

County-Level Variation in Emergency Department Admission Rates Among US Medicare Beneficiaries



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Study objective: Hospital-based emergency departments (EDs) are the gateway to hospital admissions for many Americans. Approximately half of all US hospital admissions originate from EDs, and more than 3 in 4 are among Medicare beneficiaries. Recent literature has demonstrated nearly 2-fold variation in both physician- and hospital-level ED admission rates. We study geographic variation at the county level in ED admission rates among Medicare fee-for-service beneficiaries.

Methods: Using the 100% population data from the Centers for Medicare & Medicaid Services (CMS), we analyzed beneficiaries continuously enrolled in Medicare fee-for-service Parts A and B who resided in the 50 states and the District of Columbia in 2012. The ED admission rate was aggregated to the county level. ED admission rates were adjusted with the CMS Hierarchical Condition Categories (HCC) risk score. The resulting HCC adjusted ED admission rate was mapped to display the variation by county.

Results: The average county HCC adjusted ED admission rate was 30.8% in the Medicare population. Counties in the lowest quintile had an ED admission rate of 19.9% or lower. By comparison, counties in the highest quintile had an ED admission rate of 40.3% or higher.

Conclusion: Among Medicare beneficiaries, county-level ED admission rates varied 2-fold between counties in the lowest and highest quintiles. Future work should focus on exploring causes for this variation, such as racial ethnic composition, socioeconomic status, and health care delivery system characteristics and the research of effectiveness of policies that affect ED admission decisions. [Ann Emerg Med. 2016;68:456-460.]

Please see page 457 for the Editor's Capsule Summary of this article.

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INTRODUCTION

Hospital-based emergency departments (EDs) have increasingly become gateways to admission into US hospitals for many Americans.¹ This is particularly true for Medicare beneficiaries; the majority of admissions for inpatient hospitalizations are through hospital-based EDs at a substantial cost to the Medicare program.²

Recent literature has demonstrated variation in hospital admission decisions at the hospital level and the physician level when patients present at the ED. Nearly 2-fold physician-level variation has been demonstrated for admission rates for adults and for condition-specific admission rates for pneumonia and chest pain.^{3,4} Similarly, greater than 2-fold hospital-level variation has been demonstrated across 28 states.^{5,6} Further research is needed to explore geographic variation in ED admission rates across the entire United States, specifically to discover what regions of the country may have higher or lower hospital admission rates for Medicare beneficiaries who present at

the ED. In this study, we examine geographic variation in ED admission rates among the Medicare fee-for-service population across US counties.

MATERIALS AND METHODS

Study Design and Setting

We conducted an ecological study using encounter-level data for US patients with Medicare insurance.

Selection of Participants

The data used in this study were extracted from the Centers for Medicare & Medicaid Services (CMS) Chronic Conditions Warehouse, a database that contains 100% of Medicare administrative enrollment and claims data for Medicare-enrolled beneficiaries (Chronic Condition Data Warehouse, 2012). The analysis included all beneficiaries continuously enrolled in Medicare fee-for-service Parts A and B who resided in the 50 states and the District of

Editor's Capsule Summary*What is already known on this topic*

Significant variation exists at the hospital and physician level for emergency department (ED) admission rates.

What question this study addressed

Whether a risk-adjusted geographic variation exists for rates of ED admission in a Medicare population.

What this study adds to our knowledge

ED admission rates varied 2-fold on a county level even after controlling for medical acuity.

How this is relevant to clinical practice

Hospital admission is an important driver of health care costs. Future studies should explore the underlying causes for such variations in care.

Columbia in 2012. This study excluded Medicare beneficiaries with any Medicare Advantage enrollment and beneficiaries enrolled in Part A only or Part B only. Beneficiaries who died during the year were included up to their date of death if they met the other inclusion criteria. The use of this secondary data did not require institutional review board review because they are deidentified and pose no risk to beneficiaries. Furthermore, the data presented conform to CMS standards for privacy because counties with fewer than 11 beneficiaries and fewer than 100 ED visits or 20 ED admissions were excluded from the study.

Methods of Measurement

This study examined the county-level ED admission rate, which was calculated as the number of patients from ED encounters who were admitted to the hospital or placed in observation status, divided by the total number of ED encounters, and was expressed as a percentage. County assignment was determined from the beneficiary's mailing address as of year-end 2012. Multiple ED encounters within the same day that did not result in an admission were counted as distinct ED visits. In cases of ED admissions that resulted in subsequent transfers to secondary inpatient facilities, both admissions were counted as a single admission.

Primary Data Analysis

Adjusted county-level admission rates were adjusted according to the CMS Hierarchical Condition Categories (HCC) risk score,^{6,7} which uses broad clinical profiles, as

well as demographic characteristics, to adjust for the burden of morbidity and cost of Medicare beneficiaries. Although these scores were created at the individual level, risk scores were used for fair comparison across groups of people or populations. This analysis aggregated beneficiary-level HCC scores to create a county average HCC score. To standardize scores, county HCC scores were divided by the national HCC score, creating an adjustment factor. ED admission rates were then divided by the adjustment factor to create the HCC adjusted ED admission rate. In this case, the HCC score was used to adjust for populations' baseline clinical risk before admission. Previous studies have demonstrated the superior performance of the HCC score compared with Elixhauser and other comorbidity indices.⁸ All data preparation and manipulation were performed with SAS (version 9.4; SAS Institute, Inc., Cary, NC). The HCC adjusted ED admission rate was mapped in ARCMAP (version 10.2; Environmental Systems Research Institute, Inc, Redlands, CA), using a quintiles classification.

RESULTS

Across 3,045 US counties, there were 33,934,396 Medicare beneficiaries and 22,629,352 ED visits in the 2012 data we analyzed. [Figure 1](#) presents unadjusted county-level ED admissions rates as a percentage of total visits and were classified into quintile categories. The county average unadjusted ED admission rate was 29.2% and ranged from 3.3% to 61.7%. The county-level HCC scores, the adjustment factor, are displayed in [Figure 2](#). The county average HCC score was 1.07 and ranged from 0.71% to 1.87%. Quintiles of county-level HCC adjusted ED admission rates are displayed in [Figure 3](#). The average county HCC-adjusted ED admission rate was 30.8%. Counties in the lowest quintile had a rate of 3.8% to 19.9%; those in the highest quintile, 40.3% to 82.2%. [Figure 3](#) illustrates the HCC adjusted ED admission rate by county. For example, every county in New Jersey falls within the highest quintile in [Figure 1](#). The HCC scores ranged from 1.01 to 1.39; however, the county HCC-adjusted ED admission displayed 19 of 21 counties in the highest quintile. Conversely, in Colorado only 6 of 59 were within the highest quintile of [Figure 1](#). The HCC scores varied from 0.71 to 1.16. However, after adjustment 18 of 59 were within the highest quintile of [Figure 3](#).

LIMITATIONS

There are several limitations to this study. First, beneficiary-level conclusions cannot be drawn from this analysis. Second, the data set does not adequately describe

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