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ASSOCIATION OF EMERGENCY DEPARTMENT AND HOSPITAL CHARACTERISTICS WITH ELOPEMENTS AND LENGTH OF STAY

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☐ **Abstract—Background: As the Centers for Medicare & Medicaid Services (CMS) core measures in 2013 compare Emergency Department (ED) treatment time intervals, it is important to identify ED and hospital characteristics associated with these metrics to facilitate accurate comparisons. Study Objectives: The objective of this study is to assess differences in operational metrics by ED and hospital characteristics. ED-level characteristics included annual ED volume, percentage of patients admitted, percentage of patients presenting by ambulance, and percentage of pediatric patients. Hospital-level characteristics included teaching hospital status, trauma center status, hospital ownership (nonprofit or for-profit), inpatient bed capacity, critical access status, inpatient bed occupancy, and rural vs. urban location area. Methods: Data from the ED Benchmarking Alliance from 2004 to 2009 were merged with the American Hospital Association's Annual Survey Database to include hospital characteristics that may impact ED throughput. Overall median length of stay (LOS) and left before treatment is complete (LBTC) were the primary outcome variables, and a linear mixed model was used to assess the association between outcome variables and ED and hospital characteristics, while accounting for correlations among multiple observations within each hospital. All data were at the hospital level on a yearly basis. Results: There were 445 EDs included in the analysis, from 2004 to 2009, with 850 observations over 6 years. Higher-volume EDs were associated with higher rates of LBTC and LOS. For-profit hospitals had lower LBTC and LOS. Higher inpatient bed occupancies were associated with a higher LOS. Increasing admission percentages were positively associated with overall LOS for EDs, but not with rates of LBTC. Conclusions: Higher-volume EDs are associated with higher LBTC and LOS, and for-profit hospitals appear more favorably in these metrics compared with their nonprofit counterparts. It is important to appreciate that hospitals have different baselines for performance that may be more tied to volume and capacity, and less to quality of care.** © 2014 Elsevier Inc.

☐ **Keywords—health services; crowding; performance metrics; emergency department; throughput**

INTRODUCTION

As the Centers for Medicare & Medicaid Services (CMS) plans to offer financial incentives to hospitals who report emergency department (ED) treatment time intervals, especially length of stay (LOS) and left without being seen (LWBS) rates, it is important to understand hospital-level characteristics to make accurate comparisons (1). LOS for discharged patients will be reported as

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outpatient metrics, whereas LOS for admitted patients will be counted on the inpatient side. How this will impact payment to hospitals is not yet clear, but it started in 2013. Recent studies have identified ED characteristics associated with proposed benchmarks, but given that ED throughput is likely affected by hospital characteristics, hospital-level metrics should also be factored into the equation (2–4).

As all hospitals and EDs are not the same, it is important to better delineate the operational factors that drive current delivery models of emergency care. Only after these are understood can process improvement efforts be initiated so that care is optimized in all ED settings, whether it is a 10,000 patients/year ED in a critical access area or one that serves over 100,000 patients/year in a busy inner-city setting. Without factoring this into consideration, as has already been demonstrated, larger EDs with longer LOS will be wrongly perceived as being poorer performers (3). Although CMS guidelines currently offer incentives for reporting alone, it is possible that reimbursement rates in the future will be tied to performance in ED operational metrics, which may further compromise their ability to provide care to an underserved and vulnerable population.

LWBS is an indicator of limited access to care, ED crowding, and overall patient dissatisfaction (5–8). As ED crowding and LWBS rates continue to worsen, hospitals will take a closer look at the operations of their EDs given the potential financial impact (9). To address this, LWBS, along with LOS, were evaluated in the context of ED- and hospital-level metrics collected at the yearly level.

ED Benchmarking Alliance (EDBA) data were merged with American Hospital Association (AHA) data from 2004 to 2009. Our goal was to look at both ED-specific operational metrics and assess their differences by ED- and hospital-level characteristics. The objective of this study was to look at the association of both the ED- and hospital-level characteristics with operational metrics over a multiyear period. The ED-level characteristics of interest include: admission percentage, percentage of pediatric patients, and ambulance arrival percentage. Hospital-level characteristics were: number of inpatient beds, inpatient bed occupancy, critical access hospital status, rural vs. urban, trauma center status, teaching capabilities, and type of hospital ownership. Our hypothesis was that larger-volume, urban, nonprofit hospitals would have worse LWBS and LOS.

METHODS

Study Design

This is a retrospective study of EDBA data from 2004 to 2009. This cohort included hospitals participating in the EDBA (http://edbenchmarking.org) (10). As of 2009, approximately 400 hospitals were part of the EDBA collaborative that collected and reported data on ED operational metrics. With approximately 4800 EDs in the United States (US) as of 2006, this represents around 8% of all EDs in the country (11). Unlike other publicly available databases, such as the National Hospital Ambulatory Medical Care Survey (NHAMCS), which provides only patient-level data, the EDBA is unique in that it provides ED-level data from a national sample (12). For this study, we excluded freestanding, specialty, and pediatric EDs because impediments to operational throughput are unique to these settings compared to the traditional ED structure.

This study was independently approved and considered exempt by both the Oregon Health and Science University and Indiana University Institutional Review Boards, as there were no individual patient-level identifiers.

On a yearly basis, the EDBA solicits for members to submit their annual metrics shortly after the completion of the prior calendar year. All data submitted to the EDBA were average annual metrics for the preceding calendar year. Hospitals were linked with the AHA database based on name and address. AHA data are collected yearly (www.ahadata.com) through self-reported surveys, with a > 70% response rate historically. Data from 2000 to 2007 had an 86% response rate and data from 2008 to 2009 had an 84% response rate (13).

Measurements

LOS was examined, first for overall median value, and then for those patients admitted and discharged, separately, as indicators of throughput efficiency. The predictor variables were selected a priori based on being measures adequately reported over the study period and the anticipated impact they would have on operational metrics along with those commonly used in the medical literature. The ED-level predictor variables were: annual ED volume, percentage of patients in the ED admitted to the hospital, percentage of patients presenting by ambulance, and percentage of pediatric patients. Hospital-level characteristics included whether or not the hospital was a teaching hospital, whether or not it was designated a trauma center, the type of hospital ownership (nonprofit or for-profit), number of inpatient beds, whether or not it was a critical access hospital, inpatient bed occupancy, and whether or not the hospital was in a rural area based on Metropolitan Statistical Areas. Inpatient bed occupancy has been demonstrated in the literature to affect LOS (14). Inpatient bed occupancy was defined as the total number of inpatient hospital days divided by the number of hospital beds divided by 365.25 days per year, and was reported as a percentage (15,16). Prior studies have