Under-triage as a Significant Factor Affecting Transfer Time between the Emergency Department and the Intensive Care Unit

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Introduction: The purpose of the study was to identify factors that affect transfer times between the emergency department and the intensive care unit (ICU) in a community hospital. Patients who are transferred from the emergency department to the ICU are usually in critical condition and in need of prompt treatment by qualified personnel. As a result of delayed transfers, a patient may experience complications, such as increased mortality rates and longer hospital stays.

Methods: A quantitative descriptive correlational design was used in this study. Data were collected from the charts of 75 patients who were transferred from the emergency department to the ICU of a 142-bed community hospital in the eastern United States. "Delayed patients" were identified as those who were transferred after more than 4 hours.

Results: Forty-four patients (58.7%) spent more than 4 hours in the emergency department. Nineteen out of 25 patients (76%) with an Emergency Severity Index designation of 3 were identified as delayed. Delayed status and an Emergency Severity Index designation of 3 showed a significant correlation ($r = -.339$, $P = .004$). Eleven patients (64.7%) diagnosed with sepsis were delayed, compared with 6 who were not delayed. A total of 70.4% of female patients were delayed, compared with 52.1% of male patients.

Discussion: This study provides a more comprehensive view of the factors involved in delayed patient transfer and provides data needed for effective interventions to be developed. The results suggest significant problems with the under-triage of critically ill patients, specifically patients with sepsis. Future research should include a larger group of subjects and a multifactorial analysis.

Key words: Critical care; Triage; Sepsis; Critical care transfer

Patients who are transferred from the emergency department to the intensive care unit (ICU) are critically ill and in need of prompt treatment by qualified personnel. Chalfin et al[1] suggested that ED nurses are not trained properly to provide critically ill patients with the appropriate level of care. They cited a lack of both proper equipment and adequate personnel available to provide one-on-one care, when compared to staffing and expertise in the ICU. As a result of delayed transfers, a patient may suffer complications, such as increased mortality rates and longer hospital stays.[2] Delayed transfer may be a result of ED boarding, miscommunication, or delays during transport, and delayed patients may experience complications at a higher rate than patients who are not delayed.[3]

Richardson et al[4] reported that although correct assignment of acuity level provides patients with prompt treatment and improved patient flow, it does not guarantee better outcomes. They suggested that this phenomenon occurs because higher acuity patients have more risk factors for negative outcomes, and they recommended that practitioners focus their efforts on minimizing the time spent on patient transfers to improve outcomes and facilitate high-quality care.

Other factors in transfer delays may involve large volumes of patients. As reported by the Institute of Medicine[5] in 2006, ED crowding is a major public health con-

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cern, not only because crowding delays care but because it also may "desensitize" triage nurses to acuity.[6] Chalfin et al[1] discussed the consequences of prolonged ED stays on patient outcomes based on their cross-sectional analytical study. Based on their analysis, patients with delayed stays, who were defined as patients who remained in the emergency department for more than 6 hours, had a longer mean hospital length of stay (7.0 vs 6.0 days), higher ICU mortality (10.7% vs 8.4%), and a higher total in-hospital mortality rate (17.4% vs 12.9%). Additionally, the time gap between acceptance by the ICU team and physical transfer to the unit may bring with it particular risks, most stemming from inconsistencies in communication between units.[3]

We have a gap in knowledge about this process, because the literature reveals a dearth of research concerning transfer of patients between the emergency department and the ICU specifically. The literature that does exist focuses mainly on communication as the primary factor in delay. Other problems with current literature are that (1) most of the studies have small sample sizes, which impede generalizability, and (2) organizational and cultural factors that may influence all aspects of patient care involving the transfer of patients and communication between departments are not well delineated. Further research is needed to analyze possible factors that affect the transfer of critically ill patients from the emergency department to the ICU. The purpose of this study was to identify factors that affect transfer times between the emergency department and the ICU of a local community hospital.

Methods

SITE

The study site was a 142-bed acute care hospital located in the eastern United States with 11 ICU beds and 27 ED beds. Approximately 37,500 patients are seen in the emergency department each year, of which 18% to 20% are admitted. Forty percent to 50% of patient arriving by ambulance are admitted, and 70% of hospital admissions are through the emergency department. Of those admitted, 35% are admitted to the ICU. The emergency department uses the Emergency Severity Index (ESI) to assign acuity. Patients with ESI designations 1 to 3 are treated in a main department, and a Fast Track area offers services for patients with ESI designations 4 and 5. Imaging and laboratory services are physically located in the emergency department.

SAMPLE

A total of 92 charts were analyzed; 75 complete charts were used in the final analysis. The age range of the patients was 19 to 92 years, with an average age of 66 years. The study included 48 men and 27 women. The admitting diagnoses included sepsis, respiratory arrest, overdose, diabetic ketoacidosis, acute myocardial infarction, gastrointestinal bleed, cerebrovascular accident, and "other," which included very small numbers of patients with acute renal failure (2), alcohol withdrawal (3), subglottic edema/epiglottitis (2), pleural effusion (1), arterial occlusion (1), rhabdomyolysis (1), hyperthyroid (1), ventricular tachycardia (1), and cardiac arrest (3) (Figure 1).

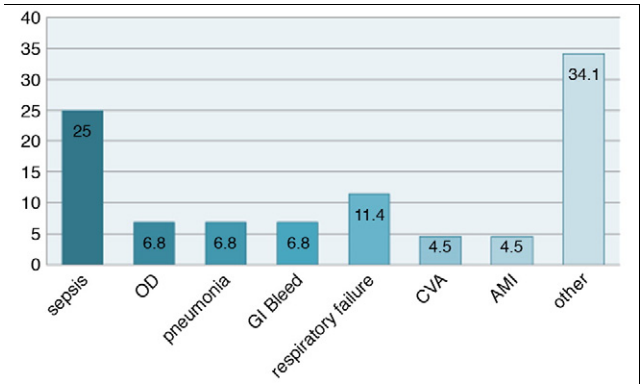

FIGURE 1

Diagnosis: delayed. *AMI,* Acute myocardial infarction; *CVA,* cerebrovascular accident; *GI,* gastrointestinal; *OD,* overdose; *other*, this category included very small numbers of patients with acute renal failure (2), alcohol withdrawal (3), sub-glottic edema/epiglottitis (2), pleural effusion (1), arterial occlusion (1), rhabdomyolysis (1), hyperthyroid (1), ventricular tachycardia (1), and cardiac arrest (3).

STUDY METHODOLOGY

The study used a retrospective chart review. After Institutional Review Board approval was obtained, data were collected from the paper and computer charts of all patients admitted to the ICU in the 12-week period of April 1 through June 30, 2009. Included in the review were all patients who were admitted directly to the ICU from the emergency department. Several charts were removed from analysis because of a lack of information regarding the time of transfer. Data collected included the date and day of the week, time that triage was conducted, time first seen by a medical doctor, time admitted to the floor, time transferred to the floor, sex, age, diagnosis, ESI acuity assignation, method of arrival (ambulance [EMS] or walk-in), and staffing levels (the number of physicians and registered nurses working in the emergency department). The time spent in the emergency department was based on the difference between time the patient was first triaged and the time he or she was transferred to the ICU.

For the final analysis, we compared patients who spent more than a total of 4 hours in the emergency

TABLE 1
Emergency Severity Index

Delayed	Frequency	%	Valid %	Cumulative %
≥4 h—valid				
1	1	2.3	2.5	2.5
2	20	45.5	50.0	52.5
3	19	43.2	47.5	100.0
Total	40	90.9	100.0	
Missing system	4	9.1		
Total	44	100.0		
<4 h—valid				
1	5	16.1	16.7	16.7
2	19	61.3	63.3	80.0
3	6	19.4	20.0	100.0
Total	30	96.8	100.0	
Missing system	1	3.2		
Total	31	100.0		

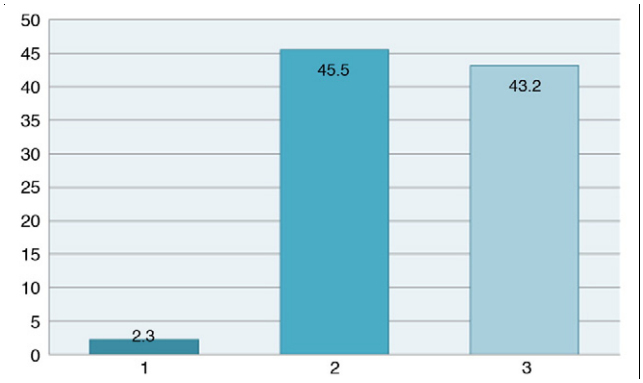

FIGURE 2
Emergency Severity Index: delayed.

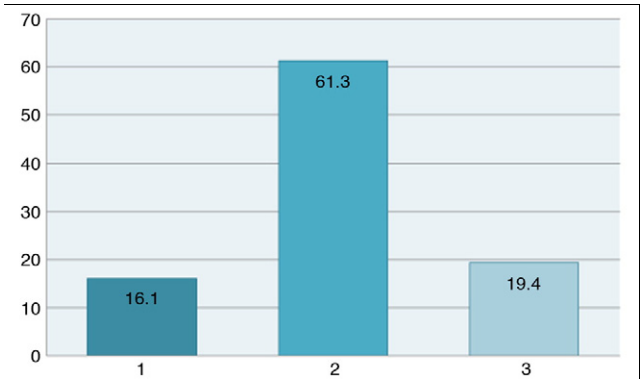

FIGURE 3
Emergency Severity Index: not delayed.

department with patients who spent less than a total of 4 hours in the emergency department. The 4-hour time frame reflected the hospital's time goal of 4 hours "up or out" for patients admitted to the ICU, based on the literature demonstrating worse outcomes for patients who spend longer periods in the emergency department. Correlations were conducted for all independent variables, with "delayed transfer" as the dependent variable. PWAS predictive analytics software by IBM Corporation was used for statistical analysis.

Results

A total of 75 complete charts were analyzed for the study. Forty-four patients (58.7%) spent more than 4 hours in the emergency department before being transferred to the ICU and were categorized as "delayed transfers" compared with 31 patients who spent less than 4 hours in the emergency department. All factors were analyzed to see their effect on the time of transfer; the most significant finding was the effect of the initial triage acuity assignment. Table 1 shows the distribution of patients based on their ESI designation and time spent in the emergency department (Figures 2 and 3). Out of 75 patients, 6 had an ESI of 1, 39 had an ESI of 2, and 25 had an ESI of 3; no patients in the sample who were transferred to the ICU were assigned an ESI level of 4 or 5. Five patients did not have an ESI level assigned at all. Nineteen of 25 patients (76%) with ESI assignations of 3 were delayed, and they comprised 43.2% of the total number of delayed patients. Delay in transfer was significantly correlated with ESI; the higher the ESI number (meaning the lower the assigned acuity), the greater the delay ($r = -0.339$, $P = .004$) (Table 2).

Table 3 shows the data breakdown based on the primary diagnosis assigned at the emergency department. Eleven of 17 persons (64.7%) with a diagnosis of sepsis were delayed. Other diagnoses analyzed included overdose, pneumonia, gastrointestinal bleed, respiratory failure, cerebrovascular accident, acute myocardial infarction, and "other," which is described in the Sample section. None of the other diagnosis groups showed a significant difference between delayed and non-delayed groups.

TABLE 2
Correlations

	ESI	Delayed
ESI		
Pearson correlation	1.000	–.339
Significance (2-tailed)		.004
N	93	70
Delayed		
Pearson correlation	–.339	1.000
Significance (2-tailed)	.004	
N	70	75

ESI, Emergency Severity Index.
Correlation is significant at the .01 level (2-tailed).

TABLE 4
Gender

Delayed	Frequency	%	Valid %	Cumulative %
≥4 h—valid				
Male	25	56.8	56.8	56.8
Female	19	43.2	43.2	100.0
Total	44	100.0	100.0	
<4 h—valid				
Male	23	74.2	74.2	74.2
Female	8	25.8	25.8	100.0
Total	31	100.0	100.0	

TABLE 3
Diagnosis

Delayed	Frequency	%	Valid %	Cumulative %
≥4 h—valid				
Sepsis	11	25.0	25.0	25.0
Overdose	3	6.8	6.8	31.8
Pneumonia	3	6.8	6.8	38.6
Gastrointestinal bleed	3	6.8	6.8	45.5
Respiratory failure	5	11.4	11.4	56.8
Cerebrovascular accident	2	4.5	4.5	61.4
Acute myocardial infarction	2	4.5	4.5	65.9
Other	15	34.1	34.1	100.0
Total	44	100.0	100.0	
<4 h—valid				
Sepsis	4	12.9	12.9	12.9
Overdose	4	12.9	12.9	25.8
Pneumonia	6	19.4	19.4	45.2
Gastrointestinal bleed	3	9.7	9.7	54.8
Respiratory failure	3	9.7	9.7	64.5
Cerebrovascular accident	2	6.5	6.5	71.0
Acute myocardial infarction	3	9.7	9.7	80.6
Other	6	19.4	19.4	100.0

Gender analysis is shown in Table 4. Based on the analysis, women are more likely to be delayed than are men, with 70.4% of female patients being delayed in contrast with 52.1% of male patients.

A comparison of the outcomes of patients who were brought in by EMS and patients who walked in themselves is shown in Table 5. Based on the data, 14 of 20 walk-in patients (70%) were delayed, compared with 30 of 55 patients brought in by EMS (54.5%).

Discussion

The negative effects associated with the delay of patient transfer from emergency department to other units has

TABLE 5
Method of arrival at emergency department

Delayed	Frequency	%	Valid %	Cumulative %
≥4 h—valid				
EMS	30	68.2	68.2	68.2
Walk-in	14	31.8	31.8	100.0
Total	44	100.0	100.0	
<4 h—valid				
EMS	25	80.6	80.6	80.6
Walk-in	6	19.4	19.4	100.0
Total	31	100.0	100.0	

been recognized by previous studies.[3,4,7] The current study was aimed at analyzing specific factors affecting the time of transfer of critically ill patient in need of intensive care.

In our sample the average wait time in the emergency department for patients admitted to the ICU was 5.8 hours, which indicated that many patients were delayed. Our findings suggest that initial triage acuity assignation had the most significant effect on the time of transfer of patients. Another study reported that higher level acuity generally selected patients for an earlier transfer but did not guarantee better outcomes because of the extent of their injuries;, that study focused on trauma patients.[4] Our results suggest that patients with an ESI designation of 3 were statistically more likely to spend more than 4 hours in the emergency department (Tables 1 and 2). Inaccurate triage may play a crucial role in the likelihood that both nurses and medical practitioners will fall prey to the "problem of geography" discussed by Croskerry.[8] The incorrect triage assignation directs the trajectory of the patient visit; both nurses and medical providers may not revisit the initial assessment for some time because of the presumed stability that an ESI designation of 3 implies.

Patients with a diagnosis of sepsis had a tendency to spend more time in the emergency department before being transferred. Work done in Australia suggests that of a group of patients who died in the hospital after admission, a majority were patients with sepsis.[9] In our study, patients with sepsis contributed to the largest group of delayed patients (Table 3), which suggests that practitioners may be missing critical cues in early stages of sepsis. Because sepsis can present with vague symptoms, especially in elderly persons (the average age of patients in our study was 66 years), accurately identifying sepsis is a challenge. Current research regarding triage suggests an over-reliance on intuition and an under-reliance on physiologic cues to determine acuity[6,10]; this factor also may play a role in the under-triage and subsequent delay for these patients. Further research is recommended to explore why the acuity of patients with sepsis specifically is being underestimated and what critical cues are being missed.

It is reported that women are under-triaged when they present with atypical cardiac symptoms[11]; in our sample, women spent more time in the emergency department before transfer to the ICU regardless of diagnosis. Nevertheless, the delay was not statistically significant and may be typical only for our sample and not across the population.

Patients brought in by EMS spent less time in the emergency department than did those who were walk-ins. This finding may be explained by the fact that patients who arrived via ambulance were brought straight into the department and bypassed the waiting area. Other findings were not significant.

SIGNIFICANCE

This study begins to delineate some specific factors affecting the delay of patient transfer between the emergency department and the ICU. Previous studies addressed issues with delays such as ED boarding and overcrowding[4]; this study provides significant information relating specifically to the role of under-triage, suggesting that problems with delayed transfer may in fact begin with the primary assessment of the patient. Critical cue identification also appears to be a factor, especially in the case of patients presenting with sepsis.

LIMITATIONS

This study was done in a small community hospital in the eastern United States, and our findings may be limited to this particular population and may not be generalizable to other ED populations. The study is a retrospective study that concentrated only on the patients transferred straight from the emergency department to the ICU; we excluded patients who were transferred from the emergency department to the regular floor and to the ICU later. Further analysis is suggested to look at this subgroup specifically to gauge the effect of under-triage or delayed declaration of acuity.

Although staffing levels were analyzed as a factor and were not found to be statistically significant, it was impossible to determine conditions in the emergency department at the time because of the retrospective nature of the review. Thus we cannot take into account factors such as overall volume or acuity. Prospective, observational study is recommended to investigate this factor.

Our analysis was based on single factor correlations, such as ESI, diagnosis, or gender. Because the

problem has a multifactorial origin, further research is needed to see how several factors contribute to the problem simultaneously.

Conclusion

Several factors affect the amount of time that critical care patients spend in emergency department. Our findings revealed that under-triage is an unexpected and significant factor in delayed transfer to the ICU. It appears that delay begins in triage, and interventions targeted at improving assessment at the beginning of the patient visit may be most effective in identifying patients, particularly patients with sepsis, in need of ICU care.

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