

Using CPT Charges as an Economic Proxy for Telehealth and Non-telehealth Emergency Department Utilization

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Introduction and Background

Economic analysis of health care utilization is a pressing priority. However, procuring economic data presents many challenges. One approach is to obtain charge and reimbursement data within a single healthcare organization, but this approach lacks external validity. Another approach is to obtain charge and reimbursement data across healthcare organizations by analyzing claims databases (e.g., Medicare, Medicaid claims). But this approach restricts the sample to covered beneficiaries (e.g., older, disabled), which restricts generalizability. With availability of telehealth and non-telehealth economic data on emergency department (ED) visits from multiple unrelated rural hospitals, we sought an approach for calculating an economic proxy for healthcare utilization across EDs. It appeared feasible to use rural hospitals' reported Current Procedural Terminology (CPT) codes (AMA, 2021) and associated charges for a sample of telehealth and non-telehealth ED visits, since CPT codes would be generated for billing and insurance claims submission. The specific aim of this analysis is to explore the characteristics of the resulting dataset in terms of distribution and association with related variables.

Key Findings

- Rural hospitals reported the Current Procedure Terminology (CPT) code and associated charge for a sample of telehealth and non-telehealth emergency department (ED) visits.
- Charges were examined in terms of distribution and association with related variables.
- This appears to be a feasible process for calculating an economic proxy of health care utilization across EDs.

Methods

The Office for the Advancement of Telehealth (OAT) in the Health Resources and Services Administration (HRSA) established the Evidence-Based Tele-Emergency Network Grant Program (EB TNGP). In 2014, this program awarded grants to six ED-based telehealth (teleED) networks to expand the delivery of teleED in rural hospitals across the U.S.¹ The grantees provided teleED services to 65 rural hospital EDs in 11 states. In 2015, OAT awarded a cooperative agreement to the Rural Telehealth Research Center (RTRC) to systematically collect data from the six EB TNGP networks.² RTRC identified data elements pertinent to teleED and asked the EB TNGP grantees to submit data through the Tele-Emergency Performance Assessment Reporting Tool (T-PART) from November 2015 through December 2017 (Ward et al., 2020). Data elements included patient demographics, the Emergency Severity Index - ESI (Gilboy et al., 2011), process of care measures on four time-urgent conditions (acute myocardial infarction, chest pain, severe sepsis/shock, and stroke), the CPT code assigned to the visit, and the ED charges for that CPT code.

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Sample

EB TNGP grantees used the T-PART to collect the defined data elements from their rural hospital partners and exported de-identified visit-level data files to RTRC on all their grant-funded teleED encounters. Over the 26-month data collection period, these efforts yielded data on 4,324 teleED encounters (Heppner et al., 2021). The EB TNGP grantees were also asked to provide data on a small sample of their non-teleED controls. These controls were matched to a subset of teleED cases chosen to include encounters for patients with selected diagnoses, ESI, and age within the same hospital as the teleED cases. The selected diagnoses, shown in Table 1, were chosen to permit comparative effectiveness analysis of conditions where use of teleED was of particular interest. Papers on these conditions are available elsewhere (Miller et al., 2020; Mohr et al., 2020; Swanson et al., 2019; Weigel et al., 2019a; Weigel et al., 2019b). TeleED tends to be activated for ED patients with time urgent and more serious acute illnesses and injuries. Our approach to selecting non-teleED controls was designed to match the teleED patients on level of severity. Thus, the sample included here, combining teleED and non-teleED encounters, reflects relatively high ESI and CPT codes rather than the usual distribution of patients seen in rural hospital EDs, which includes lower acuity.

Table 1: Number of ED cases and controls selected by diagnosis

Focus of Sample	TeleED Cases	Non-teleED Controls	Total ED Visits
Chest pain	331	889	1,220
AMI	92	173	265
Sepsis	36	608	644
Stroke	338	548	886
Behavioral health	415	1,310	1,725
Pediatric patients	394	9,641	10,035
Other TeleED cases	2,718	Not Applicable	2,718
Total	4,324	13,169	17,538

Analysis

As part of the T-PART, hospitals were to record the CPT ED visit code and its associated charge for each encounter. ED CPT codes reflect ED care intensity and patient severity, with higher CPT codes reflecting greater intensity, as described in the addendum. The specific CPT codes examined in this brief are 99282, 99283, 99284, and 99285 (there were only 33 cases where CPT code 99281 was recorded, so those were excluded). The initial step in the data cleaning process was to remove any cases that were clearly out of range. The 26 cases that had a charge of \$0 were removed, as were the 6 cases with a charge that exceeded 10 times the median charge for a given CPT code. The 2016 Medicare wage-adjusted payment within each state for each CPT code (CMS, 2021) was then assigned to each record. If the supplied CPT charge was found to be less than the associated wage-adjusted payment, then the charge was considered out of range, since it would not cover the cost of service, and such cases were removed. As shown in Table 2, implementing this rule led to the removal of 477 cases, which was 2.7% of the sample. The next step was to compare CPT-specific charges within each hospital to identify outliers. This step was implemented iteratively. If a CPT charge within a hospital was more than a factor of 4 beyond the median charge at that hospital, then those data points were considered unreliable and removed. For example, if the median charge was \$1000, then any charges either greater than \$4000 or less than \$250 would be removed. This exclusion rule was narrowed to a factor of 2 and finally a factor of 1.25.

Table 2: Description of attrition through data cleaning process

CPT Code	Start N	Loss due to low charge	New N	Loss due to median charge discrepancy	Final N
99282	4,182	206 (4.9%)	3,976	199 (5.0%)	3,777
99283	5,843	113 (1.9%)	5,730	233 (4.1%)	5,497
99284	4,022	72 (1.8%)	3,950	126 (3.2%)	3,824
99285	3,446	86 (2.5%)	3,360	165 (4.9%)	3,195
Total	17,493	477 (2.7%)	17,016	723 (4.2%)	16,293

Findings

After removal of outliers, the final sample included 16,293 ED cases. Characteristics of the sample were examined across CPT codes. As shown in Table 3, higher acuity CPT codes were associated with greater age, Medicare coverage, greater inpatient admission, and more serious ESI scores. In contrast, lower acuity CPT codes were most common in young patients, non-White patients, Medicaid covered, and those discharged locally with less serious ESI scores. The ESI, which is used in larger EDs but not standard in small rural EDs, was missing for over half of the cases.

Table 3: Description of the selected ED sample

Variable	CPT Code 99282	CPT Code 99283	CPT Code 99284	CPT Code 99285
Gender				
Female	47.0%	45.7%	46.9%	46.2%
Male	53.0%	54.3%	53.1%	53.8%
Age				
0-14	93.8%	75.3%	29.4%	17.1%
15-24	1.1%	4.5%	8.3%	6.3%
25-44	2.1%	7.0%	13.7%	13.7%
45-64	1.5%	7.1%	21.2%	27.1%
65+	1.4%	6.1%	27.4%	35.8%
Race (12.0% missing)				
White	53.5%	65.7%	74.4%	78.6%
American Indian/AK Native	28.1%	16.5%	15.4%	13.0%
All Other Races	2.6%	2.6%	1.3%	2.8%
Ethnicity (8.3% missing)				
Hispanic/Latinx	9.7%	9.0%	3.75	2.7%
Non-Hispanic/Non-Latinx	83.4%	83.0%	88.5%	86.2%
Primary Payer				
Medicaid	64.9%	47.9%	25.5%	20.8%
Private Insurance	25.9%	35.4%	31.4%	27.7%
Medicare	1.5%	7.2%	29.6%	37.7%
Other	7.7%	9.5%	13.5%	13.8%
Discharge Disposition				
Routine Discharge	98.2%	90.5%	47.0%	22.2%
Admitted Locally	0.9%	4.1%	28.2%	28.3%
Transferred to Inpatient	0.3%	4.0%	22.1%	45.0%
Other	0.6%	1.4%	2.7%	4.5%
Emergency Severity Index (only available for half of ED visits)				
Non-urgent	2.8%	2.0%	0.6%	0.3%
Less Urgent	56.0%	38.9%	11.8%	3.1%
Urgent	26.8%	40.3%	48.2%	43.2%
Emergent	10.3%	18.5%	38.4%	49.1%
Resuscitation	0.1%	0.3%	1.0%	4.3%

As shown in Table 4, the median ED CPT charge was \$303 for CPT code 99282, \$461 for CPT code 99283, \$748 for CPT code 99284, and \$1,356 for CPT code 99285. All univariate measurements of ED CPT charge showed an increasing pattern, as expected.

Table 4: Summary statistics of ED CPT charge post-cleaning

CPT Code	N	Minimum	1st Quartile	Median	Mean	3 rd Quartile	Maximum
99282	3,777	\$133	\$234	\$303	\$308	\$378	\$1,227
99283	5,497	\$301	\$375	\$461	\$479	\$566	\$2,476
99284	3,824	\$427	\$606	\$748	\$820	\$884	\$5,219
99285	3,195	\$576	\$984	\$1,356	\$1,543	\$1,424	\$5,484

Discussion

The specific aim of this analysis was to explore the characteristics of CPT codes and associated charges in data from a large sample of unrelated rural EDs. Obtaining these data required having each rural hospital access their billing data, a step which often lagged the ED visit by a month or more. However, all but 4 of 65 participating rural hospitals did report charge data, thus supporting the feasibility of this approach. In examining the obtained data, it was apparent that some charge amounts were unrealistically small or large. A straightforward approach to identifying outliers was used and these were eliminated, with loss of less than 0.2% of data. The next step of data cleaning involved comparing charge data with an external, published source, and in this case, state-specific CMS wage-adjusted payments were used. Again, unrealistically small or large charge amounts were flagged and deleted, with a loss of 2.7% of data. The resulting charge amounts show an expected linear trend across CPT codes. The CPT codes reported for the 17,538 ED visits in the participating rural hospitals appear valid in that they are associated with related variables. In particular, higher CPT codes were found for patients with increased age, higher ESI scores, and more serious discharge dispositions. Of note, the charge amounts reported by these 65 rural hospitals are quite similar to average charge amounts from approximately 200 California hospitals (Hsia & Antwi, 2014), the only report of charge amounts by CPT codes that we could find in the literature. Given the importance of economic analysis in health care, and the challenges of obtaining charge data across unrelated health care organizations, the approach described here may be helpful. When either researcher or participating healthcare organization resources are limited, obtaining economic data that are already being systematically collected for billing purposes may be a feasible approach. However, such data are variable and steps to identify and delete outliers, as described here, are important.

Notes

AMA. CPT Code Description. 2021. <https://www.ama-assn.org/amaone/cpt-current-procedural-terminology>

CMS. Wage Index Files. 2021. <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Wage-Index-Files>

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Addendum

Descriptions of Emergency CPT Codes - 99281, 99282, 99283, 99284, 99285

99281 Emergency department visit for the evaluation and management of a patient, which requires these 3 key components: a problem focused history; a problem focused examination; and straightforward medical decision making. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are self-limited or minor.

99282 Emergency department visit for the evaluation and management of a patient, which requires these 3 key components: an expanded problem focused history; an expanded problem focused examination; and medical decision making of low complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of low to moderate severity.

99283 Emergency department visit for the evaluation and management of a patient, which requires these 3 key components: an expanded problem focused history; an expanded problem focused examination; and medical decision making of moderate complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of moderate severity.

99284 Emergency department visit for the evaluation and management of a patient, which requires these 3 key components: a detailed history; a detailed examination; and medical decision making of moderate complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of high severity and require urgent evaluation by the physician but do not pose an immediate significant threat to life or physiologic function.

99285 Emergency department visit for the evaluation and management of a patient, which requires these 3 key components within the constraints imposed by the urgency of the patient's clinical condition and/or mental status: a comprehensive history; a comprehensive examination; and medical decision making of high complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of high severity and pose an immediate significant threat to life or physiologic function.

Source: <https://www.medicalbillingcptmodifiers.com/2013/01/emergency-department-cpt-codes-99281.html>

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