



# Does the Number of Diagnostic Fields in Hospital Administrative Discharge Data Affect its Utility and Validity for Assessing Disparities in Injury Severity?

Sylvia D. Hobbs, MPH<sup>1</sup>, Turner T. Osler, MD<sup>2</sup>, Kevin Kane, MA<sup>3</sup>, Heena P. Santry, MD<sup>3</sup>, Jon Burstein, MD<sup>4</sup>, Frederick H. Millham, MD<sup>5</sup>, Wenjun Li, PhD<sup>3</sup>

<sup>1</sup> Center for Health Information & Analysis, <sup>2</sup>University of Vermont College of Medicine, <sup>3</sup>University of Massachusetts Medical School,

<sup>4</sup>Massachusetts Department of Public Health, <sup>5</sup>Newton-Wellesley Hospital



## Background

Diagnostic fields are commonly used for severity adjustment and examination of anatomic damages when analyzing trauma care outcomes. The AHRQ's HCUP documents significant between state variation in number of diagnostic fields in administrative inpatient hospital discharge databases. It remains unclear how such variations influence the validity and utility of the data for analysis of state-level disparities in the care and outcomes of trauma patients.

**The Definition of Trauma** for the Massachusetts trauma system is tissue injury due to the direct effects of externally applied energy. Energy may be mechanical, thermal, electrical, electromagnetic or nuclear. Burns, isolated smoke inhalation, slip and fall and drowning will be included in the definition of trauma having a principal ICD-9-CM diagnostic code of 800 - 959.9 or 994.1 or 994.7 or 995.55. The **Erwin Hirsch State Trauma Registry** tracks all individuals who meet this definition of trauma and whose injury resulted in a hospital inpatient admission, or observation stay, or transfer patient via air or ground EMS transport from one hospital to another hospital (includes inpatient or observation or emergency department) or death.

**Method:** The Erwin Hirsch State Trauma Registry and administrative hospital discharge records were compared for average number of diagnoses every injured person who received inpatient trauma care from FY2008 to 2011 at any Massachusetts acute care hospital and for a subset by survival status of who received care the highest level of care at a Level One Trauma Center during FY2009 to 2010. The trauma registry sets no limit on number of diagnoses while hospital discharge data sets a limit to 15 diagnoses.

Figure 1. Trauma Center Level comparison of FY2008 through FY2011 Annual Average Number of Diagnoses per Trauma Patient in Inpatient Administrative Discharge Billing Data where record limit is set at 15 diagnoses per patient

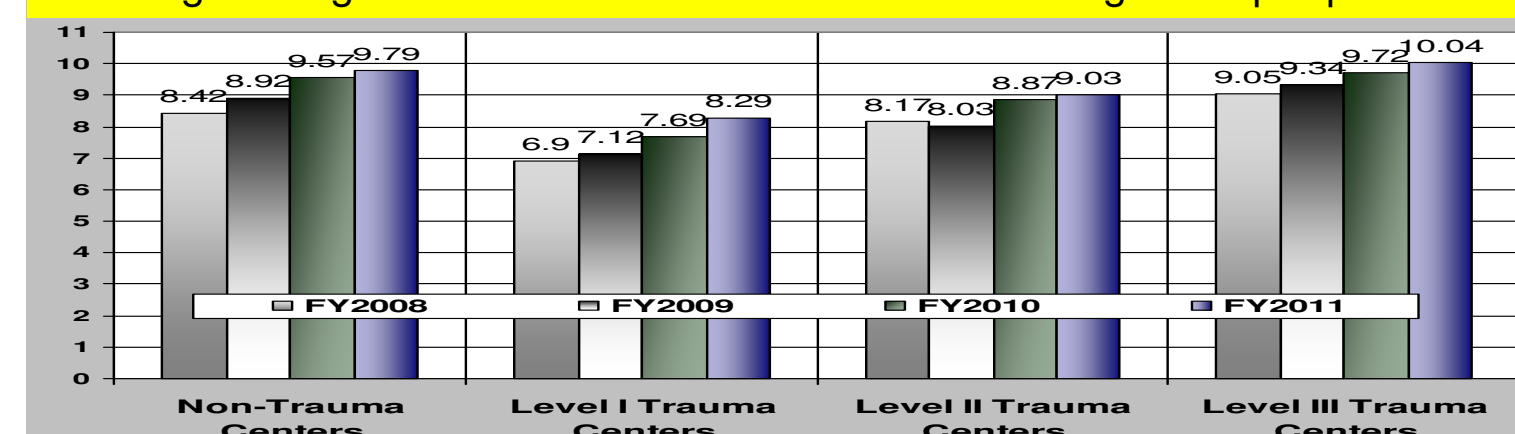


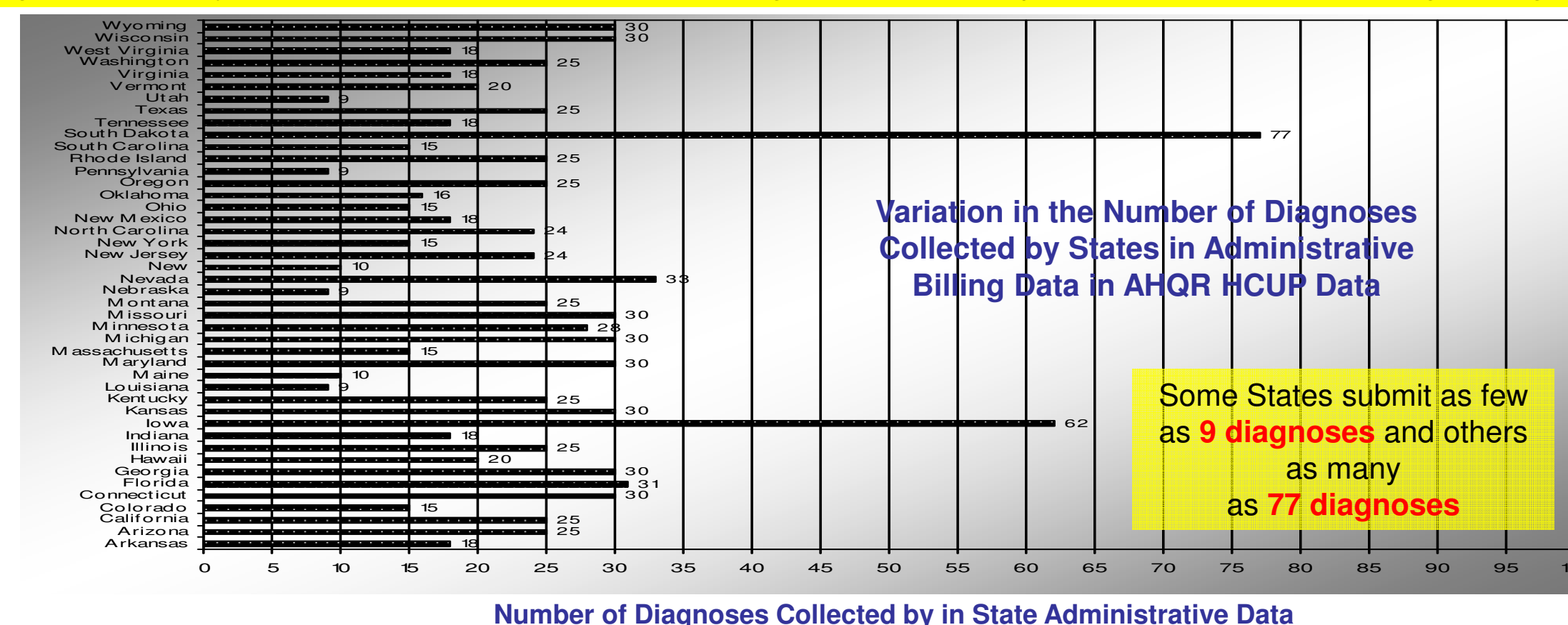
Table 1. Trauma Cases Reaching the Maximum Limit of 15 Diagnoses in Inpatient Discharge Billing Data increased from 10% in 2008 to 20% in 2011

Fiscal Year		FY2008	FY2009	FY2010	FY2011
Non-Trauma Centers	Total Trauma Cases	15604	15599	14681	14998
	Cases at Maximum Limit	1947	2529	2943	3329
	Percent Cases at Max	12.5%	16.2%	20.0%	22.2%
Level I Trauma Centers	Total Trauma Cases	14243	14778	15182	14759
	Cases at Maximum Limit	1215	1515	1986	2378
	Percent Cases at Max	8.5%	10.3%	13.1%	16.1%
Level II Trauma Centers	Total Trauma Cases	2028	2322	2279	2446
	Cases at Maximum Limit	138	163	222	417
	Percent Cases at Max	6.8%	7.0%	9.7%	17.0%
Level III Trauma Centers	Total Trauma Cases	2836	2803	2571	2503
	Cases at Maximum Limit	321	366	490	691
	Percent Cases at Max	11.3%	13.1%	19.1%	27.6%

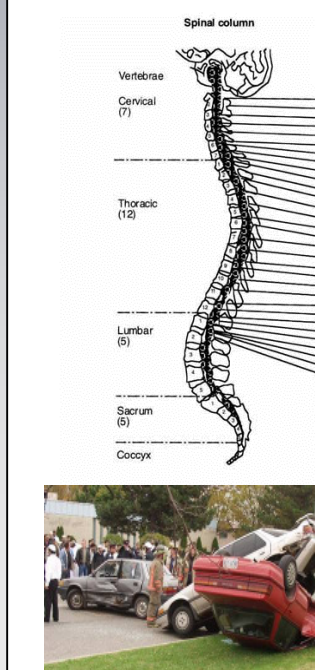
## Comparison of Erwin Hirsch State Trauma Registry Inpatient Diagnoses Volume to Administrative Diagnoses by Patient Survival Status

Diagnosis Code	Diagnosis Description	Percent High TR Coding Compared to Administrative Hospital Discharge (HD)	MARC Severity Dosage	TR Codes	HD Codes
85205	Subarachnoid Hemorrhage Following Injury, Without Mention Of Open Intracranial Wound, With Prolonged (More Than 24 Hours) Loss Of Consciousness, Without Return To Pre-Existing Conscious Level	23.9%	0.6317	114	92
85220	Subdural Hemorrhage Following Injury, Without Mention Of Open Intracranial Wound, With State Of Consciousness Unspecified	46.1%	0.5250	856	586
80025	Closed Fracture Of Vault Of Skull With Subarachnoid, Subdural, And Extradural Hemorrhage, With Prolonged (More Than 24 Hours) Loss Of Consciousness, Without Return To Pre-Existing Conscious Level	11.4%	0.9126	49	44
85305	Other And Unspecified Intracranial Hemorrhage Following Injury. Without Mention Of Open Intracranial Wound, With Prolonged (More Than 24 Hours) Loss Of Consciousness, Without Return To Pre-Existing Conscious Level	57.7%	0.8577	82	52
920	Contusion Of Face, Scalp, And Neck Except Eyes	79.9%	-	2937	1633
85200	Subarachnoid Hemorrhage Following Injury, Without Mention Of Open Intracranial Wound, With State Of Consciousness Unspecified	185.0%	0.282	741	260

Figure 2. State by State Differences in the Number of Diagnostic Fields in Inpatient Administrative Discharge Billing Data



## Anatomic Specificity Gained by Lifting Diagnoses Limit in Erwin Hirsch State Trauma Registry



Hugh DeHaven (in the 1950s), William Haddon (1970s), Vita Barell (1980s), Ellen McKenzie (1990s), and Turner Osler and others have worked on formalizing systems for objectively describing injuries by anatomy and measuring **the dosage of trauma injury (i.e. severity)** resulting from **force applied to the body** causing it to accelerate, deforming it's anatomic structure and distressing it physiology using ICD-9-CM diagnoses codes. However, severity adjustment and Injury disparity measurement are stymied by when the injuries exceed the diagnostic fields.

**Results:** Records of the same patients from the trauma registry and the administrative hospital discharge data were linked. The number of injury diagnoses in the hospital discharge data had a mean of 3.5 (STD 2.7) ranging from 1 injury to 14 injuries while the TR had a mean of 5.8 injuries (STD 4.6) ranging from 1 injury to 26 injuries. The TR data had 2,855 injury diagnoses and 519 distinct anatomical injury types. In comparison, the HD data included 1,640 total injury diagnoses and 449 distinct injury types. Certain anatomic types of damage were less likely to be extensively enumerated in the hospital discharge data than in the trauma registry data, including the full extent of C1-C7 and T1-T12 cord level damage, closed, intracranial and open fractures of the skull vault and base and specificity on subarachnoid, subdural, and extradural hemorrhaging. While no limit is set on diagnoses codes in TR data and limits are set in administrative HD data, administrative billing data contained higher coding for severe sepsis and hip fractures.

**Conclusion:** The highly variable number of diagnostic fields in administrative hospital data state-by-state may affect the utility and validity of the data in severity adjusted injury disparity studies. Policy makers should consider the information gained in using trauma registry data and lifting the limits to administrative hospital discharge data to improve the utility of such data for injury research. This is especially true with the upcoming United States implementation of ICD-10-CM which expands diagnostic coding schema to include anatomic laterality of injuries and all components of the Glasgow Coma Score.

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