS resource usage. This Washington State cost and staffing estimate is independent of this feasibility report.

In order to save time and money, other states have used data standards to develop their emergency department data collection system, facilitating the design and development processes. Intuitively, the use of data standards to develop new or enhanced data systems should: 1) provide a cost effective roadmap to implementation; 2) simplify the development process; and 3) strengthen the relationships between data suppliers and data users. Achieving success in each of the three areas contributes to a positive return-on-investment (ROI) for the project. As an example, Table 6 documents the time and resources required to develop the New York State Emergency Department Data Collection System. The end result was a positive financial return on investment, an implementation process that adhered to timelines, and a strengthened relationship between the NYS DOH, the agency that manages the data, and the hospitals in New York State.

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It is important to note that all system design and development for this project was completed on time or in advance of the legislation’s mandated collection date.

These cost considerations do not include the analytic costs associated with the use of ED data for reporting; however, it is assumed that the state will adopt a data dissemination policy to produce public data sets, research data sets, and forge partnerships with public health programs to analyze and integrate the data for public health purposes. These data partnerships are valuable and remove from the state staff the burden of being the sole analysts of the data.

NAHDO recently asked its members to share how they handled the additional volume when they implemented ED reporting. The following comments were shared by the Massachusetts Division of Health Care Finance and Policy, which implemented ED data reporting in 2001.

How did the increased volume in encounters impact your agency?

It increased IT support for any technical future updates (maintenance programming). It also added to the work of each of our agency’s hospital liaison work. For the 74 acute care hospitals in the state, we have 5 liaisons that each are assigned 10-20 hospitals for which they are responsible for getting the hospitals’ quarterly submissions in and passing the edits for the year, plus monitoring hospitals’ yearly reports to verify the data content.

I like to use the volume as well as the hospital number to get a better idea of the impact. The state total inpatient volume for discharges is about 800,000 per year. The state total ED volume for visits is about 2 million.

Was the editing program more liberal or lax the first year or years, with only critical fields rejected or flagged?

For the first year of concurrent data collection, several fields were delayed (edits were turned off for first year of reporting). This has made corrections going forward more difficult. For example, one field turned off was discharge time, which was problematic to capture in successive years. Hospitals didn’t put an actual time in place for a couple of years. Some just defaulted the discharge time. It impacted ED Length of stay – which could not be calculated accurately.

How much additional resource (FTE) was needed to handle the data management/editing of the ED data?

We added about 1.5 FTEs for hospital liaisons (from 3 full time staff to 4 full time and 1 part time person) in the support staff. All data submissions are electronic now (which freed up IT FTEs) through INET and hospitals can see within a day if the submission passes or fails edits and what data elements or what caused the submission to fail.

Table 6. Estimated Costs for ED System Development in New York

Phase One Programming	
2 programmers working for 4 months each	1200 hours
Average hourly rate	\$40
<i>Total estimated salary complete phase one</i>	<i>\$48,000</i>
Phase Two Programming	
2 programmers working for 3 months each	900 hours
Average hourly rate	\$40
<i>Total estimated salary complete phase two</i>	<i>\$36,000</i>
Old File Conversion Task Programming	
1 programmer working for 1 month	150 hours
Average hourly rate	\$40
<i>Total estimated salary complete migration task</i>	<i>\$6,000</i>
Total Estimated System Development Costs	\$90,000

Notes: The daily rate is based on an average hourly rate of staff persons assigned this work. It does not include increments to account for non-salaried benefits. The work week used in the calculation was 37.5 hours.

Another consideration is the data sales revenue potential of ED data. Based on current pricing practices for inpatient data, the state should be able to estimate and project data sales revenue from ED data. ED data may not, however, have as wide a user network as do inpatient data, so ED data sales may not equal those for inpatient data.

ED data are a major public health and research data set, and as such, the forging of local data partnerships has the potential for additional revenues. If public health and researchers will have access to ED data in the state for the first time, the capacity to attract new grant funding will increase significantly.

Partnerships between the health data program and programs with a high need for ED data, in states with ED data, include the following:

- CDC-funded Environmental Public Health Tracking Network
- The National Highway Traffic and Safety Administration (NHTSA) Crash Outcomes Data Evaluation System (CODES)
- The Agency for Healthcare Research and Quality’s Healthcare Cost and Utilization Project (HCUP) for the State Emergency Department Data set (SEDD).

All programs could provide resources, either in kind or funding, in return for ED data. In a NAHDO survey of states, in 2007 state public data set prices ranged from \$100 per year to \$30,000 per year.

Recommendation

NAHDO recommends that the state Department of Health budget for additional FTEs to provide sufficient staffing to successfully implement an Emergency Department Data Collection System. Based on the experiences of other states, additional staff is necessary initially to address edit issues associated with any new implementation. The long term use of this staff would be to provide needed analytic capability for strategic use of the data.

Recommendation

As ED data become available and potentially linked to the inpatient data, consideration should be given to reassessing the fees currently charged to non-public health entities for the use of these data.

Barriers and Concerns and Mitigation Strategies

This section discusses possible barriers to statewide ED data collection in a State, including perceptions of duplication of effort in reporting systems by hospitals and/or state or local public health agencies. It also discusses the need for ongoing training and the continuous development costs of hospitals.

The 28 health data programs that have expanded inpatient reporting to include ED data have addressed the challenges and barriers to ED data collection. All of these programs have extended their existing inpatient reporting platforms to include ED data, and have relied on the data partnerships, established through inpatient reporting, to add ED reporting. The inpatient reporting platform usually lays out the legal framework for data collection, validation, release, and security so that the incorporation of ED reporting is just an extension of these policies and procedures already in place. Maintaining trust and support throughout the provider community is essential for any expanded reporting, and ED data are no different. The addition of ED data to inpatient reporting does bring new partners to the table, such as traffic safety, injury surveillance, and other public health programs, so the potential to forge new data partnerships has strengthened in many states.

These potential barriers and related solutions are summarized in Table 7 below:

Table 7. Potential Barriers and Solutions

Barriers	Solutions
Perceived duplication of public / local health reporting	ED data have the potential to reduce provider reporting burden, as the core UB data set can address some surveillance needs. Because they lack clinical data, the ED data set will not replace the reporting of clinical or abstracted data, such as syndromic surveillance.
Concerns about privacy and data protection	Privacy provision under state law; data use agreements, etc.
Provider resistance to reporting	Building consensus and establishing an open and transparent process that includes all stakeholders; providing useful and timely information to providers for their own use.
Concerns about ED data quality	Especially in the first year of reporting, the state should use ED data cautiously. During the first year, data reporting errors and variation can be assessed and improved, with provider feedback and training, for future years. Training and education activities to improve coding issues will help improve the data.
Increase in public health demand for more information	Management of expectations within the public health community is important, through training and education regarding the utility of the core UB-04 data set for many applications, and collaboration to fill priority data gaps through linkage with other data sets instead of adding data elements.

Assessment is one of the three principal functions of public health, and ED data are an important component to guide policies and activities to assure and improve the health of a state's population. Hospitalization data facilitate the measurement of occurrence of health conditions, identify hospital use for disease related to lifestyle or behavior, and facilitate monitoring of health care quality, access, and utilization. For these uses, ED data provides a larger window for conditions not warranting inpatient admission. The ED visit may be an indicator of underlying health system failure or emerging public health threats.

Like inpatient data, which are now collected in almost every state, statewide ED data are becoming an essential data set. As inpatient data has evolved into a mature and widely-used dataset, ED data is increasingly becoming a resource for market and policy applications. ED data do have limitations, as do inpatient data. Like inpatient data, ED data do not capture clinical detail about the patient's treatment. The data are reported quarterly to the health data program and aggregated into an annual statistical abstract, thus lacking real-time or near-time reporting that many users desire. Hospitals may vary in their information system capabilities, including how they identify and capture an ED visit. There is generally more variability in outpatient data collection flow in the hospital than is the case with inpatient and outpatient coding practices, and standards vary more than inpatient practices¹¹.

One of the technical issues is the definition of an ED visit. While states use the source of admission, the type of admission, and revenue codes (45X) to identify inpatient admissions from the ED, once a patient is admitted as an inpatient there is a loss of some specific ED procedures and it is difficult to discern which procedures occurred in the ED and which in the inpatient settings.

With increased use of ED comes an understanding of the data. In a 2005 study by the Agency for Healthcare Research and Quality (AHRQ), ED data quality assessment was conducted across five state ED data sets. When compared with other national data sources, such as the National Hospital Medical Ambulatory Care Survey's ED data set and the American Hospital Association's Annual Survey of Hospitals, the state ED encounter-level data sets were found to adequately capture the universe of community hospitals with EDs in the study states and the volume of ED visits were similar to the other external data sources¹².

States with established ED reporting systems have developed programs and analytic tools and most are willing to share these at no or low cost to other states. For example, edit logic documentation is available from other states. States may also provide their program source code for ED edits to states with the same platform. State ED reports, such as preventable ED visits and ED utilization studies, provide a model for presenting and disseminating ED data. Other states may make their programming logic available for adaptation.

¹¹ Agency for Healthcare Research and Quality, HCUP Methods Series, Emergency Department Data Evaluation, Report #2005-02, http://www.hcup-us.ahrq.gov/reports/2005_02.pdf

¹² Agency for Healthcare Research and Quality, HCUP Methods Series, Emergency Department Data Evaluation, Report #2005-02, http://www.hcup-us.ahrq.gov/reports/2005_02.pdf

Web-based Data Query Systems (WDQS) are an emerging technology permitting states to disseminate statistical information cost-effectively, permitting the user to customize the output. Examples of WDQS tools include Washington state's King County Health Department's VISTA, the Utah Department of Health's Indicator-based Information System for Public Health (IBIS-PH), and the Missouri Information for Community Assessment (MICA). IBIS-PH supports queries on the use of "Emergency Department Encounters for Primary Care Sensitive Conditions". South Carolina has an online query system which allows policy makers to examine issues like cross-county utilization of EDs, utilization by specific categories, such as violence related, or specific disease categories. Other potential policy uses include monitoring the number of external injuries to assess how well injury prevention programs are working. Wisconsin has a query system called Wisconsin Interactive Statistics on Health (WISH); it includes the ability to query on injury related visits to emergency departments in Wisconsin.¹³

States that have expanded from inpatient to ED reporting have garnered support in the provider, Medicaid, and public health communities. Identifying priority data needs and looking to the stakeholders as customers have been keys to successful expansion in these states. Looking to ED lessons learned in other states, including model reports geared to key stakeholders in various states, will help a state advance its ED reporting agenda more quickly.

Recommendation

The state should evaluate other states' documentation and tools for emergency department edits and analytic reports. In particular, NAHDO recommends that the edit processes from states with established emergency department collection systems be evaluated. Potential candidate states are California, Massachusetts, New York, Florida, and Maine. This would also include reviewing the analytic reports to provide model approaches from those states with established emergency department collection systems. This would enable the state to learn from established systems from other NAHDO member states that preceded it in this development initiative.

Possible use of ED data and implications in public policy

The effectiveness of interventions and public programs can be evaluated, with ED data as a key component. ED data, when linked to other data systems, provide information for more robust analyses. Many programs are geared to reducing ED use rates for target populations, with ED as a proxy indicator of program success through reduced morbidity and cost. Today, the South Carolina data warehouse utilizes ED data to evaluate the effectiveness of programs. For example, the Communi-Care program which provides free prescription drugs to the uninsured was evaluated by linking across program and hospital data sets. By documenting the reduction in hospital inpatient and ED utilization, Communi-Care's impact could be quantified.¹⁴ Other states

¹³ Accessed on February 3, 2008 at <http://dhfs.wisconsin.gov/wish/>

¹⁴ Walter P. Bailey, South Carolina Office of Research and Statistics of the South Carolina Budget and Control Board, December 2007 interview.

have looked at Children with Special Health Care Needs program enrollees to improve case findings and target interventions.

Estimate costs, including one time cost for design, development, and implementation, and anticipated operational costs

The cost estimates for start-up and ongoing operations are discussed in detail in the Costs section.

Feasibility of linking data

Data linkage fulfills expanded data needs without the additional expense and delay of new data collection initiatives. Linked with other information, Emergency Department data can promote a better understanding of how to prevent use of EDs for routine care, and whether there are areas of the state where access to ambulatory care is lacking, or to understand which injuries are most common and most costly in their state. Other linkages, such as linkages to the birth data, can provide a wide array of information about mothers and their prenatal care, characteristics of the mothers and babies, type of birth, weight of the baby, smoking and alcohol use during pregnancy, etc.

Hospital discharge data can be combined with other data sources to fill important information gaps. States with hospital data systems frequently augment and enhance their data by using a technique called record level data linkage. Record linkage is the task of deciding whether two or more records belong to the same entity (individual, hospital, geographic region, family, or household) from one or more data sources. Linking the healthcare and public health data at an individual level requires presence of a unique identifier in all databases being linked. Since such unique identifiers, generally the Social Security Number (SSN), are often not available for some or all of the records, accurate record linkage becomes difficult.

An example of a common data linkage is linking inpatient hospital discharge data with birth certificate data; this combines the billing utilization data with maternal and newborn clinical data for robust outcomes studies. This is readily done when both records contain the mother's Medical Record Number.

The Crash Outcome Data and Evaluation System (CODES) is an example of a national data linkage project initiated by the National Highway Transportation and Safety Agency (NHTSA) in collaboration with states, in which hospital discharge data, emergency department data, ambulance records, and post-acute care data are linked to driver license, crash report, and death certificate data to address a variety of research questions related to motor vehicle accidents and to formulate policies relative to safety.

Hospital discharge inpatient and ED data can be combined with other data sets to study healthcare use and outcomes for special populations or for targeted conditions. Hospital discharge data are used in community health assessment projects to assess variation in admissions for preventable conditions such as asthma, injuries, or chronic diseases. Many of these conditions may be preventable with the proper access to outpatient care or through community outreach and educational initiatives.

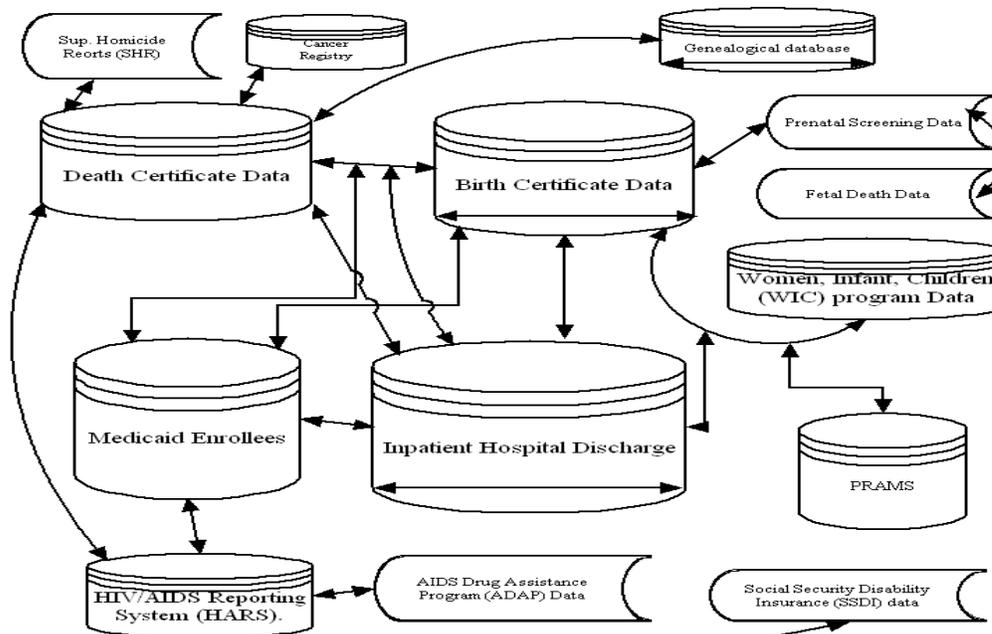
Some states link hospital discharge data with other databases routinely as well as upon special requests. Some of these applications are:

- De-duplication: Annual hospital discharge data file or ED data file may contain several duplicates because it is completed through a batch process with weekly, monthly, or quarterly data, and it goes through several rounds of edits. Individual discharge record level linkage allows states to identify and remove duplicates.
- Augmenting hospital discharge data: States augment hospital discharge data by borrowing information from other sources for more sophisticated analyses (e.g., linking ED visits data, hospital discharge data, Medicaid Enrollee data and death certificate data to investigate the burden of heart disease) and to reduce data collection burden (e.g., link a hospital characteristics file like AHA files with hospital discharge data).
- Hospital Readmissions Indicator: State also use record level linkage of the hospital discharge data file for tracking hospital readmissions and make this indicator available for research on quality of care. Having a unique patient identifier allows linkage across hospitals, providing greater detail than just readmission to the same hospital.

Some of the probabilistic linkage software is available to states at no cost, including Link King and Link Plus. State to state sharing of best practices and lessons learned through NAHDO helps states with decisions about record linkage. Inhibitors of record linkage include non-availability of semi-unique and unique identifiers, needed for linkage.

States regularly link Hospital Discharge data with Birth Certificate, Death Certificate, and Medicaid Enrollee Data, as shown in Figure 3 below.

Figure 3. Data sets linked by respondents of NAHDO Survey on Linkage



Note: The arrow inside a database indicates linkage of data files within the database.

Given the advantages of application of record linkage reviewed in this section, NAHDO recommends that the state collect SSN and other variables required for record linkage. Standard variables required for discharge record linkage are name, birth date, gender, and zip code. States collecting other information such as SSN can use that as well. Record linkage forges data partnerships across data stewards and improves the quality of the linked data sets. According to Utah’s CODES program, one full-time equivalent staff is sufficient to conduct annual linking of ED and other data sets.

Possible linkage variables for probabilistic linkage of ED and other data

As mentioned in other sections, a unique patient ID is critical for direct linkage. When a unique ID is not available, other indirect forms of linkage, such as “probabilistic linkage”, require a number of elements in order to successfully link across files. These include gender, birth date (or age), race/ethnicity, and zip code of residence. The more matching variables the better the probability that the same person has been found in linked files.

Recommendation

It is recommended that the EDDCS mirror the collection of the personal identifier used in the current inpatient data system to serve as a linkage variable between the ED and inpatient data bases. In addition, NAHDO recommends that the state add patient medical record number (MRN) to its inpatient and ED reporting requirements to help assure appropriate linkage and to provide the source number for the specific discharge for editing and retrieval purposes. The MRN can be encrypted to protect patient identity when used for external reporting purposes.

Feasibility of a pilot

Clear benefits are associated with doing a pilot study prior to the implementation of a new data system. Most states conduct a pilot before establishing a new data collection. The pilot will:

- provide an opportunity to assess how capable hospitals are in the submission of the selected data elements;
- assist in developing training materials for the new system by identification of knowledge gaps of submitters and staff;
- assist in assessing what changes would need to be made to the existing inpatient system without bearing the load of a full submission of data, reducing any threats to the inpatient system from load;
- provide test data for designing analytic programs and reports;
- provide feedback to submitters which could result in greater support for the data collection;
- provide an opportunity to test data reliability and validity;

- provide cost information for implementation (cost information associated with establishing a new healthcare data collection is based on other states' experiences; the addition of pilot information will enhance the estimation of costs for a specific implementation);
- elicit stakeholder feedback to determine potentially burdensome features of the system design prior to statewide implementation.

1. Assumptions for Pilot

With any substantial endeavor such as development of a new data collection effort, there are always assumptions as to the nature and goals of the endeavor. Following are basic assumptions:

- Purpose is to test the system of data submission and editing.
- Design of submission system is linked to existing IT infrastructure.
- ED data submission system development, including programming, will be the principal task of the pilot.
- An editing system for hospitals will be a component of the design.
- The design features of the submission system for the ED dataset will also enhance the potential for additional data element collection (e.g., new data fields from the UB-04 to possibly be added).
- Hospitals will receive limited reports on their data submissions within the pilot; these reports will showcase the potential of the information that can be gleaned from ED claims information.
- The development of training tools for the pilot submitters will also lay the foundation for full implementation training.
- A relatively small number of hospitals will adequately test the submission system, but such a small number of hospitals will not provide a stress (load) test of the system. This may require development of a manufactured dataset, perhaps using ED data from another state, and loading this through the system for testing the speed of the submission system.

2. Pilot Selection

From discussions with other state implementers, we have found that a small sample of hospitals is adequate for identifying both the idiosyncratic and common problems in submission, allowing development of universal solutions in advance of full implementation. Site selection should be somewhat representative, but does not necessarily need to include all sizes and types of hospitals. The site should be willing to participate and have an interest in ED information; the site should

also be willing to make constructive recommendations for improvement of the system. The site should have the capacity for electronic submission, currently submitting ED claims electronically.

3. Process for Solicitation

Stakeholder meetings should be held to allow the DOH to identify potential hospital participants for the pilot. Some additional marketing of the pilot may still be necessary in order to engage potential hospitals. Site visits, to meet and discuss the pilot and expectations for participants, should be done as quickly as possible. At the time of the site visit, it would be useful to request sample data from the facility. The speed with which the request for data is fulfilled may provide insight as to how quickly hospitals can turn around data, and will assure that the specific data elements are actually stored and available in their current systems. DOH staff should provide a list of the elements and the hospital should provide a sample file containing those elements. This would essentially be a small flat file that could be viewed in Excel or other data management software. There is additional value to acquiring this limited unedited sample data at the beginning of the pilot, beyond just assuring availability. This small sample can be used to assist in the design of the initial hospital reports.

4. Final Selection and Contracting

It is likely that some hospitals will not follow through with the process and thus selection will be ultimately based on willingness and capacity to submit. A sample of 3-5 hospitals should be adequate for testing purposes.

Hospitals will likely require a data use agreement from the state and possibly a business associate agreement, although statutory language and administrative rules may supersede the need for a business associate agreement. It will be important to protect the hospitals from Freedom of Information Act requests (FOIAs); and a statement indicating that data cannot be accessed via FOIAs and that all data will be destroyed at the end of the pilot should be included in the data use agreement. Pilot hospitals may also wish not to be specifically identified as participants.

<p>The state could work with the most progressive entities to determine what would best fit the high-end submitters, and then later focus on bringing the others up to the standard of the high-end submitters. It would be particularly helpful in the implementation phase for hospital personnel from the high-end hospitals to assist in the training of the other, less savvy hospitals. While some states have designed submission systems for the lowest common denominator, this inevitably leads to frustration on the part of the larger systems and customers of the data, since older forms of submission are more likely to slow down processing.</p>
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5. Pilot Implementation

During the pilot period, a number of IT related issues should be assessed and a determination made based on experience with the pilot sites. For example, the state should examine: how using data standards can improve the submission process, adequacy of existing IT security during the

pilot, and adequacy of the existing system to do this work, and, based on that assessment, whether there is need for new equipment or software to manage this program successfully.

Using the pilot data to conduct descriptive analysis can shed light on any unexpected findings that may point out problems in either submission, editing, or analytic programs. It is also very important during this period to provide feedback to the pilot facilities. Some written assessment will be useful to the program and its stakeholders; this assessment should include a summary of data findings. In the Wisconsin implementation of the physician office visit data, a study was done on the identified problems with the data, and recommendations for improvement were included.

During this time it would also be useful to have data submitters in the pilot sites meet with the program advisory committee (if there is an established advisory committee) to discuss options for improving the system. The more input by hospitals, the better the system, and the more support for the system.

6. Costs Associated with Pilot Study

Costs for the pilot will include expenses related to:

- IT infrastructure design and project management of submission system
- Database management software
- Analytic software
- IT design and programming for editing system (both in-house and hospital)
- Legal fees for pilot contracts (may be provided by the parent infrastructure)
- Training sessions for submitters in the pilot, including staff time for developing training materials, such as slide decks
- Connections for web-enabled communications
- Conference calls between staff and pilot sites
- Meeting rooms for stakeholder meetings; refreshments
- Travel expenses for staff to meet with sites
- Staff time for producing reports from the pilot data
- Mailing of hard copy reports
- Advisory Committee related expenses

It is important to note that a substantial portion of the start-up costs associated with full implementation are embedded in the pilot costs, given the need to have the system fully operational to test whether the submission system is adequate. That is, whether 1 or 100 hospitals are submitting data, the costs are the same as far as system design, hardware, and software are concerned.

7. Factors that can influence the pilot study cost estimates include:

- a. The number of submitters and the volume of claims. This influences the staff resources required for marketing the project, negotiating the contract, submission training, end-user support, and preparation of feedback reports to hospitals. Volume influences processing time and storage requirements. Additional storage will be needed. Upgrades to the system processing time may also be required, as load slows processing.
- b. The format in which the data are expected to arrive—using standard formats reduces costs for both submitters and DOH. This influences the extent of DOH software development for data processing.
- c. The expected level of effort for data submitters' cleanup tasks—which the pilot will determine. This influences the need to develop additional data correction tools with capabilities appropriate to ED/outpatient data elements and the length of the production cycle which will determine staff resources.
- d. The goals for data and information outputs. This influences the amount and type of staff resources for developing and producing those outputs.

Strategy for determining cost estimates includes:

- Assessment of specific work tasks to be accomplished during the pilot, based on the goals for the pilot;
- Mapping out the work areas and tasks for each phase;
- Estimating the resources required for the work; and
- Estimating the costs associated with those resources.

8. Work Tasks and Resources Needed for Pilot Success

We begin first with the programming tasks for the pilot, which are central to the success of the pilot. The programming tasks necessary to implement an EDDCS would include:

- Development of an edit program to validate incoming data and to maintain (add, update, delete functions) the state Emergency Department file.
- An update to the current infrastructure to support additional data submissions. This would include programming support for clerical staff to authorize potentially new data submitters as well as supporting the routing of a variety of reports back to the submitting providers.

- Development of a series of designs for reports to provide feedback to submitting providers on the completeness and accuracy of data submitted. Additionally, a series of reports for assessment of the quality of the data optimally would be written as part of the provider feedback loop.

It should be noted that this list is not fully inclusive, but does provide the basic programming needs for a new emergency department data collection system. It is estimated that 2 to 3 programmers working full time would likely be required to complete these tasks, depending on the skill and breadth of the programmers' knowledge. Specifically, we suggest that the first task, of building in the edits for an EDDCS, would likely consume a full-time FTE for one year.

The second task is to program in the rest of the data collection language; this will also likely take 50-75% of an FTE. While most of the programming costs are upfront, as the program is implemented there will be ongoing need for staff resources to manage the submission process and maintain hospital participation and the quality of the data.

The third task in the pilot relates to providing feedback on submission and quality of data via reports to the submitters. This task will likely take 25%-50% of one FTE. Depending on the breadth of staff skills, one person may be able to do more than one task in one year.

For projections of these types of costs see Year 1 of the Implementation Table. Costs for the pilot are likely to be in the same range as first year implementation in the Table, but would be focused on somewhat different tasks than the first year of implementation.

Recommendation

It is recommended that a pilot data collection effort be initiated, with 3 to 6 volunteer hospitals representing the key characteristics of the hospitals in general. These characteristics include urban/rural setting, for-profit/non-profit/public district hospital status, various levels of trauma system designation, and various bed-capacity sizes.

Full Implementation Costs

As noted in the section on cost for the pilot, some resource needs will continue from the pilot study into implementation; other tasks and their associated costs would be essentially completed during the pilot study.

Using the same strategy as outlined in the pilot section, we assessed the scope of work, mapped it out, assigned resources necessary to accomplish the scope of work, and then estimated costs for those resources. We also laid out upfront costs and ongoing costs during implementation.

Work Tasks Associated with Implementation and Resources Needed

In this section, you will find a table that maps tasks with FTEs and position type, and Pilot with Ongoing Tasks and Resources. The potential assignment of tasks should be altered to meet personnel knowledge and skill. The table is followed by a more detailed description of each task.

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Table 8. Tasks and Staffing Resources for Implementation

Task	(YR 1) FTE	Ongoing (YR 2 and 3) (FTE)	Programmer /Analyst	Analyst	Epidemi- ologist
1. Draft administrative rules for the data collection; manage approval process for administrative rules.	.15				.15 (0)
2. Ongoing load tests to assure system can handle data with satisfactory speed	.10	(.05)	.10 (.05)		
3. Notification to submitters, refinement and provision of submission manual and other resources as needed. Quarterly instructions to submitters via e-newsletter, and as needed.	.20	(.10)	.05 (.05)	.15 (.05)	
4. Provision of training to submitters, and management of test submissions process; ongoing training related to staff turnover, program changes, and problems.	.10	(.05)	.10 (.05)		
5. Provision of reports to hospitals on the quality and completeness of their reporting, and an additional report for edits needed to the data submitted.	.25	(.25)		.25 (.25)	.
6. General management of staff, resources, and relationships both internal and external.	.40	(.30)			.40 (.30)
7. Development of reports for use by public health, health policymakers, and other stakeholders.	.40	(.60)		.10 (.10)	.30 (.50)
8. Data linkage between ED and inpatient data—and release of public use data files. Additional data linkages would substantially increase this estimate—likely up to 1.0 FTE	.10	(.20)	.10 (.20)		
9. Select and upload data for query system.	.10	(.10)	.10 (.10)		
10. Follow-up and ongoing evaluation of satisfaction with data collection and	.10	(.10)		.10 (.10)	

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Task	(YR 1) FTE	Ongoing (YR 2 and 3) (FTE)	Programmer /Analyst	Analyst	Epidemi- ologist
reporting. Identify additional needs in regard to Emergency Department Data. Ongoing process evaluation.					
10 Security of data and information and implementation of privacy rules.	.25	(.15)	.25(.15)		
11. Data sales, custom data requests, staffing IRB (data privacy committee).	.30	(.35)		.30 (.35)	
Data validation—post production analysis and cleaning.	.15	(.20)	.15 (.15)	(.5)	
13. System maintenance, internal end-user support.	.15	(.15)	.15 (.15)		
14. Staffing Advisory Committee.	.25	(.10)		.10 (.0)	15 (.10)
15. Other Tasks	.10	0 (.30)	0 (.10)	0 (.10)	0 (.10)
Total (ongoing)	3.0	(3.0)	1.00 (1.00)	1.00 (1.00)	1.00 (1.00)

With implementation, a number of programming tasks must take place, which are beyond what would be tested in the pilot. While a reduction of tasks is associated with the submission and editing system, new tasks are added, related to data management, development of linked files, data security and privacy issues, and maintenance of software and hardware. In addition, new programming tasks will be associated with report production and other custom data requests. Some of these additional tasks will require an individual with epidemiologic and research skills and analytic programming knowledge.

The third task in the pilot is expanded in full implementation to include general relationships with stakeholders; it includes the following tasks: data submitter relations; training; development of submission documents for submitters; ongoing relationships with submitters related to problems in submission, design, and distribution of reports; and evaluation of the process on an ongoing basis. As time passes during implementation, it is also critical to assure submitters of ongoing training—staff turnover can be high in hospital data positions. Given the importance of buy-in to the program, in the pilot we anticipated this would require 25-50% of an FTE (given small number of hospitals in the pilot), but would expand significantly when the full implementation is begun. New reporting tasks would include: marketing of database; data reports for web-based query system; development of specialized reports for the consumer, providers, policy makers, and others. Reports must be timely, requiring an intense use of resources each quarter.

Project management, relations with internal and external stakeholders, and management of the advisory committee also add to the program costs. Without good management, data release is often delayed, there can be poor stakeholder relations, and products may not meet the needs of end-users. It is critical to have a manager with a high level of data, research, and management skills to assure program success.

Other implementation costs include those associated with general resources, beyond expenditures in the pilot. Three positions will require work areas, desktop computers, office supplies, software for analysis, communication, and data management. Also, new products that are web-based will require additional software for development. Other resources include travel to meetings, conferences, etc. It is critical that staff skills are maintained—this can be accomplished by both local and national travel to conferences and meetings.

In the next section, we discuss the options available for implementation of these tasks; this includes a table of possible alternatives and their associated benefits and challenges

Alternative Locations for the EDDCS

We developed the tasks and FTEs based on the most common alternative used by states—a co-located ED system with the inpatient discharge system in the department of health. This does not preclude another alternative from being selected. We provide information on what additional costs or reduction in costs would occur should another selection be made.

As one might expect, a completely independent system would have additional costs associated with creation of a new system, whether within or outside of government. These systems are complex and building from the ground up will take substantial IT resources (hardware, software, and staff). These costs could add anywhere from \$750,000 to \$1 million to the cost of the projected co-located system.

Surveillance systems are usually designed to meet specific public health risks, for example influenza surveillance, hospital acquired infections, traumatic brain injury, etc. Because of the clinical issues being addressed, these systems generally rely on primarily clinical data elements (abstracted from medical records) with some added demographic administrative data elements. Thus, adding an ED data collection system to this type of surveillance program would require a considerable shift in the nature of the surveillance program or the type of data collected for the ED data collection. The load of claims would also likely swamp existing IT structures in these surveillance systems. Costs for abstracting data elements from clinical systems are significantly higher than using electronic administrative systems for data collection.

Recommendation:

Given the additional costs associated with another alternative to the EDDCS, we recommend that the EDDCS should utilize the existing infrastructure for operations. It will save money and allow for faster data sharing between programs.

Conclusions

This paper reflects the myriad uses of emergency department data for all the key stakeholders. It includes input from the stakeholders, as well as a technical assessment of the sufficiency of the system to respond to stakeholder likely Key Business Requirements. It also links the proposed data elements to the UB-04 standards necessary for providing information to stakeholders. The report includes a guide to barriers to data collection and solutions suggested by other states to mitigate the barriers. It provides strategies for infrastructure design, pilot testing, and implementation. Cost estimates are provided as well. Essentially, this is a toolkit for the collection of emergency department data that will assist a state in moving forward with this important new data collection.

Appendix I – Wisconsin Emergency Department Data Collection Experience

The table below lists proposed data elements to be used for emergency department data collection in Wisconsin. The table also contains brief definitions and indicates which entities/stakeholders in Wisconsin proposed use of these elements. It should be noted that the data elements proposed by the Bureau of Health Information (BHI) identified under Sources in Table 4 are typical of other state discharge system requirements, which are based on the UB-04 standards with a few additionally abstracted elements. It is also true that the majority of the data elements listed also represent the needs for a typical inpatient discharge data system. The other sources proposing elements included a “Panel” which refers to the Technical Advisory Panel established by BHI, a full listing of sources is directly below the Table. The data elements with a preceding asterisk(*) were not available within hospital administrative systems and were not included in the Wisconsin ED data collection.

Table 10. Proposed Data Elements for an Emergency Department Data Collection System in Wisconsin

Element	Definition	Source(s)
Facility ID	Facility where patient seeks or receives outpatient emergency care	BHI, STAC, DEEDS, Panel
*Facility Type	Code to identify hospital EDs, free standing urgent care clinics, urgent care clinics connected to hospitals, etc.	Panel
Date of service / ED arrival date	Date (month, quarter) of ED service	BHI, STAC, DEEDS, Panel
Encrypted case ID / unique identifier	Identifier used by the facility to identify the patient at admission (medical record number, etc.)	BHI, STAC, WEMISIS, DEEDS
*ED Admission type	Code indicating the priority of admission: emergency, urgent, elective, newborn Alternative from Ky. ED Triage routine, urgent, serious, critical	BHI, KY
ED Admission source	Code indicating the source of admission: physician referral, clinic referral, HMO referral, transfer from hospital, transfer from skilled nursing facility, transfer from another health care facility, emergency room, court/law enforcement, unknown	BHI
*Time in / arrival time	Time documented in patient’s record for the ED visit	STAC, DEEDS, Panel
Diagnosis codes	Principal and up to 8 other diagnosis codes describing the condition established, after study, to be chiefly responsible for causing a patient’s admission	BHI, STAC
E-code	ICD-9-CM code describing the external cause of an injury, poisoning, or adverse effect	BHI, STAC, WEMISIS, Panel
Procedure codes	Principal and up to 5 other codes describing a procedure performed for definitive treatment or that was necessary to treat a complication rather than for diagnostic, exploratory, or therapeutic purposes	BHI, STAC

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Element	Definition	Source(s)
*Chief complaint	Patient's reason for seeking care or attention, expressed in words as close as possible to those used by the patient or responsible informant, entered as code with associated text description or as text description alone	DEEDS, Panel
*Patient severity	Classification of patient's severity: requires immediate evaluation or treatment, requires prompt evaluation or treatment, time to evaluation or treatment not critical, or unknown. Alternative classification: critical, emergency, urgent, observation (see ED Triage above).	DEEDS, Panel
Discharge diagnosis	Encoded description of ED disposition diagnosis	DEEDS, Panel
ED Discharge status	Code for the arrangement or event ending a patient's ED visit: discharged to home or self care, discharged to another short-term general hospital, discharged/transferred to a skilled nursing facility, discharged/transferred to an intermediate care facility, discharged/transferred to another type of institution, discharged/transferred to home under care of organized home health service organization, left against medical advice, transferred or discharged to a home intravenous provider, expired, discharged to hospice-home, discharged to hospice-medical facility	BHI
*Time out / departure time	Time when patient leaves ED	STAC, DEEDS, Panel
*Mode of transport to ED	Patient's mode of transport to ED: ground ambulance, helicopter, police, walk-in (following private transport, public transport, law enforcement transport, not specified), other, unknown	STAC, WEMISIS, DEEDS, Panel
*EMS response unit ID	Identifier for EMS unit that transported patient to ED	STAC, WEMISIS, DEEDS
*EMS agency ID	Identifier for EMS agency that transported patient to ED	DEEDS
Referral source to ED	Individual or group that determined patient should seek care in ED: self-referral, EMS transport, practitioner or health care facility referral, internal facility referral or transfer, law enforcement, acute care hospital transfer, other health care facility transfer, other, unknown	DEEDS, Panel
*Incident site type (place of injury, location emergency occurred)	Type of place where patient's injury occurred, entered as home, residential institution, school or other institution and public administrative area, sports and athletic area, street highway, trade and service area, industrial and construction area, farm, other, or unspecified	STAC, WEMISIS, DEEDS, Panel

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Element	Definition	Source(s)
ED disposition	Patient's anticipated location or status following ED visit, entered as discharged to home or self-care; transferred/discharged (to another short-term general hospital, skilled nursing facility, intermediate care facility, another type of institution, home under care of home intravenous drug therapy provider, or home under care of certified home provider/program); left (without receiving medical advice against leaving or with receiving medical advice against leaving); placed in designated observation unit; admitted (to hospital floor bed, intermediate care/telemetry unit, ICU, or OR); died; other; or unknown	DEEDS, STAC, Panel
*Receiving facility ID	Identifier for facility to which patient is transferred or discharged at conclusion of ED visit	STAC, DEEDS, Panel
*Mode of transport for transfers following ED visit		STAC
*Transport personnel	EMT, RN, MD, etc.	STAC
Inpatient admission codes		Panel
Attending/Admitting provider ID	Identifier for ED provider responsible for the patient's care during the ED visit	BHI, STAC, DEEDS, Panel
Attending provider type/specialty		DEEDS, Panel
Consulting provider ID	Identifier for consultant provider who participates in patient's care during the ED visit	DEEDS
Consulting provider type/specialty		DEEDS, Panel
Performing provider ID	Identifier of provider who performs ED procedure; designated as Other Physician ID at BHI	DEEDS, BHI
Performing provider type/specialty		DEEDS, Panel
*Inpatient provider ID	Identifier of provider whose inpatient service patient is admitted to	DEEDS
*Inpatient provider type/specialty		DEEDS, Panel
Patient zip code	Zip code of patient residence	BHI
Patient county of residence	County of patient residence	BHI, STAC
Patient sex	Sex of patient	BHI, STAC, DEEDS
Patient date of birth / age	Patient's date of birth (integer age)	BHI, STAC, WEMSYS, DEEDS

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Element	Definition	Source(s)
*Patient race	Race of patient	BHI, STAC, WEMSIS, DEEDS, Panel
*Patient ethnicity	Ethnicity of patient	BHI, DEEDS, Panel
Primary and Secondary payer ID	Medicare, Medicaid, WPS, CHAMPUS or CHAMPVA, Non-Medicaid Blue Cross and Blue Shield, Other	BHI, STAC, DEEDS, Panel
Primary and Secondary payer type	FFS, Alternative Health Care Insurance Plans (HMO, PPO, PPA), workers' compensation, general relief, self pay, etc.	BHI, DEEDS, Panel
Total charges		BHI, STAC, DEEDS, Panel

** Indicates those elements that do not appear to be routinely collected by Emergency Departments in the state at current time, although potentially available for collection. These might be suggested for a second phase of implementation.*

Note: DEEDS (Data Elements for Emergency Department System) is proposed by CDC and others, STAC (State Trauma Advisory Committee), WEMSIS (Wisconsin Emergency Medical Services Information System), BHI (Bureau of Health Information), Panel (Technical Advisory Panel convened November 30, 2000 by BHI), KY(Kentucky Project on Emergency Data Collection; offered by a panel member).