Utah Statewide Surveillance of Medical Injuries

Wu Xu[1,4], Steven Pickard[1], Paul Hougland[1], Steve Donnelly[2], Jonathan Nebeker[3,4]
Matthew Samore[3,4], Michael Silver[2], Carol Masheter[1], and Scott D. Williams[1,4]

[1] Utah Department of Health, [2] *HealthInsight,* [3] Geriatric Research, Education, and Clinical Center, VA Salt Lake City Health Care System, [4] University of Utah School of Medicine

APPLIED RESEARCH QUESTIONS

State public health agencies are accountable for surveillance of medical injuries. They are also regulators and implementers for statewide improvement. This study addresses the following practical questions to support the states' decisions in patient safety initiatives:

1. Should medical injuries be a priority issue for public health in our own state?
2. Who would be the most effective partners for preventing medical injuriess at the initial stage?

DEFINITION, DATA AND METHOD

This analysis focused on adverse events (AEs), defined as undesirable and unintended injuries that resulted from a medical intervention and caused patient harm. AEs are grouped into three categories: adverse drug events (ADEs), surgery-related AEs, and medical/other treatment-related AEs.

A stratified random sample of 1,962 medical charts for hospitalizations in 2001 from all 41 acute care hospitals in Utah was studied. Charts from small rural hospitals and charts with a length of stay greater than three days were over-sampled.

The chart review instrument was a modified version of the tool developed by the previous Harvard Medical Practice and Utah/Colorado studies. Trained nurses were the primary reviewers of the medical charts. Blinded to the nursing results, trained physicians re-examined 153 of the nurses-reviewed charts. The physician sample was randomly selected from strata defined by the "causality scores" of nurse detected AEs. The Kappa coefficient for physician and nurse review results at the chart level was 0.58 for inpatient adverse events and 0.36 for adverse events causing admission. With additional information from the death certificates, a research physician verified all adverse deaths identified by nurse and physician reviewers.

This study describes statewide incidence, incidence rates, and proportion of adverse events by hospital characteristics. Sample weights were applied to the population estimates to adjust for the sampling strategy.

FINDINGS

Table 1. Statewide Estimates of Iatrogenic Adverse Events Among Utah Acute Care Hospitals, 2001

Type of Adverse Events	Sample: No. of Discharges*	Sample: No. of Events**	Weighted Population Estimates: Estimated No. of Discharges N	95% CI	Estimated % of Discharge	Estimated AE Rate per 1,000 Inpatient Days
All Adverse Events						
Causing Admission***	254		25,918	(21822-30014)	10.8%	
Acquired in Hospital	403	606	41,977	(36941-47012)	17.6%	47.4
Number of Patients Died Due to AEs	5		407	(9-806)	0.17%	0.46
Adverse Drug Events						
Causing Admission***	91		9,119	(6657-11580)	3.8%	
Acquired in Hospital	218	264	22,786	(19118-26454)	9.5%	25.7
Surgery-related Adverse Events						
Causing Admission***	84		9,463	(6928-11998)	4.0%	
Acquired in Hospital	137	182	15,340	(12290-18388)	6.4%	17.3
Medical and Others Adverse Events						
Causing Admission***	79		7,336	(5264-9408)	3.1%	
Acquired in Hospital	125	160	11,942	(9404-14480)	5.0%	13.5
Total Number of Sample or Population	1,962		239,051		100%	885,312

Sources: The Utah Patient Safety Chart Review Data - 2001 Sample One. Utah Hospital Inpatient Discharge Data, 2001.
* One discharge may have two or more types of AEs.
** Each AE is classified into one of AE types in the following hierarchy: ADE, surgery, and medical/other AEs.
*** Only one AE that caused admission was recorded per medical chart.

Medical injuries are top leading causes of death and hospitalization in Utah in 2001:

- On average, 18 adverse events occurred among every 100 hospitalizations.
- Approximately 11% of patients (n=25,918) arrived at hospitals with iatrogenic injuries, which could be ranked between the fourth to seventh leading reason for hospitalization.
- Estimated number of iatrogenic adverse events was 407 in 2001. Fatal medical injuries could be the 4th highest leading cause of death (n=806) or, at least, the 30th leading cause of death (n=9).
- Adverse drug events made up 45% of total estimated adverse events among all of Utah's acute care hospitals.

Utah Leading Reasons for Hospitalization and Estimated Adverse Events Causing Admission, 2001

Rank	Leading Reasons for Hospitalizations by Major Diagnosis Category (MDC)	Number of Discharges
1	Pregnancy, Childbirth & Puerperium	49,198
2	Newborn & Other Neonates (Perinatal Period)	47,951
	Adverse Events Causing Admission (95% CI HL)	30,014
	Adverse Events Causing Admission (Estimate)	25,918
3	Circulatory System	21,899
	Adverse Events Causing Admission (95% CI LL)	21,822
4	Musculoskeletal System & Connection Tissue	19,489
5	Digestive System	15,543
6	Respiratory System	15,186

Sources: Utah Hospital Inpatient Discharge Database and Table 1.

Utah Leading Causes of Death and Estimated Adverse Deaths in Hospitals, 2001

NCHS Defined 50 Leading Cause of Deaths	Number of Deaths
1 Diseases of heart	2,875
2 Malignant neoplasms	2,304
3 Cerebrovascular diseases	867
Medical Care Related Adverse Deaths (95% HL)	806
4 Unintentional injuries	631
5 Chronic lower respiratory diseases	522
6 Diabetes mellitus	509
7 Influenza and pneumonia	412
Medical Care Related Adverse Deaths (Estimate)	407
8 Intentional self-harm (suicide)	316
9 Alzheimer's disease	314
10 Nephritis, nephrotic syndrome and nephrosis	177
11 - 28 …	
29 Human Immunodeficiency Virus (HIV) Disease	12
Medical Care Related Adverse Deaths (95% LL)	9

Sources: Utah Vital Statistics System and Table 1.

Supporting patient safety efforts in hospitals with high volume and high acuity patients could lead to major statewide reduction of medical injuries.

- Higher percentages of documented adverse events were detected in hospitals with high acuity case mix index, high volume of admissions, or teaching status, in comparison with the group's share of total discharges.
- In the multivariate ecologic analysis, which is not reported here, hospital case mix index, calculated from the 3M APR-DRG patient severity classification and average hospital charges by APR-DRG, was the only significant predictor for hospital adverse event rate per 100 discharges. Annual volume of admissions was the single strongest predictor for adverse event rates per 1,000 inpatient days when other hospital factors are controlled.

Table 2. Hospital Characteristics and Percentage Ratio of Adverse Events to Discharges: Utah, 2001

Hospital Characteristics	No. of Hospitals	% of AEs	% of Discharges	Ratio of % AE to % Discharge
Acuity Case Mix Index*				
Below State Average	34	34%	52%	0.65
At/above State Averege	6	66%	48%	1.37
Volume of Discharges				
LessThan 5000	25	11%	17%	0.64
5000 to 9999	9	20%	28%	0.70
10000 or More	7	69%	55%	1.26
Teaching Status				
Non Teaching	35	50%	61%	0.82
Teaching Hospital	6	50%	39%	1.28
JCAHO Accredited				
Non-JCAHO	15	2%	5%	0.50
JCAHO	26	98%	95%	1.02
Hospital Location				
Rural	22	11%	18%	0.59
Urban	19	89%	82%	1.09
Ownership Type				
Investor	12	17%	29%	0.58
Government	10	15%	14%	1.10
Not for Profit	19	68%	58%	1.19
Total N	41	63735	239051	

Sources: The Utah Patient Safety Chart Review Data - 2001 Sample One. Utah Hospital Inpatient Discharge Data, 2001. * VA Hospital at Salt Lake City was excluded from the analysis of Case Mix Index due to lack of facility charge data.

DISCUSSION

- Medical injuries have been a missing category in the state public health injury surveillance system. This study established baseline measures of patient safety for state health departments to begin the surveillance.

- The above findings indicate that current patient safety reporting systems in Utah (including reporting via administrative data and sentinel event reporting) suffer from underreporting. Successful attempts to reduce medical injuries will require a variety of systems in order to learn about and prevent these events from occurring.

- The higher rates of AEs seen in high volume hospitals with higher case mix patients could be due to better recognition and documentation of these events. Documented AEs can provide valuable information for designing intervention strategies. Therefore, our view is that to effectively improve patient safety, the states should work with high volume and high case-mix hospitals first.

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