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Reliability of Administrative Codes for Capturing In-hospital Cardiac Arrest

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Journal Subject Terms

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BACKGROUND

Dedicated registries, such as Get With The Guidelines® (GWTG)-Resuscitation, have greatly advanced our understanding of care strategies and outcomes for in-hospital cardiac arrest.[1,2] Several recent investigations have attempted to broaden understanding of outcomes among non-registry hospitals using billing codes for cardiac arrest or cardiopulmonary resuscitation to identify cases of in-hospital cardiac arrest.[3–5] However, the validity of using administrative billing data to study in-hospital cardiac arrest remains unknown.

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Disclosure.

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METHODS

Using linked data between GWTG-Resuscitation (a large prospective registry of *confirmed* cases of in-hospital cardiac arrest) and fee-for-service Medicare claims data,[6] we evaluated the sensitivity of administrative claims data in identifying verified cases of in-hospital cardiac arrest from a clinical registry. Within GWTG-Resuscitation, a total of 56,678 patients ≥65 years of age from 545 hospitals with an in-hospital cardiac arrest between January 1, 2000, and December 31, 2012 were linked to Medicare claims files.

We assessed **t**he proportion of cardiac arrest cases from GWTG-Resuscitation that were identified in corresponding Medicare claims using *International Classification of Disease – 9th Edition Clinical Modification* (ICD-9-CM) diagnosis codes for cardiac arrest (427.5 [cardiac arrest], 427.1 [ventricular tachycardia], 427.41 [ventricular fibrillation] or 427.42 [ventricular flutter]) or procedure codes for cardiopulmonary resuscitation (ICD-9-CM codes 99.60, 99.63) or defibrillation (ICD-9-CM code 99.62). Further, among GWTG-Resuscitation hospitals with ≥10 cases, we examined hospital-level variation in rates of administrative capture for cardiac arrest with each strategy. We also describe this variation using median odds ratio, which quantifies the average site-level variation in capture rates for two identical patients. Finally, we compared rates of survival to discharge with each strategy to the observed survival rate in the reference GWTG-Resuscitation cohort.

RESULTS

Of 56,678 patients in GWTG-Resuscitation, 26,547 (46.8%) were identified using diagnosis codes for cardiac arrest and 21,096 (37.2%) with procedure codes for cardiopulmonary resuscitation or defibrillation. A total of 11,882 (21.0%) had both a diagnosis and procedure code, and 20,917 (36.9%) were not identified with any billing data (Table). There was substantial hospital-level variation in identifying cases of in-hospital cardiac arrest using administrative data (Figure), with a median odds ratio of 1.63 (95% CI: 1.57–1.70) using diagnosis codes and 2.92 (95% CI: 2.71–3.18) using procedure codes. Use of diagnosis or procedure codes to identify patients with an in-hospital cardiac arrest had significant implications for survival outcomes. Compared to an 18.7% rate of survival to hospital discharge in the reference GWTG-Resuscitation cohort, those identified as having an in-hospital cardiac arrest using ICD-9-CM diagnosis codes had a survival rate of 28.4%, whereas those identified using ICD-9-CM procedure codes or not identified at all had survival rates of 15.7% and 12.0%, respectively (P-values <0.05 for all, compared with the GWTG-Resuscitation cohort).

DISCUSSION

In this study of 56,678 patients with confirmed in-hospital cardiac arrest, we identified several key limitations of using administrative data for cardiac arrest research. Most studies have used a diagnosis or procedure code alone to identify cases of in-hospital cardiac arrest. However, we found that the majority of confirmed cases in a national registry would not be captured using either administrative data strategy. Furthermore, survival rates using administrative data to identify cases from the same reference population varied markedly

and were 52% higher (28.4% vs. 18.7%) when using diagnosis codes alone to identify in-hospital cardiac arrest. Finally, there was large hospital variation in documenting diagnosis or procedure codes for patients with in-hospital cardiac arrest, which would have consequences for using administrative data to examine hospital-level variation in cardiac arrest incidence or survival, or conducting single-center studies to validate this administrative approach. Collectively, our study highlights the challenges of using administrative billing data to conduct research on in-hospital cardiac arrest.

LIMITATION

Our study did not evaluate the positive predictive value of cardiac arrest cases identified using administrative codes, or assess whether GWTG-Resuscitation captures all cardiac arrest cases in hospitals. De-identification of data within GWTG-Resuscitation Medicare files precluded such analyses, but these additional issues are important areas of research in future studies.

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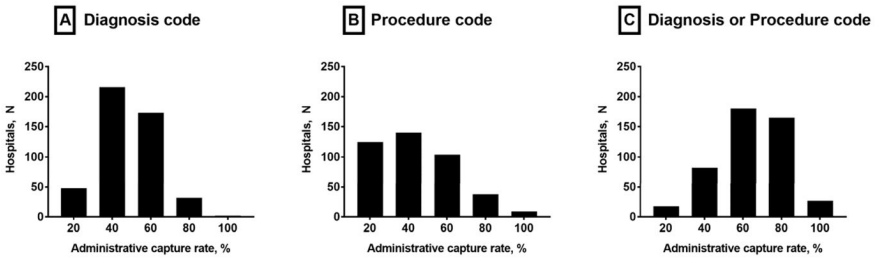

Figure 1. Hospital variation in the sensitivity of Medicare data to identify in-hospital cardiac arrests in GWTG-Resuscitation

Wide hospital variation exists in the sensitivity of using administrative data to capture confirmed cases of in-hospital cardiac arrests in GWTG-Resuscitation using (A) diagnostic codes only, (B) procedure codes only, and (C) either a diagnostic or procedure code for cardiac arrest or resuscitation.

Table 1

Accuracy of Administrative Claims-based Approaches in Capturing Cases of In-hospital Cardiac Arrest, and the Respective Survival Estimates with Each Approach

Of 56,678 patients with an in-hospital cardiac arrest in GWTG-Resuscitation, the proportion of patients identified using ICD-9-CM diagnosis codes and procedure codes, and the corresponding survival estimates, are summarized.

Study group	Case Capture		Survival	
	N	Percent	N	Percent
GWTG-Resuscitation (reference)	56,678		10,624	18.7%
ICD-9-CM Billing Code Category				
Any diagnosis code[1]	26,547	46.8%	7533	28.4%
Any procedure code[2]	21,096	37.2%	3302	15.7%
Either a diagnosis or a procedure code[1,2]	35761	63.1%	8119	22.7%
Both a diagnosis and a procedure code[1,2]	11,882	21.0%	2716	22.9%
No diagnosis or procedure code	20,917	36.9%	2505	12.0%

Abbreviations: ICD-9-CM, International Classification of Diseases – 9th Edition Clinical Modification

[1] ICD-9-CM diagnosis codes 427.5, 427.41, and 427.42,

[2] ICD-9-CM procedure codes 99.60, 99.62, or 99.63

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