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EMERGENCY DEPARTMENT EXPANSION VERSUS PATIENT FLOW IMPROVEMENT: IMPACT ON PATIENT EXPERIENCE OF CARE

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☐ **Abstract—Background: Most strategies used to help improve the patient experience of care and ease emergency department (ED) crowding and diversion require additional space and personnel resources, major process improvement interventions, or a combination of both. Objectives: To compare the impact of ED expansion vs. patient flow improvement and the establishment of a rapid assessment unit (RAU) on the patient experience of care in a medium-size safety net ED. Methods: This paper describes a study of a single ED wherein the department first undertook a physical expansion (2006 Q2 to 2007 Q2) followed by a reorganization of patient flow and establishment of an RAU (2009 Q2) by the use of an interrupted time series analysis. Results: In the time period after ED expansion, significant negative trends were observed: decreasing Press Ganey percentiles (−4.1 percentile per quarter), increasing door-to-provider time (+4.9 minutes per quarter), increasing duration of stay (+13.2 minutes per quarter), and increasing percent of patients leaving without being seen (+0.11 per quarter). After the RAU was established, significant immediate impacts were observed for door-to-provider time (−25.8 minutes) and total duration of stay (−66.8 minutes). The trends for these indicators further suggested the improvements continued to be significant over time. Furthermore, the negative trends for the Press Ganey outcomes observed after ED expansion were significantly reversed and in the positive direction after the RAU. Conclusions: Our results demonstrate that the impact of process improvement and rapid assessment implementation is far greater than the impact of renovation and facility expansion.** © 2016 Elsevier Inc.

☐ **Keywords—total duration of stay; ED crowding; patient experience; patient satisfaction; ED renovation; emergency department; diversion**

INTRODUCTION

Crowding in the emergency department (ED) and the ensuing problem of ambulance diversion have long attracted national attention. Additionally, long waiting and turnaround times in the ED have been shown to negatively affect both quality outcomes and patient satisfaction (1–3). Among U.S. EDs in 2010, only 31% achieved the appropriate flow targets for their patients, whereas only 48% admitted their patients within 6 h (4). Most of the tactics that have been suggested to help ease crowding in the ED and diversion require additional space and personnel resources, major process improvement interventions, or a combination of both. Accordingly, most of these strategies also require institutions to make considerable investments of money and time that may not be readily available.

Cambridge Health Alliance (CHA) Whidden is a medium-size ED in a community safety net public

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hospital. Like many other EDs around the country, the CHA ED suffered from patient flow issues, including long waits, inefficient processes, and poor patient satisfaction. This work compares the impact of ED expansion vs. patient flow improvement and the establishment of a rapid assessment unit (RAU) at CHA's Whidden Hospital Campus ED.

Materials and Methods

This work describes a study of a single safety-net ED with a volume that ranged between 30,126 visits in 2005 and 45,459 visits in 2012 by the use of an interrupted time series analysis. During this period, the ED first undertook a physical expansion followed by a reorganization of patient flow and the establishment of an RAU. Measured metrics were collected on all patients who entered the ED from January 2005 to December 2012. They included diversion time, arrival to provider time, duration of stay, patient satisfaction scores, and percent left without being seen. The protocol received an Exempt Status from the Cambridge Health Alliance institutional review board (IRB).

Between the second quarter of 2006 and the second quarter of 2007 the Whidden ED underwent a major expansion and renovation process resulting in an almost doubling of the physical space. The original ED had 12 acute care treatment areas, six express care rooms, and two triage/registration areas. The expansion took place in multiple phases and resulted in 24 acute care treatment areas, seven express care rooms, and two triage/registration rooms.

During the second quarter of 2009, the CHA ED underwent a process improvement project aimed at optimizing patient flow by reengineering the arrival phase. This change included the creation of the "Patient Partner" role, implementing bedside registration and establishing an RAU.

Our existing greeters and receptionists were transformed into Patient Partners and received special training in customer service and registration. The nonclinical, multilingual Patient Partners greeted and welcomed our diverse patients, performed a mini-registration, generated a "patient encounter" in the electronic medical record, and escorted the patients immediately to the RAU.

We simplified our initial registration process to the bare minimum to identify the patient and create a unique ED electronic health record encounter in the most expeditious way. This new mini registration consisted of three questions: name, social security number (or date of birth), and chief complaint. Eventually, during downtime between tests and procedures, full bedside registration was performed after nursing and physician assessment, patient stabilization, and initiation of patient care.

The nine-room RAU space was created by combining the previously existing seven room express care with the two rooms used for triage/registration, thereby facilitating assessment and treatment at the point of entry to the ED. The RAU was staffed by the same compliment of nurses and physicians assistants that previously covered triage and express care. Combining these functions in one area minimized redundancies and created parallel functions across staff and physical space without adding new resources. Patients were triaged in accordance with the Emergency Severity Index (ESI) Triage Protocol. Low-acuity patients (ESI 4 and 5) received complete care in the RAU without ever entering the acute ED area. Patients triaged with higher levels of ESI (1, 2, and 3) were immediately moved to the acute ED areas, where they were evaluated and treated.

Data Collection and Processing

Data was collected using CHA's electronic medical record systems (Meditech and EPIC). Timestamps were used to compute the total duration of stay. Patient records were used to determine whether a patient left without being seen (LWBS). Patient Satisfaction Surveys were sent and data compiled by Press Ganey Associates.

Statistical Methods

An interrupted time series design was used to evaluate the impact of the two system changes occurring at the site (i.e., ED expansion and implementation of RAU) on each of the outcomes of interest. Interrupted time series is one of the strongest quasiexperimental designs for studying impacts of policy/process change (5). Controlling for the baseline rate and trend for the outcome of interest, we estimated changes in the level and slope of the outcome after ED expansion took place and after rapid assessment was implemented. The regression equation was specified as:

$$Y_t = \beta_0 + \beta_1 \times \text{time}_t \times \text{ED expansion} + \beta_3 \times \text{time after expansion}_t + \beta_4 \times \text{rapid assessment}_t + \beta_5 \times \text{time after rapid assessment}_t + e_t$$

Maximum likelihood estimation was used to estimate the models. We controlled for autocorrelation by including all significant autocorrelation parameters (Number of lags [NLAG] = 5) and backward elimination was used to include covariates in the final model with a type 1 error for inclusion of 0.05. Statistical analyses were performed using PROC AUTOREG in SAS (Statistical Analysis System Institute Inc., Cary, NC), version 9.3.