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Original Article

A new strategy for emergency department crowding: High-turnover utility bed intervention

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Abstract

Background: This study applied a new strategy, termed *high-turnover utility bed intervention*, to offer early admission chances for emergency department (ED) patients and alleviate ED crowding.
Methods: This before-and-after observational cohort study was conducted at the ED of an urban tertiary hospital. On January 1, 2012, 14 utility beds were prepared exclusively for ED patient use. A strict 48-hour course limit for each patient was formulated to govern these high-turnover beds. The primary outcome measure for this study was ED length of stay. Secondary outcome measures were the number of ED admissions, patients who left without being seen, and revisits within 72 hours of discharge, as well as the outcomes of cardiac arrest management and ambulance diversion hours.
Results: There were 70,515 adult ED visits enrolled during the preintervention period (January−December 2011), and 69,706 during the postintervention period (July 2012−June 2013). In the postintervention period, this new strategy offered 1401 early admission opportunities. The ambulance diversion hours decreased prominently from 5.4 hours to 1.6 hours per day. A shortening in ED length of stay from 9.7 hours to 8.0 hours was achieved, mainly in cases of nontrauma. More patients (31.2% vs. 29.7%) were admitted to the wards with a lower discharge rate in the postintervention period. Additionally, there was no difference in ED revisit within 72 hours and cardiac arrest management.
Conclusion: The high-turnover ED utility bed intervention offered improved admission chance and alleviated ED crowding output. ED efficiency improved, with shortened ED length of stay and fewer ambulance diversion hours.

Keywords: ambulance diversion; crowding; emergency department; length of stay; turnover rate

1. Introduction

Emergency department (ED) crowding has been described in emergency medicine literature as a concern for > 20 years,[1] and it has become a modern international health delivery problem.[2] It has been previously demonstrated that ED crowding has a detrimental effect on quality of care and medical management, including a longer duration of hospital stay, a higher risk of mortality, subsequent hospital admission,

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lower levels of patient satisfaction, increased costs for admitted patients, and delays in the life-saving intervention and treatment of several crucial illnesses such as myocardial infarction, pneumonia, and painful conditions.[3−9] Potential mechanisms for the harmful effects of ED crowding may include impaired decision-making, unwillingness to order tests or consultations, incomplete examinations, insufficient monitoring, suboptimal physiotherapy, deficient treatment, or a lack of discharge planning and follow-up arrangements.[10] In addition, it has been illustrated that ED overcrowding can affect the interaction between the educator and the learner.[11] This has a negative impact on the clinical education of medical students, owing to the sacrifice of certain aspects of the educational process and increased environmental stress.[12,13] Essentially, it is reasonable to assume that ED crowding is not an isolated phenomenon, but more probably a manifestation of general hospital crowding. Crowding is influenced by the number of patients and medical crew, the number of beds in the ED, and the number of available beds in the hospital, as well as by wait times for laboratory results and radiology examinations and the availability of consulting specialists.[14]

A conceptual model of ED crowding is composed of three elements: input, throughput, and output.[15] Input is about patient demand for emergency services before ED arrival, which typically includes uncontrolled variables. Throughput focuses on the operations within the ED comprising the illness severity of patients in the ED, the number of adjunct exams and procedures performed in the ED, and the number of physicians and nurses on duty. Finally, the output depicts the transferring or discharge of patients from the ED. Among the output components, prolonged boarding time, such as waiting for an available hospital bed links to delay definitive testing and increase length of stay (LOS), short-term mortality, and associated costs.[16] The poor availability or supply of inpatient beds has been described as one of the major causes of ED crowding.[17]

In order to maximize inpatient bed occupancy effectively and to increase the prevalence of admitted patients boarding in the ED, we have applied a new policy, termed high-turnover ED utility bed management, to relieve ED crowding since 2012. Now, we have sought to determine whether the introduction of ED utility beds resulted in actual improvements in ED crowding in our hospital.

2. Methods

2.1. Study population and hospital setting

We carried out a retrospective, observational cohort study at Taipei Veterans General Hospital (VGH), a 2700-bed tertiary care medical center in Taipei, Taiwan. The hospital has all types of specialties, and serves an average of 6900 outpatients, 240 emergency visits ,and 320 daily admissions. In general, the hospital beds are used by all types of specialties, and the overall bed occupancy rate is 85%. Because of the shortage of hospital inpatient beds, approximately 50 patients per day are admitted to the ED-attached observation unit for a *hold* until their inpatient bed is ready or for short-term observation. The mean LOS of patients in the ED-attached observation unit is 25 hours.

On January 1, 2012, our hospital administrator set up 14 utility beds for ED patient use only in order to improve ED overcrowding. We also formulated strict regulations to govern the occupancy of these high-turnover beds, which contained rules stipulating that. (1) ED patients waiting for admission would receive ED utility beds in the following order of priority: (a) patients in observation units with wait times for admission > 24 hours; (b) patients from resuscitation units under relatively stable hemodynamic status with the need for admission; (c) patients in observation units with wait times for admission < 24 hours; and (d) any patients who were evaluated as needing admission. (2) There would be a restriction of a 48-hour course limit for each patient who was admitted to ED utility beds to maintain the high turnover and effective occupancy state of these beds. (3) If cases failed to be transferred back to their specialty wards within the course limit, the attending physician in charge would be responsible daily for explaining the reason for the prolongation to our vice superintendent unit the occupied bed was empty; additionally, the management of ED utility beds would be directed by the ED Quality Control Committee every 2 months.

2.2. Data collection and definition

Consecutive patients were enrolled between January 2011 and June 2013, and all relevant data were obtained from the ED registry database. Because the implementation of ED utility beds went into effect during first half of the year 2012, the preintervention period was defined as January−December 2011 and postintervention period from July 2012 to June 2013. Adult patients aged ≥ 20 years were eligible for inclusion. Exclusion criteria were age < 20 years or pregnancy, given that the ED utility beds were not suitable for children or pregnant patients. The Taiwan Triage and Acute Scale was used to categorize patients by both injury and physiological findings, and rank them on a scale of 1−5, with 1 being the most critical (resuscitation), and 5 being the least critical (nonurgent).[18] The primary outcome measure was ED LOS. Secondary outcome measures were the number of ED admissions, patients who left without being seen, and patients who returned to the ED within 72 hours of discharge, as well as outcomes of cardiac arrest management and ambulance diversion hours, which occur when ED staff can no longer safely care for new patients and ambulances are diverted to nearby facilities.[19] The study was approved by the Committee on Ethics of Institutional Review Board of Taipei VGH, with no need for patients' written informed consent.

2.3. Statistical analysis

Results are expressed in numbers and percentages for categorical variables. Descriptive statistics are reported as means and standard deviation for continuous variables. Also, continuous variables were assessed using the Mann−Whitney

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