

Utah Patient Safety Update



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"[Our] success will be indicated initially by seeing an increased number of events detected and reported across the state."

Scott D. Williams, MD
Deputy Director,
Utah Department of Health

Potential Adverse Drug Events Among Hospitalized Patients: Utah, 2000

This update describes the incidence of potential adverse drug events among hospitalized patients in Utah's 41 acute care hospitals in 2000. The statistical analysis, tables, and figures presented in this update represent initial attempts in the State of Utah to utilize the Hospital Inpatient Discharge Database to facilitate patient safety efforts in Utah's hospitals.

It is worth emphasizing that the adverse drug events identified in this analysis may or may not have occurred prior to contact with hospital personnel. While primary discharge diagnosis codes (code causing hospitalization) were excluded, secondary codes and E-codes may represent conditions the patient arrived with or events that occurred in the hospital. Research is underway to determine what proportion of the discharges with these codes represent in-hospital occurrences.

The objective of this update is to highlight the types of potential adverse drug events (ADEs) that were observed among hospitalized individuals in the year 2000 and to begin examining variations by broad categories of hospitals. This update represents part of a broad multi-agency and private-public effort to add to the growing knowledge about adverse events that is needed to guide quality improvement in the health care processes. A variety of efforts are underway that seek to increase awareness regarding adverse drug events in Utah. Previous studies have indicated that adverse events, on the whole, are underreported. **It is hoped that with better recognition, documentation, and reporting of ADEs that reported rates of these events will actually increase initially.**

Health Care Facility Patient Safety Program and Administrative Rule

The Utah Hospitals and Health Systems Association (UHA), jointly with the Utah Medical Association (UMA) and Utah Department of Health (UDOH), established a patient safety task force in 2000. This task force initiated the discussion of and endorsed the administrative rule on patient safety that went into effect on October 1, 2001.

The Health Care Facility Patient Safety Program Rule requires that:

- 1) Each facility shall implement processes to effectively identify and report to the Department the incidence of all: a) adverse drug events.
- 2) Reporting to the Department may occur through established, statewide, electronic health care facility reporting systems managed by the Department.
- 3) The report shall include codes applicable to the event from the current International Classification of Diseases Clinical Modification (ICD-CM) diagnosis coding, including codes for external cause of injury (E-codes) and codes for place of occurrence.

(Continued on page 2)

Health Care Facility Patient Safety Program and Administrative Rule

(Continued from page 1)

A variety of methods are available for detecting and tracking adverse drug events. They are:

- Traditional incident reporting
- Retrospective chart review
- Automated detection based on clinical response
- Daily pharmacist chart review
- Hospital discharge data reporting

Hospitals can select any of the methods and report quarterly the aggregated number of ADEs to the Utah Department of Health.

“The biggest challenge is to get people in hospitals - physicians, pharmacists, nurses, and administrators - to recognize that errors are systems problems and not people problems.”

Lucian Leape, MD
Professor, Harvard School of Public Health

About ICD-9-CM Codes

The International Classification of Disease, 9th Revision, Clinical Modification (ICD-9-CM) has as two of its major code types diagnosis codes (N-codes) and E-codes. The former stands for nature of injury codes whereas the latter describes the possible external cause of the injury. If a drug were thought to have caused a rash, the N-code would address the rash (e.g., 782.1), while the E-code would describe the drug class (e.g., E943) that was the external cause. While N-codes play a critical role in determining how much a provider is paid for a service, E-codes are not directly related to reimbursement. There is little financial incentive for E-code reporting at this time. Therefore, ADEs identified by E-codes probably are under recorded.

Limitations of using the Administrative Data and the ICD-9-CM Classification for Detecting Adverse Drug Events

- Unable to separate the events that occurred prior to hospitalization from those that occurred during hospitalization
- Unable to categorize degree of harm
- Unable to capture all priority ADEs
- Unable to capture near misses
- Unable to perform reliable interinstitutional comparisons due to coding variation among facilities

About Adverse Drug Events

Definitions: For the Utah patient safety project, an adverse event (AE) is defined as an undesirable and unintended injury resulting from a medical intervention (an act of care provided by the hospital or by the omission of necessary care), rather than from the patient's underlying disease process. An adverse drug event (ADE) is an adverse event associated with a drug.

Classification: Adverse drug events were detected in the Utah Hospital Discharge Database using a classification scheme developed by the project's expert panel for the ICD-9-CM Classification of Adverse Events. The scheme designates a set of approximately 420 ICD-9-CM codes (including diagnosis codes [N-codes] and E-codes) as potential adverse drug event codes. The ADE classes are listed in Table 1.

Grouping: These ADE classes consist of groupings of similar codes - the three major types of classes are clinical manifestations of adverse drug events (N-codes only, Classes 1-4), adverse effects of drugs (E-codes only, Classes 15-24 and 26), and poisonings by drugs (N-codes and E-codes, Classes 5-14 and 25). While the clinical manifestation classes consist of codes describing similar clinical diagnoses such as rash and dermatitis, the adverse effect classes and poisoning classes are grouped by drug class such as antibiotics or agents affecting blood constituents.

About the Data

The Utah Hospital Discharge Database has nine fields for reporting ICD-9-CM diagnoses (N-codes). Since 1995, reporting of the principal E-code has been required.

Utah's Hospital Discharge Data System contains patient-level information about all hospitalizations that occur in all of Utah's licensed hospitals. The Utah Health Data Committee, through its staff in the Utah Department of Health, collects the data under the authority of the Utah Health Data Authority Act. During the year 2000, 235,284 total discharges were reported by Utah 41 acute care hospitals. Information about each hospitalization includes patient characteristics, diagnosis codes, procedure codes, payer information, etc.

For this update analysis was restricted to hospitalizations in 41 acute care hospitals, excluding specialty hospitals such as rehabilitation and psychiatric hospitals.

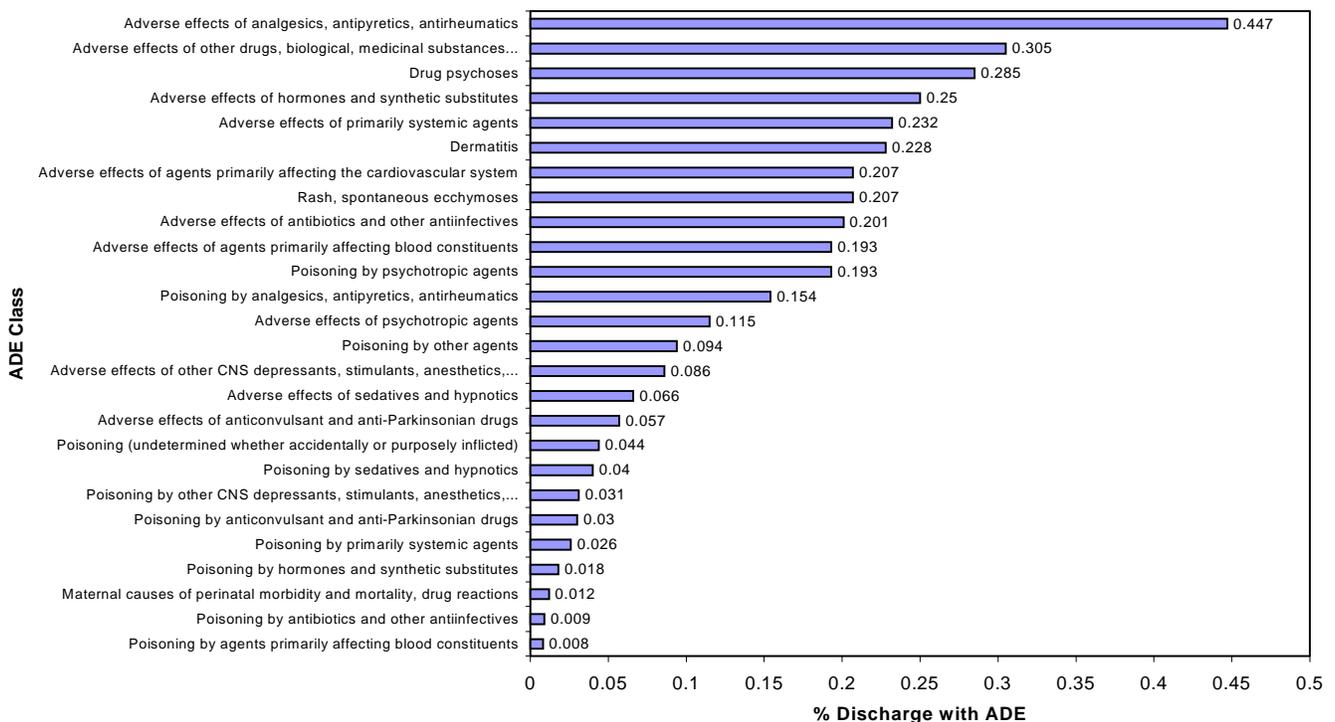
TABLE 1

The ICD-9-CM Codes of Potential Adverse Drug Events by Adverse Event Class, 2002 Version

No. Adverse Event Class	ICD-9-CM Codes Included
1 Drug psychoses	292
2 Dermatitis	692.3,692.9,693.0,693.8,693.9
3 Maternal causes of perinatal morbidity and mortality, Drug reactions and intoxications specific to newborn	760.72,760.74,763.5,779.4
4 Rash, spontaneous ecchymoses	782.1,782.7
5 Poisoning by antibiotics and other antiinfectives	960-961, E856-857
6 Poisoning by hormones and synthetic substitutes	962, E858.0
7 Poisoning by primarily systemic agents	963, E858.1
8 Poisoning by agents primarily affecting blood constituents	964, E858.2
9 Poisoning by analgesics, antipyretics, antirheumatics	965, E850
10 Poisoning by anticonvulsant and anti-Parkinsonian drugs	966, E855.0
11 Poisoning by sedatives and hypnotics	967, E851-852
12 Poisoning by other CNS depressants, stimulants, anesthetics, nervous system agents	968, E855.1-855.9
13 Poisoning by psychotropic agents	969, E853, E854
14 Poisoning by other agents	909.0, 970-979, E858.3-858.9, E929.2
15 Adverse effects of antibiotics and other antiinfectives	E930-E931
16 Adverse effects of hormones and synthetic substitutes	E932
17 Adverse effects of primarily systemic agents	E933
18 Adverse effects of agents primarily affecting blood constituents	E934
19 Adverse effects of analgesics, antipyretics, antirheumatics	E935
20 Adverse effects of anticonvulsant and anti-Parkinsonian drugs	E936
21 Adverse effects of sedatives and hypnotics	E937
22 Adverse effects of other CNS depressants, stimulants, anesthetics, nervous system agents	E938, E940-941
23 Adverse effects of psychotropic agents	E939
24 Adverse effects of agents primarily affecting the cardiovascular system	E942
25 Adverse effects of other drugs, biological, medicinal substances in therapeutic use	E943-E949,909.5
26 Poisoning (undetermined whether accidentally or purposely inflicted)	E980.0-E980.5,E980.9

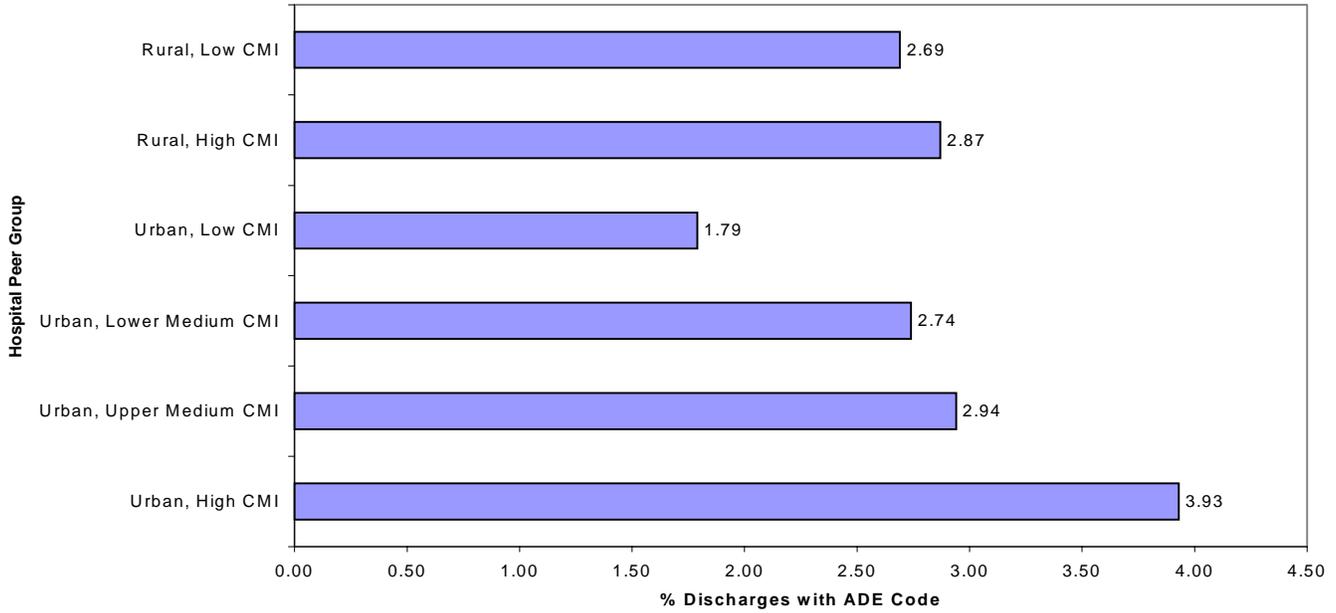
Source: The Utah/Missouri Patient Safety Project, National Expert Panel for ICD-9-CM Classification of Adverse Events, 2002

Figure 1
Percent Discharges with ADE Code by ADE Class: Utah, 41 Acute Care Hospitals, 2000



Source: Utah Hospital Discharge Database, 2000, Utah Department of Health.

Figure 2
Percent Discharges with ADE Code by Peer Group: Utah, 39* Acute Care Hospitals, 2000

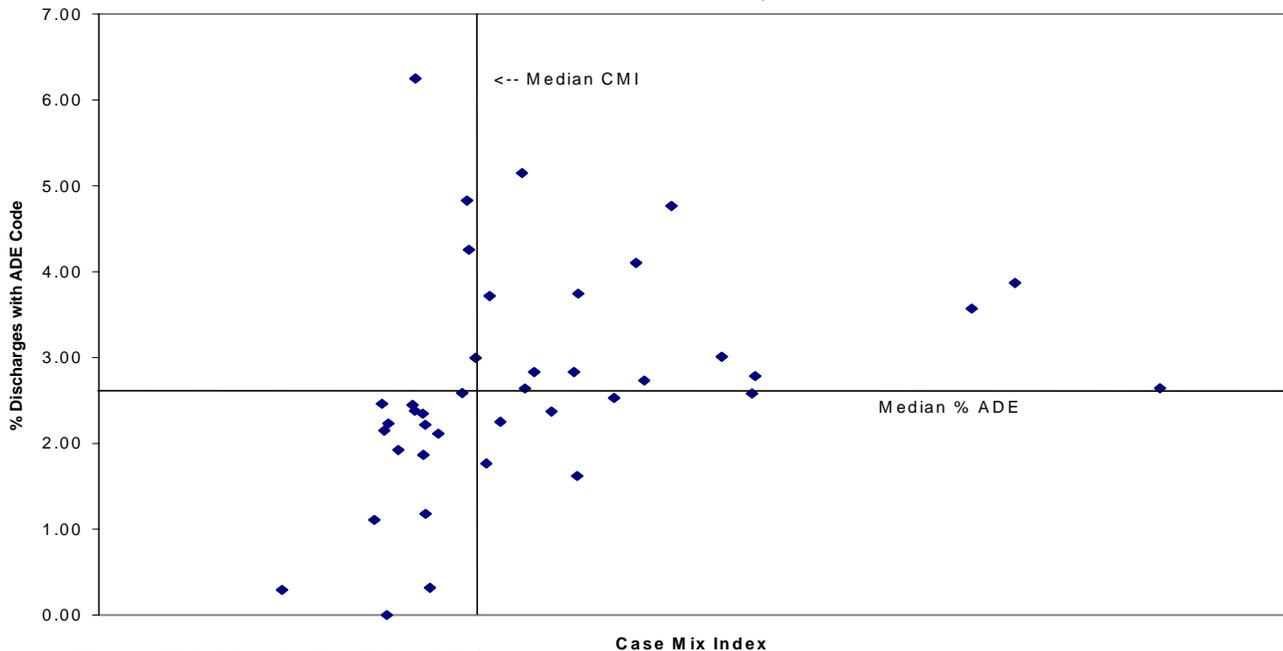


* Veterans' Administration and Primary Children's Hospitals excluded.

Adverse Drug Events and Hospital Patient Case-Mix Index (CMI)

Patient safety literature reports a positive correlation between adverse drug events and length of stay in hospital, hospital total charges, and patient severity of illness. The hospital patient case-mix indices used in the figures provide a reference for patient safety personnel to assess each hospital's ADE rate relating to the complexity of their patient population. The hospital patient case-mix index used in this update is calculated based on the All-Patient Refined Diagnosis Related Group (APR-DRG) and average charges for each APR-DRG. APR-DRG takes patient sex and age into consideration.

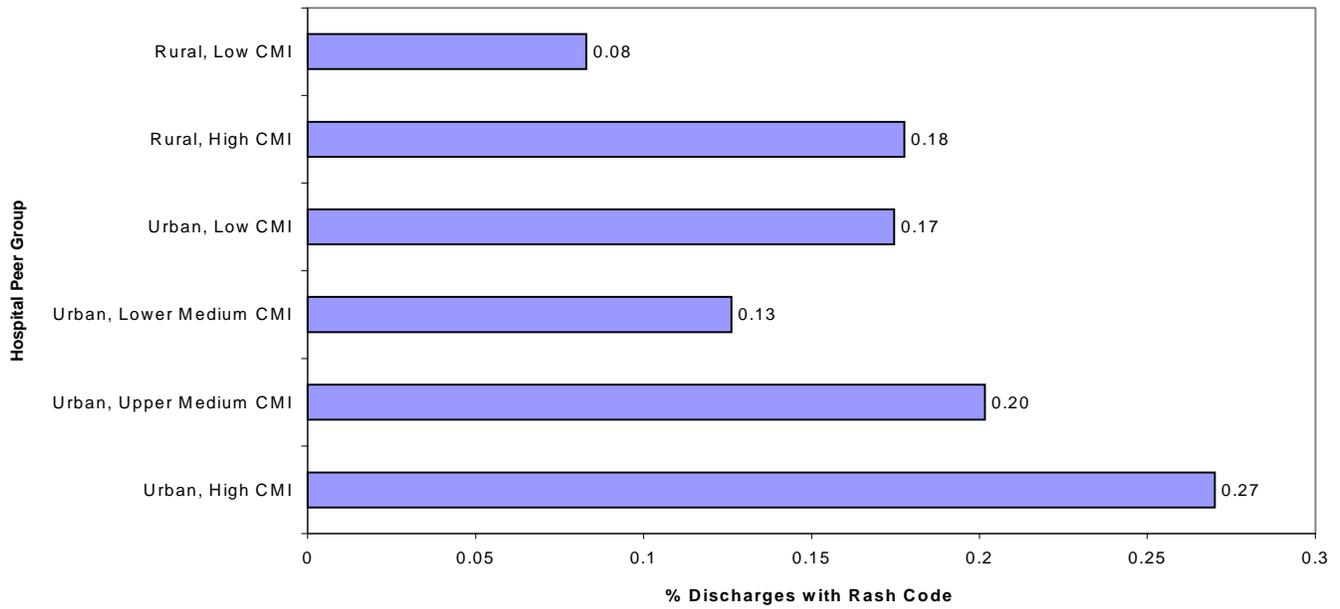
Figure 3
Percent Discharges with At Least One ADE Code by Hospital Inpatient Case Mix Index: Utah, 40* Acute Care Hospitals, 2000



*Veterans' Administration Hospital excluded.

Source: Utah Hospital Discharge Database, 2000, Utah Department of Health.

Figure 4
Percent Discharges with Rash Code by Hospital Peer Group: Utah, 39* Acute Care Hospitals, 2000

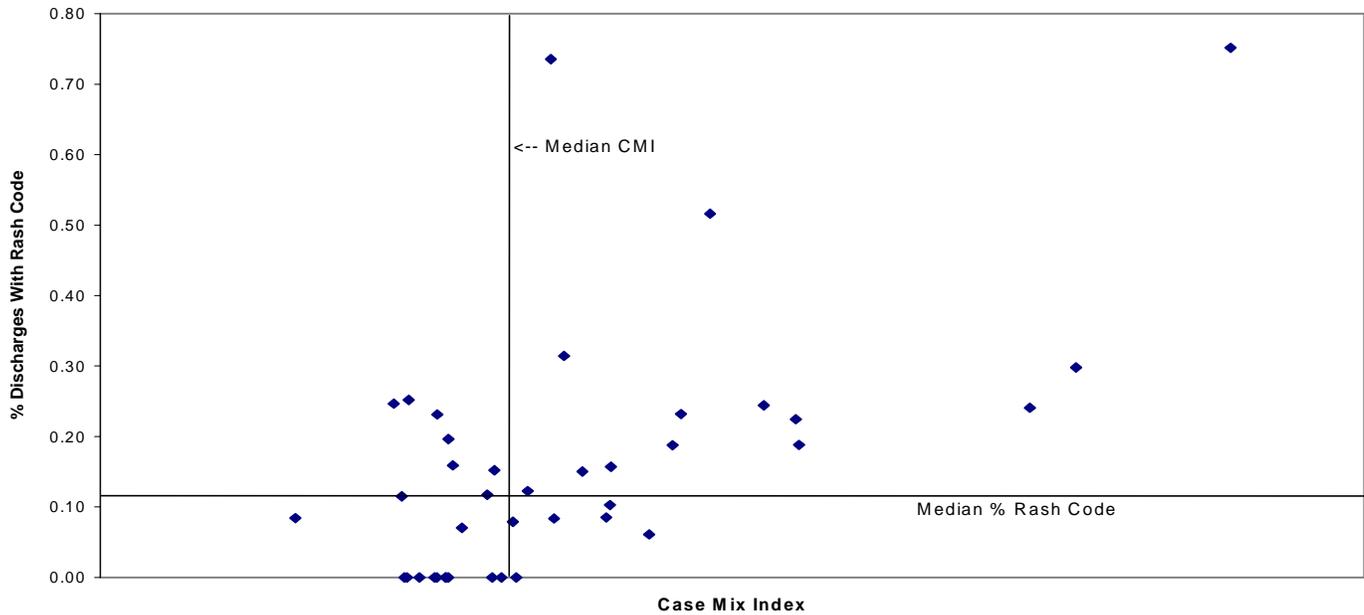


*Veterans' Administration and Primary Children's Hospitals excluded.

Clinical Manifestations of Potential ADEs - Rash

Rash is one of the more frequent adverse drug events observed. While a secondary diagnosis code of rash does not necessarily indicate an ADE, the project's expert panel felt that codes of this type were worthy of study. The specificity of this type of code for ADEs will be investigated through chart review. Figure 4 shows percentage of discharges with a rash code by peer group. While there is a correlation between the ADE rate and the CMI, factors besides case mix will obviously affect the occurrence and coding of ADEs at any one institution.

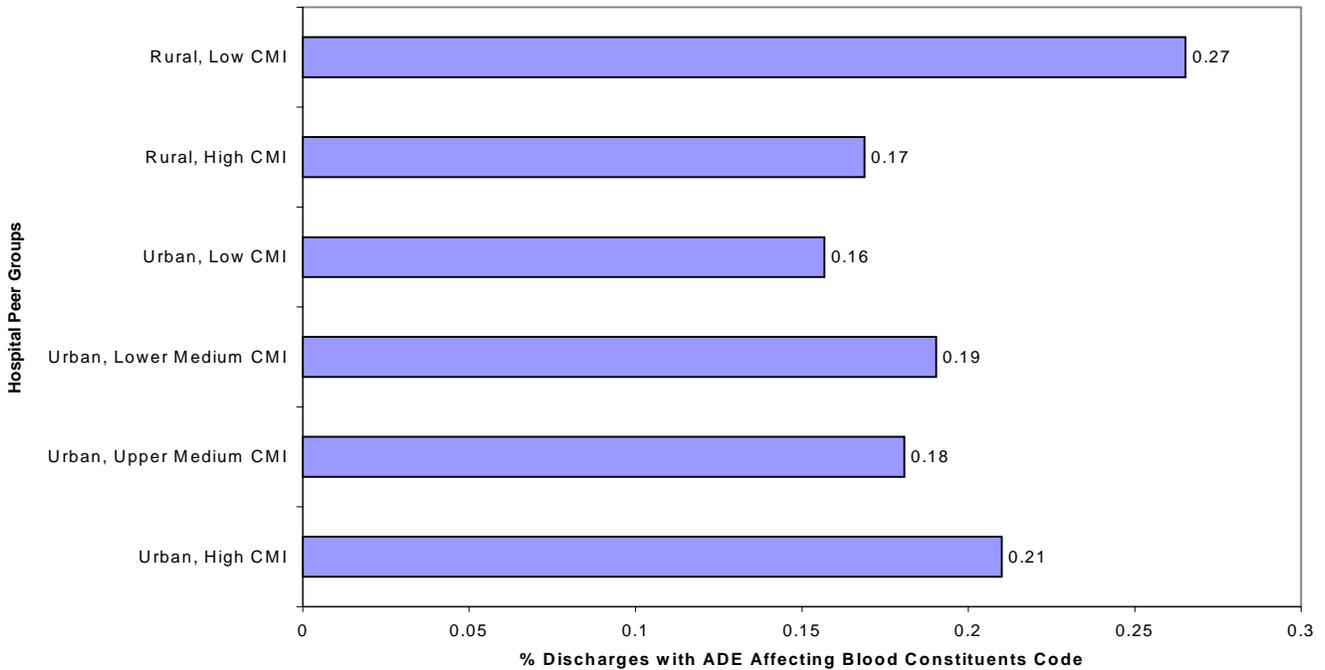
Figure 5
Percent of Discharges with Rash Code by Hospital Inpatient Case Mix Index: Utah, 40* Acute Care Hospitals, 2000



*Veterans' Administration Hospital excluded.

Source: Utah Hospital Discharge Database, 2000, Utah Department of Health.

Figure 6
Discharges with ADE Affecting Blood Constituents Code by Peer Group: Utah, 39* Acute Care Hospitals, 2000

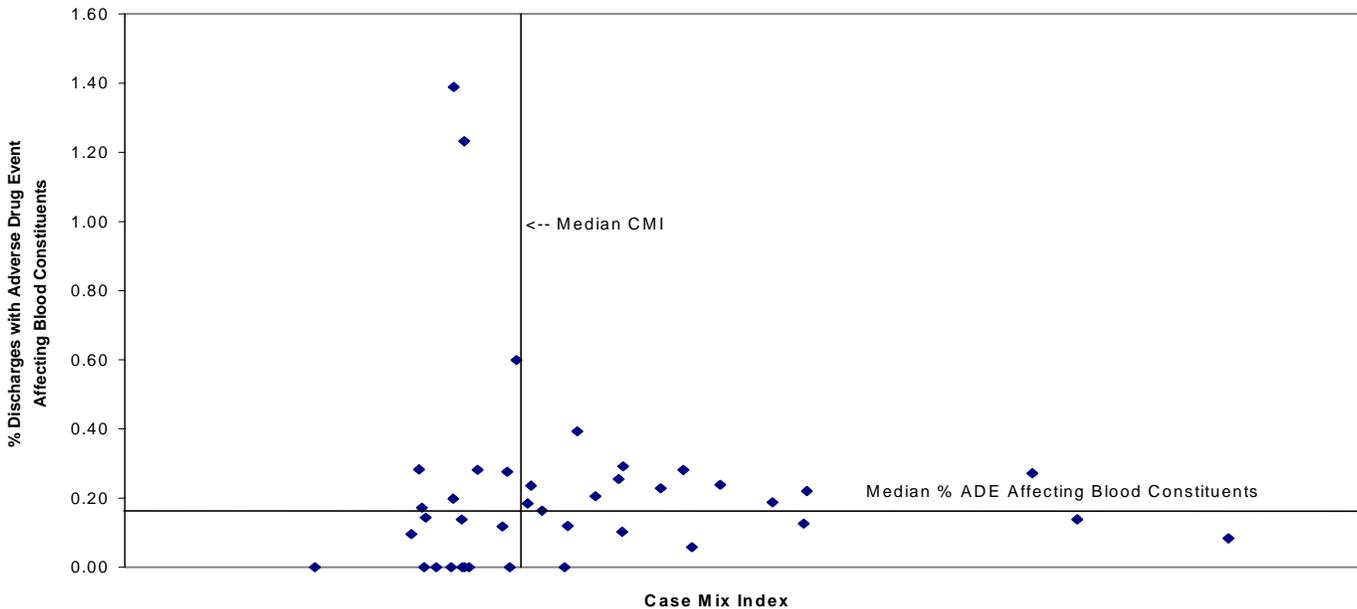


* Veterans' Administration and Primary Children's Hospitals excluded.

Adverse Effects of Agents Primarily Affecting Blood Constituents

The class of ten E-codes in Figures 6 and 7 indicates an adverse event of a drug affecting blood constituents in therapeutic use. This type of code indicates that the correct drug was administered in a therapeutic dosage. While use of this code would be expected to be fairly specific for an ADE, chart review will investigate: 1) how many of these codes indicate events that patients arrived with, and 2) how many of these events are not being coded. Included in this class are anticoagulants such as heparin and warfarin (Coumadin®). Anticoagulants are one of the drug types more frequently associated with ADEs and are of increasing interest to researchers and practitioners.

Figure 7
Percent of Discharges with Adverse Drug Event Affecting Blood Constituents by Hospital Inpatient Case Mix Index: Utah, 40* Acute Care Hospitals, 2000



*Veterans' Administration Hospital excluded.

Source: Utah Hospital Discharge Database, 2000, Utah Department of Health.

**TABLE
2**

Numbers and Percentages of Hospital Discharges
by the ICD-9-CM Potential Adverse Drug Event Class
Utah Acute Care Hospital Inpatient Discharges, 2000

ICD-9-CM Potential Adverse Drug Event Class	No. of discharges	% of all discharges
Total Discharges With Adverse Drug Events	7,210	3.064
1 Drug psychoses	671	0.285
2 Dermatitis	537	0.228
3 Maternal causes of perinatal morbidity and mortality, drug reactions	28	0.012
4 Rash, spontaneous ecchymoses	488	0.207
5 Poisoning by antibiotics and other antiinfectives	22	0.009
6 Poisoning by hormones and synthetic substitutes	42	0.018
7 Poisoning by primarily systemic agents	60	0.026
8 Poisoning by agents primarily affecting blood constituents	18	0.008
9 Poisoning by analgesics, antipyretics, antirheumatics	363	0.154
10 Poisoning by anticonvulsant and anti-Parkinsonian drugs	70	0.03
11 Poisoning by sedatives and hypnotics	94	0.04
12 Poisoning by other CNS depressants, stimulants, anesthetics,...	73	0.031
13 Poisoning by psychotropic agents	454	0.193
14 Poisoning by other agents	222	0.094
15 Adverse effects of antibiotics and other antiinfectives	472	0.201
16 Adverse effects of hormones and synthetic substitutes	589	0.25
17 Adverse effects of primarily systemic agents	546	0.232
18 Adverse effects of agents primarily affecting blood constituents	454	0.193
19 Adverse effects of analgesics, antipyretics, antirheumatics	1,051	0.447
20 Adverse effects of anticonvulsant and anti-Parkinsonian drugs	134	0.057
21 Adverse effects of sedatives and hypnotics	156	0.066
22 Adverse effects of other CNS depressants, stimulants, anesthetics,...	202	0.086
23 Adverse effects of psychotropic agents	270	0.115
24 Adverse effects of agents primarily affecting the cardiovascular system	488	0.207
25 Adverse effects of other drugs, biological, medicinal substances...	718	0.305
26 Poisoning (undetermined whether accidentally or purposely inflicted)	103	0.044

Source: Utah Hospital Discharge Database, 2000, Utah Department of Health

Undertaking Study

Conducting medical chart review to validate the ICD-9-CM adverse event codes

Supported by the AHRQ grant (U18 HS11885) and contracted with the UDOH, *HealthInsight* is conducting medical chart reviews among the participating hospitals in Utah. This chart review will consist of two phases: 1) initial nonphysician chart review and 2) subsequent physician chart review of selected cases. **The physician review is designed such that the review will be conducted at a central location (*HealthInsight*) in order to maintain confidentiality standards and ensure quality and standardization of the review process.**

The chart review will provide information for the State and each participating hospital to know following issues:

- Can the hospital discharge data be used for detecting hospital adverse events?
- What proportion of the adverse events identified by the ICD-9 codes occurred prior to the hospital admission?
- What proportion of adverse events that occurred in hospitals was not captured in hospital discharge data?
- What coding improvements for patient safety can be made?

Based on the results of the chart review, the UDOH will adjust the method of reporting adverse events using the hospital discharge data.

Acknowledging the Project's National Expert Panel

The ICD-9-CM classification of adverse events is defined by a national expert panel. The panel includes 29 experts with multiple specialties (physicians, pharmacists, medical record specialists and patient safety researchers). A total of 1,192 ICD-9 codes were initially reviewed. The 24 experts rated each code in three dimensions: medical care/causality, patient harm, and preventability. The final list includes 1,003 codes which are grouped into 66 adverse event classes for analysis.

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“The beauty of this [report] is to illustrate that we are trying to take administrative data that you [hospitals] have built in, and turn that into pertinent information, at no extra effort from the hospitals.”

Kim Bateman, MD, Physician Representative
Utah Health Data Committee, *HealthInsight*

Acknowledgments

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Utah Department of Health
HealthInsight
UHA, Utah Hospitals and Health Systems Association
University of Utah, Department of Medical Informatics
LDS Hospital, Intermountain Health Care
Missouri Department of Health and Senior Services
Missouri Patient Care Review Foundation
University of Missouri – Columbia, School of Medicine

This update was prepared by Heidi Bergvall, Paul Hougland, Carol Masheter, Luis Paita, Scott D. Williams, and Wu Xu. We would also like to thank the UHA ADE Pharmacists Group and the Utah Health Data Committee for their help with reviews.

For more information about this update, contact Dr. Paul Hougland at the Office of Health Care Statistics, Utah Department of Health at (801) 538-6353 or HealthCareStat@utah.gov.

For more copies of this update, please go to http://health.utah.gov/hda/patientsafety/PS_V101.pdf.

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