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## Communication and bed reservation: Decreasing the length of stay for emergency department trauma patients

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## ABSTRACT

**Background:** Prolonged emergency department (ED) length of stay (LOS) is associated with poorer clinical outcomes and patient experience. At our community hospital, trauma patients were experiencing extended ED LOS incommensurate with their clinical status. Our objective was to determine if operational modifications to patient flow would reduce the LOS for trauma patients.

**Method:** We conducted a retrospective chart review of admitted trauma patients from January 1, 2015 to June 30, 2016 to study two interventions. First, a communication intervention [INT1], which required the ED provider to directly notify the trauma service, was studied. Second, a bed intervention [INT2], which reserved two temporary beds for trauma patients, was added. The primary outcome was the average ED LOS change across three time periods: (1) Baseline data [BASE] collected from January 1, 2015 to June 30, 2015, (2) INT1 data collected from July 1, 2015 to October 18, 2015, and (3) INT2 data collected from October 19, 2015 to June 30, 2016. Data was analyzed using descriptive statistics, two-sample *t*-tests, and multivariate linear regression.

**Results:** A total of 777 trauma patients were reviewed, with 151, 150 and 476 reviewed during BASE, INT1, and INT2 time periods, respectively. BASE LOS for trauma patients was 389 min. After INT1, LOS decreased by 74.35 min ( $\pm 31.92$ ;  $p < 0.0001$ ). After INT2 was also implemented, LOS decreased by 164.56 min ( $\pm 22.97$ ;  $p < 0.0001$ ) from BASE LOS.

**Conclusion:** Direct communication with the trauma service by the ED provider and reservation of two temporary beds significantly decreased the LOS for trauma patients.

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### 1. Introduction

Inefficiencies in emergency department (ED) patient care or longer ED length of stay (LOS) times have been linked to overcrowding. In overcrowding, ED physical or personnel capacity is exceeded by the number of patients waiting to be seen, undergoing assessment and treatment, and waiting for departure [1]. Both external and internal factors contribute to an ED environment vulnerable to patient overflow and inefficiency. External elements include federal laws such as the Emergency Medical Treatment and Active Labor Act that mandates patient care regardless of insurance or legal status, a lack of effective preventative care, and inappropriate ED utilization for convenience care [2-5]. There is also the demographic component of increasingly older ED patients who often present with atypical, high acuity conditions on top of pre-existing comorbid illnesses that necessitate heavier resource

use along with a higher risk of post-ED discharge incidents [4-6]. Internally, inefficient output, or access block, whereby admitted ED patients are not transferred to inpatient (IP) beds efficiently, contribute significantly to overcrowding. These inefficiencies may be compounded by the throughput of patients from ED arrival to admission or discharge. The effectiveness of these processes is a function of simpler elements, ranging from inadequate staffing and hospital bed shortages, to more complex considerations, such as the local patient population served and intra-hospital department dynamics [1,7,8]. Unfortunately, despite Affordable Care Act changes in the healthcare system designed to improve preventative care and insurance levels, some studies have shown that ED visits may be continuing to increase despite reforms, highlighting the continued significance of access block, throughput, and overcrowding in the ED [9-14].

Of clinical concern, the phenomenon of ED overcrowding is linked to adverse outcomes related to cardiovascular disease, ineffective antibiotic administration, pain management, and lower patient and staff satisfaction as well as general care quality [15-19]. These injurious ramifications extend to trauma patients, manifesting as increased

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detrimental outcomes related to poor pain management, increased infection rates, and increases in trauma mortality resulting from ambulance diversion linked to ED overflow [20–22]. Various local interventions have been implemented to ameliorate overcrowding. For example, chest pain units, rapid assessment zones, clinical decision units (CDU), and lean principles that remove inefficient work processes have demonstrated varied benefits to ED patient care, such as reducing mortality and LOS [1,23–25]. Despite some improvements, the continuing demand for effective ED services underscores the imperative need to develop and study simple as well as affordable methods of facilitating care.

At our community hospital, a multidisciplinary trauma team tasked with optimizing ED care of injured patients identified throughput inefficiencies where our trauma patients were experiencing extended ED LOS incommensurate with their clinical status. This extended LOS was independent of access block. This prompted the implementation of a two part intervention to address the vulnerability. The primary objective of this study focuses on whether two quality improvements: (1) streamlining physician communication and consult placement with trauma providers and (2) reserving two temporary beds in the CDU for trauma patients, would effectively reduce components of as well as the total LOS for trauma patients in the ED at our community hospital. In addition, a secondary objective of the study focuses on a subgroup analysis considering differential impacts of the interventions based on demographic and disease severity variables.

## 2. Materials and methods

### 2.1. Study design, setting, and participants

We conducted a retrospective analysis of ED CDU trauma patient records from January 1, 2015 to June 30, 2016. Inclusion criteria included adult ED trauma patients (age  $\geq 18$ ) who were to be admitted to the trauma service through the CDU. Patients with hip fractures and those requiring a higher level of care than a regular medical floor were excluded as they would follow a different flow process. Patients moving directly to an operating room or to intensive care unit monitoring were also excluded.

Four time points were collected (occurring in the following order): ED arrival, emergency physician (EP) consultation to physician assistant (PA), admit decision, and ED departure (or time of placement into a CDU bed). Total LOS was defined as: time from ED “Arrival” to “Departure” (see Fig. 1). Time data was collected in two registries: electronic medical record and ED Data Cube.

In the pre-intervention communication protocol, the EP would initiate a trauma consult by placing an order into the electronic medical record for the trauma team PA. The ED secretary would then call the EP to ensure that the PA was notified. The PA would then conduct an electronic medical record review and see the patient, initiating additional studies if appropriate and deciding whether to admit the patient to trauma. If admitted, the patient would be discharged or transferred to a bed (if available) in the CDU. The patient then completes their course of care under observation or IP status. Observation status is designated for patients who do not meet acute care criteria for IP admission.

A multidisciplinary trauma team identified various inefficiencies in the original protocol: (1) the ED secretary may miss the new consult order due to preoccupation with another task, (2) the EP and patient must wait for the PA decision to admit, (3) and the EP may also order tests and be unaware of an admit decision or new tests ordered by the PA. (4) As there may be no beds available in the CDU, a patient requiring admission may have to linger in the ED, unnecessarily extending patient waiting time.

### 2.2. Interventions

The first intervention was the communication intervention [INT1], which was implemented on July 1, 2015 and required the EP to directly notify the trauma service (via phone). INT1 simplified the admit process by removing the ED secretary's role as a communication intermediary between the EP, who provides the initial consultation, and the PA. Direct notification established uninterrupted communication between the EP and PA in order to facilitate coordination of care and more transparent decision making (see Fig. 1). INT1 affected consultation to admit decision time. The second intervention was the bed intervention [INT2], which was implemented on October 19, 2015 and reserved two temporary beds in the CDU for trauma patients. INT2 affected admit decision to ED departure time.

### 2.3. Outcomes and statistical analysis

Our primary outcome was total LOS change across three time periods: (1) Baseline data [BASE] collected from January 1, 2015 to June 30, 2015, (2) INT1 data collected from July 1, 2015 to October 18, 2015, and (3) INT2 data collected from October 19, 2015 to June 30, 2016. To evaluate the effect of INT1 and INT2 on total LOS, changes to LOS after INT1 but before INT2 and after both INT1 and INT2 were compared with the LOS before both INT1 and INT2 (BASE). Additionally, pre- and post-INT1 consult to admit decision wait times were examined to evaluate the individual effect of INT1. Pre- and post-INT2 admit decision

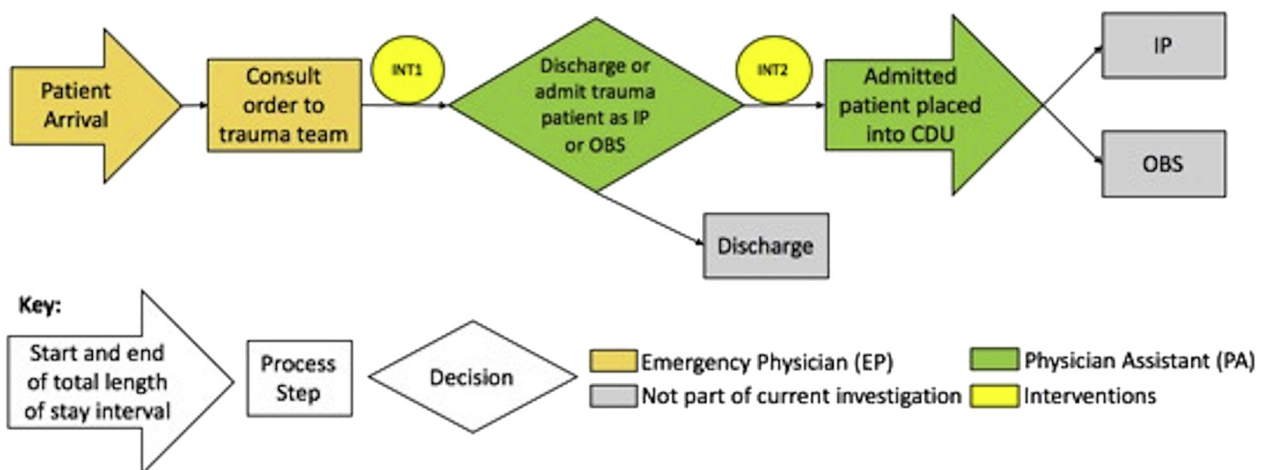


Fig. 1. Diagram depicting movement of emergency department trauma patients destined for the clinical decision unit (CDU). Patients are placed into the observation unit (OBS) or designated as inpatient (IP). The communication intervention, intervention 1 (INT1), and the bedding intervention (INT2), are depicted where they affect the flow process.

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