Evaluation of a Practice Improvement Protocol for Patient Transfer From the Emergency Department to the Surgical Intensive Care Unit After a Level I Trauma Activation

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Contribution to Emergency Nursing Practice

- The purpose of this practice improvement project was to improve the transfer time from the emergency department to the surgical intensive care unit after a level I trauma activation.
- The primary outcome of this practice improvement project was a statistically significant reduction in time to transfer and subsequent patient throughput time.
- Key implications for emergency nursing practice based on this project are that efficient patient throughput is possible through the efforts of a multidisciplinary team of nurses and physicians to develop and maintain a transfer protocol.

Abstract

Background: ED boarding is a major issue in many hospitals. ED boarding occurs when there is insufficient hospital capacity to supply inpatient beds for admitted patients. ED boarding is not only a problem because of increased wait times for patients but also because it results in delays in administration of medication, higher rates of complications, and increased mortality.

Methods: In an attempt to improve patient flow and reduce time spent in the emergency department for patients requiring admission to the surgical intensive care unit (SICU), the emergency department, trauma service, and SICU collaborated on a guideline. The protocol developed focused on level I trauma-activated patients who were admitted directly from the emergency department to the SICU. We compared the transfer times before the protocol was initiated (January 1, 2016 to December 31, 2016) with the transfer times after initiation (January 1, 2017 to December 31, 2017) using a paired Students' *t*-test. Other outcome variables analyzed were hospital and intensive care unit (ICU) length of stay, mortality, complication rate, ventilator days, ventilator-free days, ICU-free days, and injury severity score (ISS).

Results: The average time to transfer for 2016 was 408.05 minutes (standard deviation 362.76) versus 142.73 minutes (standard deviation 101.90) for 2017. Emergency nurses saved 265.32 minutes per patient, totaling 8,755.56 minutes saved overall. Total amount of nursing hours saved was 146 hours. This was significant at $P = 0.0015$. No other variables analyzed were significant.

Conclusion: We reduced the time to transfer from the emergency department to the SICU significantly by

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implementing a new protocol to expedite this transfer among level I trauma activations. Our protocol shows that a collaborative effort between the main emergency department and SICU can result in expedited care for injured and critically ill patients that not only increases care for the ill but also creates valuable space in a busy emergency department for better patient flow.

Key words: Throughput; Trauma; ED Boarding; Transfer; SICU

ED boarding is a major problem in many hospitals as a consequence of insufficient hospital capacity to supply inpatient beds for admitted patients. As a result, patients do not receive the same level of care as they would in an inpatient bed.[1] ED boarding is not only a problem because of increased wait times for patients, but it also has detrimental effects on patients such as delays in administration of medication; higher rates of complication, especially ventilator-associated pneumonia; and increased mortality.[1] ED boarding also has negative effects on other ED patients such as increasing the rates of those leaving against medical advice and those who left without being seen.[2] Patients who are ready for discharge from the emergency department are subject to longer lengths of stay as well.[3]

Emergency physicians have reported that patients requiring admission to intensive care units (ICUs) are often subject to excessive boarding time,[2] making this problem especially concerning for critically ill patients with traumatic injury. A critically injured trauma patient is one who has been identified as physiologically unstable, requiring constant and progressive disease management as the disease evolves. As such, critical care extends beyond the ICU, often beginning in the emergency department and prehospital setting.[4] Although emergency departments are equipped to provide initial treatment and emergency stabilization for critically ill patients, most emergency departments are not equipped with the same level of resources needed for optimal longitudinal delivery of care as the ICUs are.[4] The concept of the "Golden Hour" in critical care applies in these situations, as outcomes in the critically ill are affected by time- sensitive intervention.[5] As a result, critically ill patients boarding in emergency departments are at increased risk of poor outcomes. A study by Chalfin et al found that critically ill patients needing transfer to ICUs who had an ED length of stay (LOS) longer than 6 hours were more likely to have a longer hospital LOS and higher hospital mortality and ICU mortality.[6]

Three major reasons for ED boarding for critically ill patients are increased volume of critically ill patients in the emergency department, hospital and ED overcrowding creating a backlog of patients waiting for open beds, and lack of available staffed ICU beds.[6] Our practice improvement project aimed to address reason number 3—lack of available staffed ICU beds—thus, we hoped, improving ED overcrowding and hospital patient flow. Our goal was to create a protocol that expeditiously opened a bed in the SICU upon trauma activation to make room for the critically injured patient. Several previous studies have pointed to success with a 24-hour open-bed protocol; however, during busy SICU periods, a 24-hour open-bed protocol is not possible.[5,7] Therefore, we created a patient throughput protocol when the SICU is at full capacity or has an open bed, to expedite patient flow from the emergency department to the SICU for level I-activated trauma patients.

Methods

This practice improvement project took place in an inner city, level I American College of Surgeon (ACS)-Verified Trauma Center with 2,776 trauma patients in our registry for the year 2017 and approximately 124,000 ED visits per year, on average. A collaborative meeting among the Emergency Department, Trauma, and SICU was held to develop expedited transfer protocols for level I trauma activations. The primary aim of the protocol was to improve patient flow and reduce the amount of time critically ill trauma patients spent in the emergency department upon approval of admission to SICU. The secondary aim was to reduce poor outcomes associated with increased ED LOS.

Optimally, there would always be at least 1 SICU bed consistently open for emergent critical cases; however, the protocol is used both when there is an open bed and when a patient may need to be transferred out to create an open bed. In the protocol, upon being alerted of a level I trauma activation, the SICU actively contacts the ED/Trauma staff to determine if the patient is coming to the SICU. If so, an assigned SICU nurse would shift his or her responsibilities solely to prepare for and expedite patient transfer from the emergency department. These responsibilities include transferring of other SICU patients with assistance from the admitting department, assisting in the patient transport from the emergency department to the SICU, and housekeeping services to make timely accommodations for the incoming trauma patient. In-service trainings were performed with the emergency nurses and SICU nurses to make them—as well as the resident physicians on each service—aware of the plan. The flowsheet of responsibilities for SICU nurses are outlined in Figure 1.

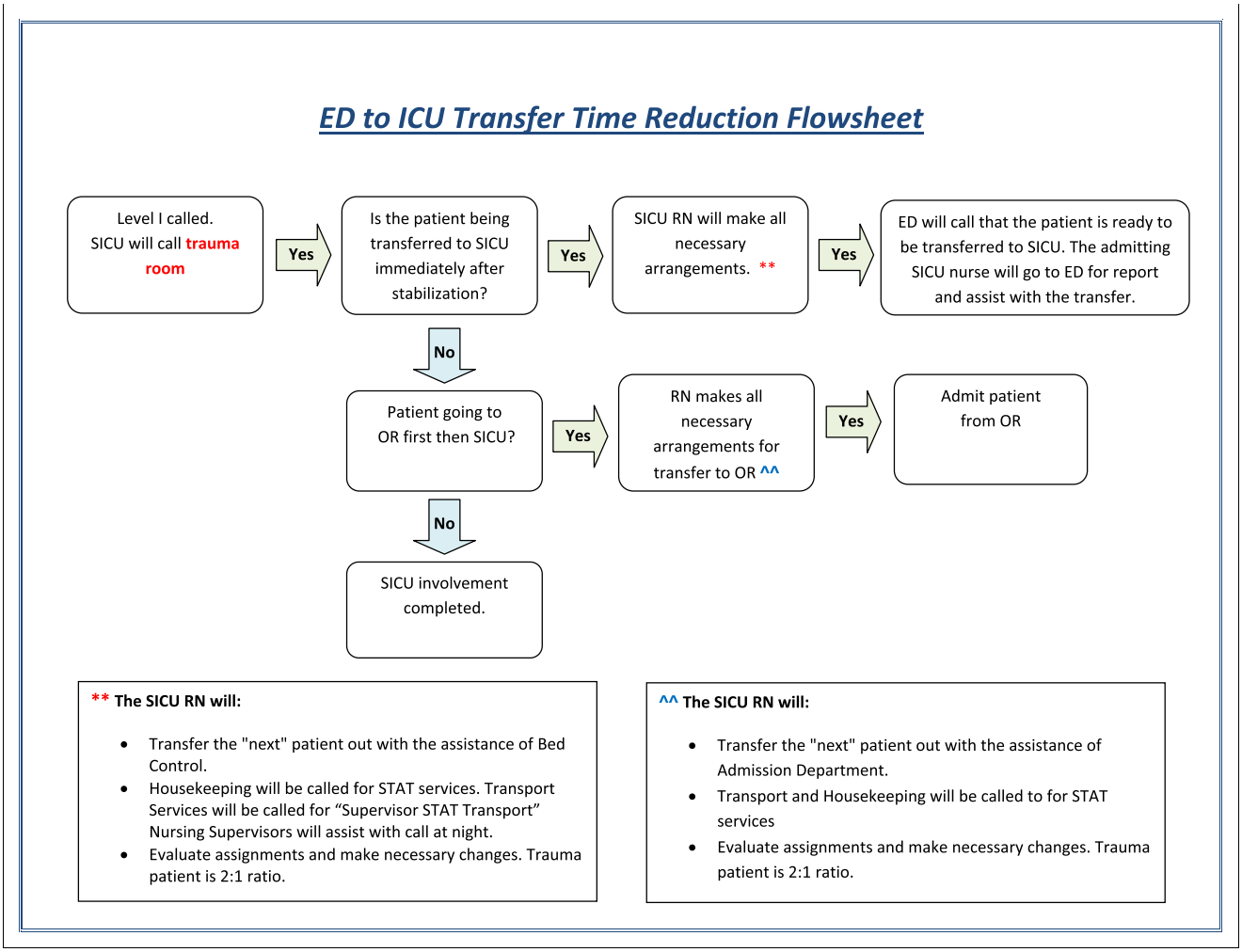

FIGURE 1
ED to ICU transfer time reduction flowsheet.

To assess the impact of this intervention, a spreadsheet using the trauma registry was created for the years 2016 and 2017. The retrospective data included the patients' medical record numbers (MRNs), level of activation, date of arrival, time of arrival to the emergency department, ED disposition, complications, injury severity score (ISS: a calculated number that describes patients' injuries based on type, severity, and location of injury), ICU days, hospital days, and hospital disposition. All level I trauma patients were extracted from the spreadsheet. The ED disposition was used to determine which level I trauma patients were transferred directly from the emergency department to the SICU. Patients departing the emergency department for computed tomography scans were included. Patients were excluded if they had interventional services between arrival at the emergency department and SICU transfer. This includes patient transfer to interventional radiology and the operating room. Transfer times to the SICU were calculated by using the patient's ED arrival time and SICU arrival time as documented by nursing staff on the transfer receiving note in the patient chart. The patient's MRN was used to access the patient's electronic medical record (EMR) for the transfer-receiving note from the emergency department to the SICU.

The differences in transfer time between patient arrival and transfer to the SICU were calculated to determine the time taken to transfer the patient to the SICU from patient arrival. ICU-free and ventilator-free days were calculated by

subtracting the number of ICU and ventilator days from the total hospital LOS. Ventilator-free days are defined as the calculated number of days the patient spent without a ventilator during the entire hospital LOS. ICU-free days are defined as the calculated number of days the patient spent admitted, but not in the SICU during the entire hospital LOS. Using a 2-tailed Students' *t*-test, transfer times from 2016—when the project started—were compared with transfer times from 2017, a full year of implementation, for statistical significance at $P < 0.05$. The paired Students' *t*-test was also used to compare the number of ICU days and hospital days and ISS of patients. The rates of complications and mortalities for each year were compared using a 2-proportion z-test for statistical significance at $P < 0.05$. This study was approved by the hospital's Institutional Review Board.

Results

There were 21 level I trauma patients transferred to the SICU in 2016 and 33 level I trauma patients transferred to the SICU in 2017. The average time to transfer for 2016 was 408.05 minutes (range: 113 to 1,366; standard deviation 362.44), and for 2017, the average time to transfer was 142.73 minutes (range: 35 to 487; standard deviation 101.90). This was significant at $P = 0.0015$. Emergency nurses saved an average of 265.32 minutes per patient, totaling 8,755.56 minutes saved overall. Total amount of nursing hours saved was 146 hours. There were no statistically significant differences found among ICU days, hospital LOS, ICU- and ventilator-free days, deaths, and ISS. Although not statistically significant, a decrease was found in the number of deaths, complications, and hospital days. Study findings are outlined in Table 1.

TABLE 1
Results of the study

Time to Transfer and Patient Outcomes Pre- and Post-Implementation

	2016	2017	*P* Value
Level I Trauma to SICU	21	33	
Average Time to Transfer (min)	408.05	142.73	0.0015
Deaths	8	7	0.17
Complication rate	33.3%	26.6%	0.61
Average ICU days	7	7.8	0.79
Average hospital days	15.62	15.06	0.39
ICU-free days	8.62	7.24	0.13
Ventilator-free days	6.67	6.76	0.87
Injury Severity Score	15.9	15	0.41

Discussion

We reduced the time to transfer from emergency department arrival to arrival at the SICU significantly by implementing a new protocol to expedite this transfer of level I trauma patients. Because of these significant results, many other units in our institution have considered adopting a similar protocol to combat ED boarding for their own departments. ED boarding/crowding is a widespread problem that affects all levels of care within the hospital. Our protocol shows that a collaborative effort between the emergency department and trauma department results in expedited care for injured and critically ill patients and creates valuable space in a busy emergency department for better patient flow.

Although an ISS of 15 signifies a major trauma, an average ISS of 15 for the patients included in this study barely reaches the threshold of being considered a major trauma. Our reasoning for the insignificant difference in outcomes after the implementation of our program is that the patients on the lower end of "severely injured" may be treated adequately at the ED level. Although continuity of care to the SICU has other benefits to the patient, as well as to patient flow, these patients may not show outcome differences, as the emergency department can handle this severity of patient appropriately because of the emergency nurses' training in critical care and Trauma Nursing Core Course (TNCC) verification. Also, our institution's average time to transfer prior to the 2017 implementation (408 minutes or 6.8 hours) is fairly close to Chalfin and colleagues' designation for the time spent in the emergency department before developing poor outcomes (6 hours). Although our time to transfer did decrease significantly, our previous transfer times may not have been long enough to show the poor outcome results of longer ED LOS.

As a quality improvement initiative, we found a significant decrease in the time from patient arrival in the emergency department to arrival at the SICU. Although our results did not show a significant difference in patient outcomes, it has been widely researched that reduced time to specialized critical care improves patient outcomes.[6,8,9]

Anecdotal reports of improvements between emergency nurse and SICU nurse relations have also been observed. Reported comments from emergency nurses and SICU nurses suggest that the protocol has acted as a staff satisfier, building a feeling of collegiality and accountability

to each other. The ED staff thinks that the SICU staff has a heightened sense of urgency and of taking ownership of "their" patient, and there is increased comradery between the SICU and emergency nurses. Anecdotally, there has also been a relief of pressure on emergency nurses to care for additional patients in the busy emergency department. By transferring the patient to the SICU, the open bed allows for emergency nursing to care for more patients, without the pressure of a critically ill ED boarded patient on their rotation. Emergency nurses and SICU nurses have also given feedback that there is increased satisfaction and reduced stress between both department nursing staffs.

There are limitations to the generalizability of this practice improvement project that explain the reason we did not find any significant differences in outcomes based on our patient data. Our sample size is small, which may contribute to the lack of significance despite the postimplementation period having lower complications, deaths, and hospital LOS. Further studies with a larger patient population would be of interest.

Implications for Emergency Nursing

Our protocol for expediting patient transfer to the SICU for level I trauma patients can be used to combat ED boarding, a significant problem in many emergency departments with detrimental outcomes for patients. Our results support the integration of this simple low-cost protocol to reduce time from patient arrival in the emergency department to patient arrival on an inpatient floor. By expediting this transfer, emergency nurses and patients can benefit from increased patient throughput, allowing for current patients to receive continuity of care and future patients to begin treatment in the emergency department.

Conclusion

ED boarding is a significant problem that poses harmful effects for patients who are critically ill or injured. Expedited transfer to the ICU is imperative to improve care for the patient and also to create more patient flow in the emergency department. This allows for increased throughput of patients, which opens up space in the emergency department to accommodate for more injured or ill patients. A multidisciplinary initiative to decrease the time to transfer from the emergency department to the SICU can be implemented successfully, thus reducing the time to providing advanced care to the patient through early identification and use of specialized resources. We showed a significant improvement in the time to transfer for our level I critical trauma patients. More research is needed on the effects of the initiative in terms of patient outcomes.

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