

Surveillance of Surgery-Related Events in Missouri Using ICD-9-CM Codes

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BACKGROUND AND METHOD

- Utah and Missouri departments of health cooperated to design surveillance systems for adverse events (AEs) that relied on statewide hospital discharge databases.
- Missouri focused on surgery-related AEs, due to their prevalence and the successful identification of surgical complications by ICD-9-CM codes in prior studies.
- A non-random, convenience sample (N=36) of Missouri's 123 acute care hospitals, reflecting varying geographic location and hospital size, participated in a chart review study.
- The purpose of the study was to assess the Predictive Value Positive (PVP) of 23 classes of 377 ICD-9-CM codes for identifying surgery-related AEs.
- A list of diagnosis, procedure and E-codes was developed with input from an expert panel and grouped into 23 categories by medical epidemiologists.
- Hospital inpatient records with surgical DRGs and the ICD-9-CM codes of interest (flag codes) were sampled in proportion to the frequency of records in each class, with a second stratification by hospital to avoid an overly large volume of medical record requests for any given hospital.
- The Utah and Missouri Consortium members jointly developed the medical chart abstraction form. Nurses were recruited and specially trained to perform the medical record reviews for this project by the Missouri Medicare Quality Improvement Organization (MissouriPRO).
- Information on up to three AEs was entered into a laptop using an electronic data collection tool developed by the MissouriPRO for this project. The tool allowed the nurse to relate the AEs to the diagnoses, procedures and E-codes on the hospital discharge record and to enter any additional diagnoses, procedures and E-codes that would help describe the AEs.

DEFINITION OF SURGERY-RELATED AE

Undesirable and unintended injury/harm*

- o resulting from care management (an act of care provided by the hospital, or the omission of necessary care), rather than the patient's underlying disease process**
- o where such injury/harm occurs during the current inpatient hospital stay
- o and was judged to be related to the surgery, either to pre-operative care, the surgery itself, or post-operative care.

*An event with a score greater than zero on the Harm Rating Scale

** An event with a score of at least 4 on the Care Management Causation Rating Scale

HARM RATING SCALE

No clinical change/no apparent injury (0)
No additional lab or diagnostic tests ordered (0)

Minor change in condition, single lab or diagnostic test ordered (1)
Increased observation required for side effects (1)

Vital signs changed (2)
Additional or change in medications, diagnostics or treatment required (2)
Decreased level of consciousness (2)
Multiple lab or diagnostic tests needed for follow-up (2)

Cardiac changes requiring intervention (3)
Hospital acquired fracture (3)
Bleeding requiring intervention (3)
Transfer to higher level of care (3)
Lab values changed to critical values (3)
Unplanned surgical procedure due to complications (3)
Length of stay increased (3)

Residual physical impairment (4)
Cardiac/respiratory arrest/failure/placed on respirator (4)
Critical lab values become more critical (4)

Death (5)

CARE MANAGEMENT CAUSATION RATING SCALE

- (1) Virtually certain evidence for disease causation
- (2) Moderate/strong evidence for disease causation
- (3) Disease causation more likely than care management
- (4) Care management causation more likely than disease
- (5) Moderate/strong evidence for care management causation
- (6) Virtually certain evidence for care management causation

RESULTS

ICD-9-CM Code-Identified Adverse Events Confirmed by Medical Record Abstraction

Adverse Event Class Number and Label	Codes	PVP*: Post-Admit AE	PVP*: Surgery AE	Pre-Admit Event	No AE
	N	%	%	%	%
1 Reopen Surgical Site	44	39	36	18	43
2 Control Post-Procedure Hemorrhage	27	48	48	15	37
3 Perforation or Laceration	27	56	52	15	30
4 Septicemia, Bacteremia	41	20	02	15	66
5 Pneumonia	52	48	42	13	38
6 Other Infections	61	33	21	20	48
7 Acute Myocardial Infarction	43	40	35	14	47
8 Pulmonary Embolism & Infection	28	46	43	04	50
9 Heart Disease	25	32	24	04	64
10 Diseases of Veins & Lymphatics, Circ. System	43	42	37	12	47
11 Diseases of Respiratory System	62	44	29	08	48
12 Acute GI Ulcer, GI Bleed, Other GI Disorders	41	22	15	15	63
13 Postoperative GI Disorders	27	33	33	19	48
14 Nausea, Vomiting, Diarrhea	59	51	46	07	42
15 Disorders of Urinary System	39	26	18	08	67
16 Complications Peculiar to Specified Procedures	44	30	25	16	55
17 Complications Affecting Specified Body Systems	61	61	57	03	36
18 Other Complications of Procedures	65	69	62	09	22
19 Complications of Medical Care, NEC	26	54	23	08	38
20 Accidental Cut, Puncture, Perforation or Hemorrhage	68	78	69	01	21
21 Other Misadventure of Surgical and Medical Care	28	61	46	00	39
22 Surgery as Cause of Abnormal Reaction or Later Complication, w/o Mention of Misadventure	56	50	48	07	43
23 Other Procedures as Cause of Abnormal Reaction or Later Complication, w/o Mention of Misadventure	57	46	35	09	46
Total Codes and Average Percent	1024	45	37	11	45
Total Records	941				

* PVP – predictive value positive

- The best performing class was Class 20 - Accidental Cut, Puncture, Perforation or Hemorrhage; 69 percent of the codes in this class were verified by chart review as flag codes for a surgical AE.
- The other class with a PVP above 60 percent was Class 18 - Other Complications of Procedures.
- The 23 classes had an average PVP of 37 percent for identifying surgical AEs.

CONCLUSION

The 23 classes need further refinement before being used in a statewide surveillance system for surgical AEs. While several individual ICD codes had stand-alone strength, the poor performance of other codes within the same class lowered the PVP for some classes. A second chart review study focusing on specific codes will facilitate the refinement of the AE code classification.

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