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Increasing Care Intensity at Emergency Department Visits in California, 2002–2009

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Abstract

High-intensity emergency department (ED) care involving complex diagnostic testing and treatment is costly and contributes to ED crowding. We examined high-intensity ED visit rates by patients with a severe, potentially life-threatening illness in California from 2002 through 2009. While total annual ED visits increased by 25% from 2002 (9.0 million) to 2009 (11.3 million), high-intensity ED visits increased 87%, from 778,000 to 1.5 million per year. The proportion of visits with high-intensity ED care increased from 8.6% to 13% (relative increase of 51%). Additionally, the overall rate of ED admissions increased by 39%, with a much larger increase in the rate of high-intensity ED admissions that increased by 88%. Safety-net EDs, compared with non-safety-net EDs, experienced a disproportionate increase in high-intensity ED visits (+157% vs. +61%, respectively). These findings suggest a trend toward intensification of ED care, particularly at safety-net hospitals where access to care outside the ED may be limited.

Introduction

Emergency department (ED) utilization has expanded dramatically in the United States over the last several decades.^{1–3} Most recently, US ED visits increased 40%, from 88.5 million in 1991 to 127.3 million in 2009.¹ In addition to higher visit volumes, patients are spending more time in the ED per visit, and the overall practice intensity — number of tests, imaging studies, and medications ordered — appears to be increasing as well.^{3–5} In concert with these trends and the closure of 27% of non-rural EDs in the US between 1997 and 2009, reports of severe ED crowding and ambulance diversion have reached crisis levels.^{6–10} In 2006, the Institute of Medicine declared a "national epidemic of overcrowded EDs."²

The problem of inappropriate, non-urgent ED visits has received significant media and policy maker attention as a possible cause of overcrowding and excess healthcare costs.⁹ However, more recently there is increasing concern for the impact of escalating practice intensity during ED visits as a potentially more significant contributor to ED crowding and ED associated healthcare expenditures.^{4,11–13} Additionally, medically complex ED patients with severe illness may be at greatest risk for negative outcomes due to crowded ED conditions, including increased mortality, increased hospital length of stay, and delays in receiving life-saving treatments.^{3,10,14–17}

A recent analysis by the Office of Inspector General found a 21% increase in physician billing for the highest intensity level of emergency care among a sample of Medicare beneficiaries from 2001–2010.¹⁸ This large increase has raised concerns for improper “upcoding” of ED care, facilitated by adoption of electronic medical records.¹⁹ However,

other studies suggest an ongoing expansion in the role of emergency care in the evaluation and management of severely ill patients, particularly as the primary portal for inpatient admission.^{4,12,13,20}

While developments in medical technology and the organization of healthcare systems have placed more emphasis on ED-based care, many EDs have also assumed increasing responsibility for underserved patients.^{2,3,6,8,9} EDs at safety-net hospitals have long been disproportionately affected by crowding, ambulance diversion, boarding of admitted patients, and limited access to specialists.^{3,6,8,9} Despite its potentially significant impact, there is no recent analysis of whether and how ED treatment intensity and ED-based admissions have changed at safety-net hospitals.

With a demographically diverse population that represents 12% of the US population, California has long been recognized as a bellwether state for trends in the healthcare system. This study investigates trends in high-intensity California ED visit rates and ED based admissions between 2002 and 2009. Additionally, we characterize whether trends have been evenly distributed across safety-net EDs and non-safety-nets EDs.

Methods

STUDY DESIGN AND DATA SOURCES

We conducted a retrospective cohort study of all EDs at acute care, non-federal hospitals operating in California from 2002 to 2009 using data from the California Office of Statewide Planning and Development (OSHPD). We analyzed OSHPD hospital annual utilization reports²¹ and patient discharge data sets (OSHPD-PDD)²² from January 1, 2002 to December 31, 2009 to establish hospital bed capacity and ED visit characteristics. The OSHPD-PDD data collection methodology used to ensure coding accuracy is described in detail elsewhere.²³ The validity of the dataset has been confirmed by several studies that found a high-degree of coding accuracy.^{24,25} We included all EDs and hospitals in California licensed as general acute care hospitals with general medical and surgical services. We excluded psychiatric facilities and chemical dependency recovery hospitals as well as hospitals with specialized principal service types that included long-term care, pediatric care, physical rehabilitation, orthopedic, and developmentally disabled services. An ED was defined as standby, basic, or comprehensive. All ED types described by OSHPD required at minimum a physician on staff 24 hours per day.²⁶

OUTCOME MEASURES

We identified high-intensity ED visits using the Physicians Current Procedural Terminology (CPT) codes documented in OSHPD-PDD and OSHPD hospital annual utilization reports. In the CPT schema, the 99285 code indicates that the highest intensity of care was provide during the ED visit, such as the use of advanced imaging, specialty physician consultation, multiple systems evaluation, and high complexity medical decision making.²⁷ The 99285 code is intended for ED patients presenting with a high acuity condition that poses an immediate, significant threat to life or physiologic function (e.g. patient with active, upper gastrointestinal bleeding). The CPT code is applied by either the treating physician or

administrative staff and used to bill Medicare and other insurers according published Center for Medicare & Medicaid Services guidelines.²⁷

Hospital capacity was characterized by type and number of inpatient beds. Critical care beds were defined as an intensive care bed or coronary critical unit bed. A non-critical care bed was defined as any general medical or surgical bed. We defined hospital capacity using the OSHPD utilization file variable “licensed bed days.” OSHPD defines licensed bed days as a “theoretical capacity measure calculated by multiplying the number of licensed beds by the number of days during the year in which the license was in effect.” We defined critical care capacity as licensed bed days among intensive care and coronary care beds. We defined non-critical care capacity as licensed bed days among general medical and surgical beds.

ADDITIONAL CHARACTERISTICS

ED visit characteristics were analyzed using the OSHPD patient discharge dataset from 2002–2009. We pooled the data for each hospital for each year to create hospital-level socioeconomic variables for each year such as age, race/ethnicity, and insurance status. We specifically calculated the proportion of a hospital’s patients who were white non-Hispanic, black non-Hispanic, Hispanic, and other (including Asian, Native American, Alaska Native, Hawaiian, Pacific Islander, and unknown/masked). Insurance status was described as proportion Medicare, Medicaid (specifically, Medi-Cal – California’s Medicaid program), private, self-insurance/uninsured (i.e. self-pay, county indigent programs, other indigent programs), and other (i.e., Veterans Administration, TRICARE, CHAMPUS, worker’s compensation). Safety-net hospital status was defined from the patient population insurance status composition as any of: >30% Medicaid, >30% self-insured or >40% aggregate Medicaid and self-insured patients, as previously described.⁹

We extracted hospital-level structural characteristics from the hospital annual utilization review reports. Variables included trauma center status (Level I or II only), urban or rural county location, ownership type (government, not-for-profit or for-profit), and teaching affiliation. For urban/rural designation, we employed the county-based Rural-Urban Commuting Area Codes (RUCAs) of the US Department of Agriculture’s Economic Research Service.²⁸ Population statistics were drawn from the 2010 United States Census data.²⁹

STATISTICAL ANALYSIS

For each year, ED visits and ED admissions (i.e., hospital admissions from the ED) were adjusted for population change using US Census data.²⁹ We stratified our results by ED safety-net status and calculated percentage differences and absolute differences over the study period. The significance of trends in hospital services and structural hospital characteristics were calculated using linear models for continuous outcomes and logistic regression model for dichotomous outcomes. The significance of trends in patient characteristics was calculated using a multinomial logistic model where year was the predictor, the patient was the unit of analysis, and hospital was the clustering variable. All available patient characteristics were included in our model and trend significance for a individual characteristic was determined after controlling for all other characteristics.

Analysis was performed using SAS (version 9.2, SAS Inc.; Cary, NC) and Excel (Microsoft Corporation; Redmond, WA).

Results

EMERGENCY DEPARTMENT VISITS

While total annual emergency department visits increased 25% from 9.0 million in 2002 to 11.3 million in 2009 ($P_{\text{trend}} < .001$), high-intensity ED visits increased 87% from 778,000 to 1.5 million per year ($P_{\text{trend}} < .001$). These increases were well in excess of overall population growth in California that increased by only 6% over this time period (Exhibit 1). Overall ED visit rates increased from 25,810 ED visits per 100,000 in 2002 to 30,504 per 100,000 in 2009 (+18%; $P_{\text{trend}} < .001$) whereas the rate of high-intensity ED visits increased 77% from 2,231 ED visits per 100,000 in 2002 to 3,943 per 100,000 in 2009 ($P_{\text{trend}} < .001$). The proportion of all ED visits classified as high-intensity increased from 8.6% to 13% (relative increase of 51%; $P_{\text{trend}} < .001$) (Exhibit 2).

Overall annual ED admissions increased significantly from 1.2 to 1.8 million ($P_{\text{trend}} < .001$) representing a population rate increase of 39%, from 3,376 admissions per 100,000 persons per year (ppy) in 2002 to 4,675 admissions per 100,000 ppy in 2009 ($P_{\text{trend}} < .001$). We observed a much larger increase in high-intensity ED admissions, which doubled from 420,000 in 2002 to 840,000 per year in 2009 ($P_{\text{trend}} < .001$) (Exhibit 3). During this period, the population rate of high-intensity ED admissions increased 88% from 1,057 per 100,000 ppy in 2002 to 1,987 per 100,000 ppy ($P_{\text{trend}} < .001$). We observed only a modest increase (+11%) in the rate of ED admissions that were not categorized as high-intensity, i.e., CPT levels 99281, 99282, 99283, and 99284. From 2002 to 2009, the proportion of all high-intensity ED visits resulting in admission to the hospital increased from 36% to 48% (relative increase of 33%; $P_{\text{trend}} < .001$).

HOSPITAL CAPACITY

During the study period, the total number of EDs operating in California was unchanged ($n=375$ to 376 EDs). While total high-intensity ED visits requiring admission to the hospital doubled, the total availability of licensed bed days for critically ill patients increased by 10% (249,067 licensed bed days; $P_{\text{trend}} < .001$) between 2002 and 2009. Non-critical care licensed bed days increased by only 4% ($P_{\text{trend}} < .001$) during the study period (Exhibit 2).

PATIENT AND STRUCTURAL HOSPITAL CHARACTERISTICS

Age categories were unchanged over the study period. In particular, the proportion of ED visits by patients older than 64 years did not increase ($P_{\text{trend}} = .42$). Additionally there was no significant change in the proportional distribution of ED visits by insurance, race/ethnicity, the hospital's metropolitan statistical area identification, trauma designation, ownership, or teaching affiliation (all $P_{\text{trend}} > .05$). Increases in high-intensity visits were generally larger at EDs with a smaller annual patient volume.³⁰

SAFETY-NET EDs

Safety-net EDs experienced a 157% increase in high-intensity ED visits ($P_{\text{trend}} < .001$) whereas non safety-net EDs had an increase of 61% ($P_{\text{trend}} < .001$). Despite comprising approximately one-third of EDs statewide, safety-net EDs accounted for approximately one-half of the total increase in high-intensity ED visits. Admissions showed a similar trend—safety-net EDs experienced a disproportionate increase in high-intensity ED visits leading to hospital admission (+150%; $P_{\text{trend}} < .001$) versus non safety-net EDs (80%; $P_{\text{trend}} < .001$) (Exhibit 4).³⁰

There was no significant change in the number or proportion of EDs that met the definition of a safety-net ED. Among all ED visits, age and gender distributions were stable for both safety-net and non-safety-net EDs. At non-safety-net EDs, the bulk of the increase in high-intensity ED visits was by patients identified as non-white. Analysis of trends in insurance status at safety-net EDs showed relatively large increases in the number of Medicare ED visits. At non-safety-net EDs there was actually an overall decrease in the number of ED visits by patients with private insurance and a 40% increase in visits by uninsured patients.

Discussion

Our findings suggest that the number and proportion of high-intensity ED visits and ED visits resulting in hospital admission have risen steeply – in fact, more steeply than the general increase in emergency care, which has also increased rapidly over the past decade. Moreover, we found a disproportionate increase in both high-intensity ED visits and ED admissions at safety-net EDs, suggesting a link between reduced availability of services outside the ED and increased ED visit intensity.

Some of the most vulnerable patients in our society rely on safety-net EDs for medical care and social services. Despite their vital role, safety-net EDs are often under significant financial and resource constraints and may be the least prepared to cope with increased demand for high-intensity emergency care and ED admissions.^{8,9} We found that safety-net EDs experienced a large (+157%) increase in high-intensity ED visits, more than double the increase observed at non-safety-net EDs (+61%). Implementation of the Affordable Care Act will result in significant changes in the compensation structure for safety-net hospitals. It is unclear whether the Affordable Care Act will adequately fund traditional safety-net EDs coping with large increases in high-intensity ED visits and ED based admissions. In fact, early reports suggest that safety-net hospitals, which are often least able to provide high-quality outpatient care for patients with complex chronic disease prone to decompensation such as congestive heart failure, will likely face the greatest penalties under the proposed Medicare restructuring.^{31,32}

Together with several other recent studies, our findings suggests that increased hospital admissions from the ED may be an important factor contributing to the observed increases in ED practice intensity.^{3,4,13,20} We found both a doubling in the annual volume of high-intensity ED visits requiring admission to the hospital (+99%) and an 33% increase in the proportion of high-intensity ED visits that required admission. Additionally, we found that the pace of increased ED admissions far outstripped hospital bed capacity increases over

these same years suggesting ongoing pressure to board patients in the ED. Prolonged ED stays due to lack of available inpatient beds likely intensifies ED care as complex medical treatments and diagnostics that might otherwise occur in an inpatient ward are carried out in the ED.^{3,4,20} Unfortunately bed shortages (particularly for critical care beds) are not unique to California and likely worsening.³³

We observed that over half of high-intensity ED visits ultimately resulted in discharge to home, suggesting an important role for ED-based care in preventing admission of patients with potentially serious medical conditions.^{13,20} This role in excluding a potentially life-threatening condition is likely to increase as the American population ages and the burden of underlying chronic disease also increases.^{38,39,40} In elderly patients and patients with chronic disease common acute complaints such as chest pain or fever are more likely to be considered potentially life-threatening.^{37–39} Some office-based physicians may feel unable to adequately evaluate high-risk acute complaints in these patients, prompting referral to the ED.^{20,37–39} Strengthening linkages between ED and office-based physicians may enhance ability of the ED to efficiently evaluate a potentially life-threatening then discharge the patient home with outpatient follow-up care and avoid inpatient admission.²⁰

Our finding of a disproportionate increase in high-intensity ED care at Safety-net EDs highlights the importance of limited outpatient availability of care in promoting ED utilization, even among relatively high acuity patients. Health care reform efforts that simplistically discourage access to the ED through such tactics as payment refusal and restrictive hospital admission may inadvertently escalate the intensity of care. We observed this scenario among safety-net EDs where the combination of lack of access to timely outpatient care and lack of access to inpatient hospital beds appears to promote a compensatory intensification of ED-based care.

LIMITATIONS

Our analysis has several potential limitations. First, emergency department care involves the evaluation of undifferentiated symptoms and the presence of an immediate threat to life is often uncertain. For example, chest pain may simply be a symptom of gastritis or beginning of potentially fatal acute myocardial infarction. CPT coding is a subjective measure of patient acuity that we were unable to confirm with physiologic data. Certain providers and hospital billing departments likely interpret the Centers for Medicaid and Medicare Services guidelines differently. Although the large, uniform trend across study years suggests otherwise, we cannot exclude the possibility of secular trends of “upcoding” bias, where more complex procedures are billed for than what is provided or required. There is clear economic benefit from designating a higher billing code because it results in a higher payment. Additionally, from our data we were unable to ascertain the impact of increasing use electronic medical records. However, the sustained steady increase across multiple hospital types with varied compensation structures makes this less likely, although not impossible. Given for-profit hospitals are more prone to upcoding than their counterparts (which would include most safety-net hospitals in our study), our results regarding the larger impact on safety-net hospitals would be conservative.⁴¹

Second, our data do not allow us to draw conclusions about real-time emergency department conditions and the extent to which the presence of patients with life-threatening illness directly contributes to ED crowding or affects the quality of care provided in any given ED. We were not able to analyze the effects of an increased patient volume and severity of illness on dynamic ED resources such as staff time, physical space, laboratory throughput, or radiologic imaging. Finally, although individual states can vary significantly in their profile of emergency department care, California is the most populous state in the nation and recognized as an indicator state for national trends in public health and health care systems.⁴²

CONCLUSIONS

Our results suggest an ongoing trend toward the intensification of ED-based care. We found particularly large increases in high-intensity ED visits resulting in hospital admission. Importantly, this trend appears to disproportionately affect safety-net hospitals. Future policy efforts directed at the reduction of ED crowding and health care quality improvements will need to address the acute needs of medically complex patients with potentially serious conditions not easily cared for in alternate medical settings.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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