



NURSE STAFFING AND HOSPITAL CHARACTERISTICS PREDICTIVE OF TIME TO DIAGNOSTIC EVALUATION FOR PATIENTS IN THE EMERGENCY DEPARTMENT

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Introduction: In the 2014 Emergency Department Benchmarking Alliance Summit, for the first time, participants recommended tracking nursing and advanced practice nurse hours. Performance data from the Centers for Medicare and Medicaid Services provides an opportunity to analyze factors associated with delays in emergency care. The purpose of this study was to investigate hospital characteristics associated with time to a diagnostic evaluation in 67 Massachusetts emergency departments from 2013 to 2014.

Methods: Covariates significantly correlated with time to diagnostic evaluation, and factors associated with timely care in emergency departments were included in the stepwise linear regression analysis. Differences in nurse staffing and performance measures in trauma and nontrauma emergency departments were examined with analysis of variance and *t* tests.

Results: Two predictors explained 38% of the variance in time a diagnostic evaluation (1): nurse staffing ($P < .001$) and (2)

trauma centers ($P < .001$). In trauma centers, the time to a diagnostic evaluation significantly increased ($P = .042$) from 30.2 minutes when a nurse cared for fewer than 11.32 patients in 24 hours to 61.4 minutes when a nurse cared for 14.85 or more patients in 24 hours.

Discussion: Efforts to improve patient flow often focus on process interventions such as improved utilization of observation beds or transfers of patients to inpatient units. In this study, time to diagnostic evaluation significantly increased when emergency nurses care for higher numbers of patients. The findings present new evidence identifying the relationship of specific nurse to patient ratios to wait time in emergency departments.

Key words: Nurse staffing ratios; Emergency nurse; Emergency department crowding; Emergency department wait times; Patient outcomes; CMS performance measures

Emergency departments in hospitals in the United States are struggling with overcrowding that has reached crisis proportion.¹ Delays in care due to ED

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holding, crowding, and poor flow challenge performance, increase costs, undermine confidence in the health care system, and adversely affect patient outcomes and access to care.² Data on ED performance available from the Centers for Medicare and Medicaid Services (CMS) provide an opportunity to analyze factors associated with delays in ED care. Hospitals are obliged to demonstrate efficient patient flow management in the emergency department as a condition of accreditation³ and to report to CMS measures of timely and effective care. Under the CMS Pay-for-Performance Program, emergency departments with longer wait times will be penalized, whereas those that outperform others will be rewarded through additional revenue.⁴

Massachusetts's health insurance reform is considered the model for the Affordable Care Act (ACA). Examining trends in CMS measures reported in Massachusetts emergency departments may foreshadow patterns of timely and effective care for emergency departments nationwide.⁵ In Massachusetts, after

health insurance reforms were enacted, there was a measurable increase in ED visits, suggesting that full implementation of the ACA is likely to result in a rise in ED volume across the United States.⁶ Although higher numbers of Americans will have health insurance under the ACA, emergency departments will still serve as a safety net for patients who cannot access outpatient care as a result of insufficient primary care providers or who cannot be admitted to a hospital because of a shortage of inpatient beds.

Patient flow is a key factor in reducing crowding and improving performance.^{7,8} The time a patient waits to be evaluated by a qualified health professional has been shown to be more affected by physician and emergency nurse staffing than by the volume of ED patients.⁷ Improvements in staffing models have been reported using sophisticated analytic decision support tools to predict staffing needs based on historical data about busy times or “surges” in ED demand.^{9–11} Staffing models to decrease ED length of stay include using advanced practice nurses (APNs), physician-assisted triage, and “medical assessment units.”⁸ The addition of nurse practitioners decreased ED length of stay by 49% and decreased the number of patients who left without being seen by 71%.¹² In addition to improving patient flow, the use of APNs is cost-effective because more APNs may be employed for a cost similar to that of one physician.¹³

A systematic review focusing on 15 measures of ED crowding found that the 3 measures most frequently linked to the quality and outcomes of care were the number of patients in the waiting room, the percentage of ED beds that were occupied, and the number of ED patients awaiting inpatient beds.¹⁴ Delay in evaluation time has been associated with an increased risk of death and significant delays in receiving pain medication.^{15,16} The number of patients who leave without being evaluated is considered a significant indicator of ED performance because it presents risk for both patients and the hospital. An analysis of ED performance found that volume alone did not explain patients who left without being seen, rather “better resourced emergency departments with efficient flow processes perform better regardless of volume and acuity.”⁷

Agreement is widespread about the need to study how resources and processes in emergency departments influence crowding and care quality.¹⁴ However, a gap in knowledge exists about how specific numbers of patients assigned to emergency nurses affect the wait time to diagnostic evaluation in emergency departments. The purpose of this study was to determine¹ the percent of variance in the time from a patient arrival at the ED door to a diagnostic evaluation by a qualified medical/health care professional that could be explained by hospital characteristics and emergency nurse staffing in Massachusetts hospitals and²

whether there are differences in nurse staffing and time to diagnostic evaluation between certified trauma emergency departments and nontrauma emergency departments.

Methods

This cross-sectional study examined factors associated with the median time from ED door to diagnostic evaluation by a qualified medical/health care professional in 67 Massachusetts emergency departments from 2013 through 2014. The dependent measure in this study is defined by CMS and reported in the set of timely and effective care measures for emergency departments. This measure captures how much time elapses in minutes from when a patient arrives in the emergency department until the patient has a direct diagnostic evaluation with a qualified medical/health care professional. A “qualified health care professional” is defined as an institutionally credentialed provider, including an emergency nurse under the supervision of a physician, a nurse practitioner, certified nurse specialist, certified registered nurse anesthetist, certified nurse midwife, or physician assistant.¹⁷ CMS technical specifications note that documentation of initial evaluation or assessment as recorded by the emergency nurse is acceptable.¹⁸

DATA SOURCES

The publicly available data sources used in this study included the CMS “timely and effective care ED measures” from January 1, 2013 to December 31, 2014,¹⁹ the Massachusetts Center for Health Information and Analysis hospital profile data from 2010 to 2014,²⁰ and the Massachusetts Hospital Association Healthcare Provider Data report of emergency nurse staffing plans in emergency departments from 2013 to 2014.²¹ These data sources were merged using the CMS hospital identifier number with the American Hospital Association Annual Survey of Hospitals released for 2009.²² This study is exempt from an institutional review board approval because the data are available from public sources.

SAMPLE

All 70 nonfederal Massachusetts hospitals were included in the initial sample, and therefore a power analysis was not performed. Hospital closures or mergers between 2013 and 2014 and the exclusion of a trauma emergency department for children resulted in a final sample of 15 certified adult trauma emergency departments and 52 nontrauma emergency departments. In the final sample of 67 hospitals, random missing data in the 18 variables used in the data analysis totaled 3.8% and lowered sample sizes reported in Table 1 (N = 62, N = 37), Table 2 (N = 37), the Figure (N = 61), and the independent *t* test (N = 63).

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