The 2002 Report on the Findings of Rating The Utah/Missouri ICD-9-CM Adverse Event Codes

The Expert Panel for Classification of Adverse Event ICD-9-CM Codes
UT/MO Patient Safety Project
AHRQ Patient Safety Grant #U18 HS11885

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[Note: Please Contact Wu Xu at 801-538-7072 or wxu@utah.gov for use or citation of this document and the ICD-9-CM Adverse Event Classification]

I. Purpose of Establishing an expert panel:

To refine and finalize the classification of adverse events identified by ICD-9-CM N- and E-codes for the Utah/Missouri Patient Safety Project. This classification will be used as part of project's chart review criteria, training materials for participating hospitals in Utah and references for other interested organizations that have statewide hospital discharge databases.

The panel is fully aware of the limitations of using the ICD-9-CM to detect adverse events. However, since the ICD-9-CM is the only available coding scheme for all hospitals, the panel believes that this classification effort has its practical merit.

II. Definitions of Adverse Events:

We will focus on hospital-detected adverse events. Injury caused by previous hospitalization will be tracked for detecting and surveillance purposes. Intervention will only focus on injuries that occurred during the current admission. The ICD classification will not be able to capture near misses.

Adverse event: In the UT/MO patient safety project-the expert panel rating, 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 patient's underlying disease process; and where such injury occurs during an inpatient hospital stay (i.e., subsequent to admission) and results in or leads to patient harm.

Patient harm: death, prolonged hospital stay, or temporary or permanent impairment of body function or structure to a patient. Potential harm will not be measured in this project. The seriousness of harm should require interventions such as (1) a change in monitoring the patient's condition; (2) a change in therapy; or (3) active medical or surgical treatment or attention, if an intervention is feasible or possible.

Preventability: The panel has had heated debate on this issue. No commonly agreeable definition has been formulated.

Panelists' discussion on the concepts and definitions will be summarized in the report later.

III. Sources for the Initial List of ICD-9-CM Codes and Sub-Lists

The initial list of 974 codes representing potential AEs was assembled based on the following literature and researches in progress. This list was split into smaller sub-lists with each list containing a majority of codes in one of the following areas – codes representing medical events, surgery related events, and adverse drug events.

An additional 118 codes, primarily representing OB/GYN and its procedure related events, were proposed to be added to the initial list. As such, another sub-list, containing codes related to these areas, was compiled.

Sources for the Selected ICD-9 Codes as Adverse Events

1. Utah Department of Health. 2001. Adverse Events Related to Medical Care, Utah: 1995-99. (Robert Rolfs' list) (AHRQ Grantee).

2. Jonathan Nebeker and John Hurley, Internal research list for potential adverse drug event codes, VA Medical Center in Salt Lake City, Utah. (VA grantee).

3. Wisconsin Employers Alliance. Quality Counts Technical Report on the Safety of Hospital Care Report ™ (consists of data for 1999 and 2000 from the Bureau of Health Information's (BHI) inpatient public use data sets) (Internal Document).

4. Peter Layde. Forthcoming. Wisconsin Medical Injury Reporting System (WMIRS) Categorization. Medical College of Wisconsin (AHRQ grantee) (Research in Progress. Internal Document)

5. UCSF-Stanford Evidence-Based Practice Center, Forthcoming. Evidence Report for Measures of Patient Safety based on Hospital Administrative Data – The Patient Safety Indicators (Draft report under review. Internal Document) (AHRQ grantee)

6. Matthew Samore, List of ICD-9 Adverse Device Event Codes. University of Utah. (Research in Progress. Internal Document) (FDA grantee).

7. Missouri Department of Health Patient Safety Team. Proposed ICD-9 Adverse Event Codes (AHRQ grantee).

8. McCarthy EP, Iezzoni LI, Davis RB, Palmer RH, Cahalane M, Hamel MB, et al. Does Clinical Evidence Support ICD-9-CM Diagnosis Coding of Complications? MedCare 2000;38(8):868-876.

9. Lawthers AG, McCarthy EP, Davis RB, Peterson LE, Palmer RH and Iezzoni LI. Identification of In-Hospital Complications from Claims Data: Is It Valid? MedCare 2000; 38(8):785-795.

10. Geraci JM, Ashton CM, Kuykendall DH, Johnson ML and Wu L. International Classification of Diseases, 9th Revision, Clinical Modification Codes in Discharge

Abstracts are Poor Measures of Complication Occurrence in Medical Inpatients. MedCare 1997; 35(6):589-602.

11. Tpouzis F, Yu F, Coleman AL. Factors associated with elevated rates of adverse outcomes after cyclodestructive procedures vs. drainage device procedures. Ophthalmology. 1998, 105(12):2276-81.

IV. Background on the Expert Raters

Twenty-three expert raters completed and returned the lists. This group consisted of fifteen physicians, four medical record coders, three pharm D's, and one attorney. The physicians' breakdown by specialty was as follows:

Three family practice
Two epidemiologists
Two cardiologists
Two obstetrician/gynecologists
One internist
One pathologist
One surgeon
One geriatric physician
One critical care pediatrician
One psychiatrist

In addition to the above panelists there were three non-responders.

Each panelist received a ninety-minute telephone orientation at one of five orientation sessions. Each panelist was asked to rate each code on three scales – medical care/causality, harm, and preventability. The definition and rating instruction were discussed at the orientations. Following is the one page ratings reference sheet that accompanied each list.

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Quick Reference for Rating ICD-9-CM Codes

Adverse event: 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 patient's underlying disease process; and where such injury occurs during an inpatient hospital stay (i.e., subsequent to admission) and results in or leads to patient harm.

Patient harm: death, prolonged hospital stay, or temporary or permanent impairment of body function or structure to a patient. Potential harm will not be measured in this project.

When evaluating a code, assume it is a secondary diagnosis code.

Dimension One - Medical Care/Causality:
· Rate each ICD-9-CM code as a possible adverse event due to medical care (or omission of care) as follows:

5 = Very likely an AE due to care rather than underlying disease

4 = Likely an AE due to care rather than underlying disease
3 = Care and disease equally likely as cause of AE
2 = Likely not an AE (rather, caused by underlying disease) **(enter this number and skip to next ICD-9-CM code)**
1 = Very likely not an AE (rather, caused by underlying disease) **(enter this number and skip to next ICD-9-CM code)**
9 = Outside area of expertise **(enter this number and skip to next ICD-9-CM code)**

Dimension Two - Patient Harm:
· If the rating score for Medical Care is 1 or 2, skip this rating
· Rate the likelihood that this adverse event would lead to patient harm (death, prolonged hospital stay, or impairment of body function or structure to a patient requiring some intervention):

5 = Very likely
4 = Likely
3 = Possibly
2 = Unlikely
1 = Very unlikely
9 = Outside area of expertise

Dimension Three - Preventability:
· If the rating score for Medical Care is 1 or 2, skip this rating.
· Rate the likelihood that this adverse event could be prevented given currently available medical therapies and care processes:

5 = Very likely
4 = Likely
3 = Possibly
2 = Unlikely
1 = Very unlikely
9 = Outside area of expertise

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V. Analysis of Panelists' Ratings

Overview:

- The codes were rated on each axis on a 1 to 5 scale, with 9 available to indicate outside the panelist's area of expertise.

- Each code was rated by at least three or maximum nine panelists.

- Out-range rating scores were verified and edited. There were two types of patterns where panelists deviated from the rating instructions:

    1) Isolated mistakes (occurring in four codes or less).
    2) Systematic skipping issues (The Medical Care field was rated 1, 2 or 9 and instead of skipping to the next ICD-9 code, the Harm and/or Preventability fields were rated as well)

- The panel chair, vice chair, and two expert panelists provided advice to staff in the analysis.

- Median, Mean, and Range for Medical Care, Harm, and Preventability are calculated for each code.

- Table 1 reports the descriptive statistics for Median scores for each axis.

Table 1. Descriptive Statistics on Ratings' Median of Medical Care, Harm, and Preventability

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Medical Care Median	1091	4.00	1.00	5.00	3.9675	1.23912	-.717	.074
Harm Median	1069	2.00	3.00	5.00	4.0702	.69794	-.160	.075
Prevent Median	1069	3.00	2.00	5.00	3.4677	.57665	.911	.075
Valid N	1069							

Medical Care Rating as the Key Screening Criterion:

- Initial analysis focused on median of medical care/causality for each code.

  - There were 863 codes with median of medical care/causality of 3.0 or greater. These codes were kept on the list.

  - There were 26 codes with median of medical care/causality less than 2.0. These codes were removed from the list.

  - There were 202 codes with median of medical care/causality greater than or equal to 2.0 but less than 3.0. These codes remain under consideration.

- Advised by four panelists in the verification group, approximately 138 codes with a median under 3.0 are currently kept on the list.

For detailed lists of the codes, along with the analysis of the expert panelists' ratings for each code, please see the two excel files:

AE_Keep_032502	Codes proposed to remain on the list
AE_NotKeep_032502	Codes proposed to be removed from the list

Analysis of Median for Patient Harm by Likelihood of Adverse Event Due to Medical Care

Table 2. Distribution of Median for Patient Harm by Level of AEs Due to Medical Care

Median for Due to Medical Care	Median For Patient Harm Ratings	Count	%
1.00= Very unlikely	5.00	13	1.2%
1.50	4.75	15	1.4%
2.00=Unlikely	5.00	175	16.0%
2.50	4.00	27	2.5%
3.00=Equally Likely	4.00	133	12.2%
3.50	4.00	16	1.5%
4.00=Likely	4.00	127	11.6%
4.50	4.50	25	2.3%
5.00=Very Likely	4.00	560	51.3%
Total	4.00	1091	100.0%

- Regardless the likelihood of medical care as a cause, panelists rated the likelihood of harm for patient as "likely (score=4)" or higher.

Analysis of Median for Preventability by Likelihood of Adverse Event Due to Medical Care

Table 3. Distribution of Median for Patient Harm by Level of AEs Due to Medical Care

Median for Due to Medical Care	Median For Preventability	Count	%
1.00= Very unlikely	5.00	13	1.2%
1.50	4.75	15	1.4%
2.00=Unlikely	4.50	175	16.0%
2.50	4.00	27	2.5%
3.00=Equally Likely	4.00	133	12.2%
3.50	3.90	16	1.5%
4.00=Likely	4.30	127	11.6%
4.50	4.30	25	2.3%
5.00=Very Likely	4.00	560	51.3%
Total	4.00	1091	100.0%
Total	4.00	1091	100.0%

- Regardless the likelihood of medical care as a cause, panelists rated preventability of an AE as "likely (score=3.9)" or higher.

VI. Codes that were removed from list for reasons other than panelists' ratings:

- Ventilation pneumonitis: 495.7 – This code represents pneumonitis due to air conditioning organisms (rather than pneumonitis associated with a ventilator). This code was removed from the list.

- Two four digit codes were included along with their five digit counterparts. As these four digit codes can not be used since a more specific code is available, they were removed from the list. These codes were:

    - 283.1 Non-autoimmune hemolytic anemias
    - 787.0 Nausea and vomiting

VII. Panelist Comments on the Specific Codes

- Streptococcal septicemia (038.0)– **not necessarily starting as inpatient problem**

- Hypoglycemic coma (251.0), drug induced diagnoses (292.11, 292.12, 292.2, 292.81, 292.83, 292.84, 292.89, 292.9), neuroleptic malignant syndrome (333.92), reaction to spinal/lumbar puncture (349.0), polyneuropathy due to drugs (357.6) – **equal likelihood of outpatient treatment as cause**

- Cushing's syndrome (255.0) – **not due to hospital care**

- Infection of tracheosotomy – **developing before on after hospitalization?**

- Infection of gastrosotomy – **Was gastrostomy done this admit?**

- Closure of laceration of liver (50.61) – **Likely to be external trauma**

- Iatrogenic pulmonary embolism and infarction vs other pulmonary embolism and infarction (415.11, 415.19) – **how do you know it is iatrogenic vs not?**

- Complications from devices, procedures (60 codes) - **Just don't treat the patient and it cannot happen**

- Other specified complications (999.89), Unspecified complication of procedure, not elsewhere classified (998.9), Accidental cut, puncture, perforation, or hemorrhage during other specified medical care (E870.8), Accidental cut, puncture, perforation, or hemorrhage during unspecified medical care (E870.9) –

What magnitude?

- Nausea and vomiting (787.0) - **not a complete code needs a 5th digit: see next three codes** [This code was subsequently removed from the proposed list.]

- Accidental poisoning (E850-E858) - **assumes these are accidental (eg a child gets into a bottle) or intentional and that such actions are beyond the scope of the health care system: a point that is quite debatable.**

- Suicide and self-inflicted poisoning (E950) - **How does this differ from accidental poisoning? It is a debatable point, but many people would consider these unavoidable, as they occur outside the scope of the health care system. Others, however, would argue**

that an effective health care system should be able to pre-identify these situations and take steps (eg child-proof caps) that prevent or mitigate them.

VIII. Adverse Event Classes

There will be two samples of charts during chart review: the flagged sample (each chart will have at least one potential AE code) and the unflagged sample. For each sample, 1800 charts will be pulled.

As the preliminary list of codes numbered almost 1100, pulling charts at the individual code level (as well as reporting results of the chart review solely at the code level) did not seem feasible.

As such, the adverse event codes have been grouped into classes of similar codes for sampling, analysis, and reporting.

Below is the analysis of panelists' medical care rating for codes grouped into the proposed AE classes. For more detailed descriptions of the classes along with the codes included in each class, please see the excel file named "listofAEclasses".

Table 4. Descriptive Statistics of Median for Medical Care by AE Class

AE Class	Count	Median of M_care Median	Mean of M_care Median	Standard Deviation	Range of M_care Median	Col %
1 Reopening of surgical site, control of post-procedure hemorrhage	14	3.5	3.75	0.64	2	1.40%
2 Infections	65	2	2.56	0.73	2	6.50%
3 Perforation or laceration	20	4	4.03	0.92	3	2.00%
4 Endocrine disorders	7	2.5	2.21	0.7	2	0.70%
5 Metabolic/immunity disorders	10	2.5	2.7	0.54	1.5	1.00%
6 Anemias, coagulation defects, hemorrhagic conditions	8	2	2.25	0.38	1	0.80%
7 Drug psychoses	10	4.5	4.35	0.91	3	1.00%
8 Disorders of nervous system	10	3.25	3.55	0.64	1.5	1.00%
9 Acute myocardial infarction	20	2	2	0	0	2.00%
10 Pulmonary embolism	2	4	4	1.41	2	0.20%
11 Heart disease	3	3	3	1	2	0.30%
12 Diseases of veins and lymphatics	11	3	3.32	0.6	2	1.10%
13 Respiratory system diseases	12	3	3	0.88	3	1.20%
14 GI system diseases	49	2	2.44	0.73	2	4.90%
15 Urinary system disorders	6	3	3	0	0	0.60%
16 Labor and delivery complications	97	4	3.59	0.61	2	9.70%
17 Complications of puerperium	24	3	2.63	0.65	2	2.40%
18 Dermatitis	5	4.5	4.3	0.84	2	0.50%
19 Decubitus ulcer	1	2.5	2.5 .		0	0.10%
20 Urticaria	4	3	3	0	0	0.40%

21 Maternal causes of perinatal harm, newborn drug reactions	4	5	5	0	0	0.40%
22 Mental status alterations	5	2	2	0	0	0.50%
23 Rash, ecchymoses	2	2.5	2.5	0.71	1	0.20%
24 Epistaxis, throat hemorrhage	2	3	3	0	0	0.20%
25 Shock	3	3	3	0	0	0.30%
26 Hemoptysis	1	3	3 .		0	0.10%
27 Sudden death	2	3	3	0	0	0.20%
28 Respiratory arrest	1	3	3 .		0	0.10%
29 Poisoning by antibiotics	22	5	5	0	0	2.20%
30 Poisoning by hormones	11	5	5	0	0	1.10%
31 Poisoning by primarily systemic agents	9	5	5	0	0	0.90%
32 Poisoning by agents affecting blood constituents	11	5	5	0	0	1.10%
33 Poisoning by analgesics, antipyretics, antirheumatics	20	5	5	0	0	2.00%
34 Poisoning by anticonvulsant, anti-Parkinsonian drugs	7	5	5	0	0	0.70%
35 Poisoning by sedatives and hypnotics	18	5	5	0	0	1.80%
36 Poisoning by other CNS depressants, stimulants, nervous system agents	16	5	5	0	0	1.60%
37 Poisoning by psychotropic agents	20	5	5	0	0	2.00%
38 Poisoning by other agents	90	5	5	0	0	9.00%
39 Certain adverse effects not elsewhere classified	6	4.25	4.08	0.92	2	0.60%
40 Complications peculiar to specified procedures	57	5	4.7	0.46	1	5.70%
41 Complications affecting specified body systems	13	5	4.35	0.88	2.5	1.30%
42 Other complications of procedures	13	4	4.04	0.52	2	1.30%
43 Complications of medical care, not elsewhere classified	10	5	5	0	0	1.00%
44 Accidental cut, puncture, perforation, or hemorrhage	11	5	5	0	0	1.10%
45 Other misadventures of surgical and medical care	51	5	5	0	0	5.10%
46 Surgical operation/procedure as cause of abnormal reaction/complication	9	4	4.06	0.39	1.5	0.90%
47 Other procedures without mention of misadventures	10	4.5	4.5	0	0	1.00%
48 Accidental falls	8	4	4.06	0.18	0.5	0.80%
49 Adverse effects of antibiotics	20	5	5	0	0	2.00%
50 Adverse effects of hormones	10	5	5	0	0	1.00%
51 Adverse effects of primarily systemic agents	8	5	5	0	0	0.80%
52 Adverse effects of agents affecting blood constituents	10	5	5	0	0	1.00%

53 Adverse effects of analgesics, antipyretics, antirheumatics	10	5	5	0	0	1.00%
54 Adverse effects of anticonvulsant, anti-Parkinsonian drugs	5	5	5	0	0	0.50%
55 Adverse effects of sedatives and hypnotics	9	5	5	0	0	0.90%
56 Adverse effects of other CNS depressants, stimulants, agents	18	5	5	0	0	1.80%
57 Adverse effects of psychotropic agents	10	5	5	0	0	1.00%
58 Adverse effects of agents affecting the cardiovascular system	10	5	5	0	0	1.00%
59 Adverse effects of other agents	61	5	5	0	0	6.10%
60 Suicide and self-inflicted injury	13	4	4.46	0.52	1	1.30%
61 Homicide, injury purposely inflicted by other persons	2	5	5	0	0	0.20%
62 Poisoning (undetermined whether accidental or purposeful)	7	5	5	0	0	0.70%
Total	1003	5	3.96	1.24	4	100.00%

APPENDIX A: Membership for the Expert Panel

Utah/Missouri Patient Safety Project (AHRQ #U18 HS11885)

Principal Investigator: Scott D. Williams, MD, MPH, Utah Dept. of Health
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