Original Research Article

ASSESSING FACTORS AFFECTING DELAYED INTENSIVE CARE UNIT TRANSFER FROM THE EMERGENCY DEPARTMENT AND ITS IMPACT ON HOSPITAL OUTCOMES- A CROSS SECTIONAL STUDY

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A B S T R A C T

Background: An emergency department (ED) is a hospital unit that handles and stabilizes patients who need urgent care before transferring them to the right healthcare provider. However, patients who are critically ill and need intensive care and monitoring must be admitted to the intensive care unit as soon as possible. The Society of Critical Care Medicine recommends that critically sick patients should be transferred from the ED to the intensive care unit (ICU) as quickly as possible. Given the frequent lack of ICU beds, emergency medicine professionals should be prepared to offer critical care in the ED. Nonetheless, research suggests that patients who fulfill the requirements for ICU admission and receive treatment there have a greater chance of surviving than those who do not receive treatment there. ICU outcome can be independently predicted by the length of hospital stay prior to ICU admission. Therefore, early detection of critical illness is crucial for facilitating the timely transfer of patients who might benefit from intensive care. Transfers from the ED to the ICU may be delayed for a variety of reasons, including patient-related concerns, administrative hold-ups, ED-level complications, or ICU-level issues. Outcome for critically ill patients often depends on time- sensitive critical care interventions; thus, the impact of delays in transfer to an intensive care unit (ICU) on outcome could be substantial. Emergency department (ED) "boarding" of critically ill patients (holding admitted patients pending ICU bed availability) is common, resulting in a prolonged ED length of stay. The objective is to determine the incidence of delayed transfer from the emergency department (ED) to the intensive care unit (ICU) and identify contributing factors influencing transfer time.
Materials and Methods: This study was conducted was conducted at the Accident & Emergency Department and Intensive Care Units (ICUs) of Indraprastha Apollo Hospitals, a tertiary care Centre among critically ill adult patients (aged ≥18 years) who required ICU admission from the ED during the study period over a three-month period. A total of 50 patient records were analysed using convenience sampling. The Statistical data was entered and analysed in SPSS version 23.
Results: The result of the study revealed that most (72%) of the critically ill patients stayed more than 6 hours in the ED, while (28%) of them were transferred to the ICU in less than 6 hours of ED stay. This result implies that majority of patients who need ICU care; spending more hours in the ED. The most common factors that caused delay in ICU admission from ED are admission delays in ER and time taken for resuscitation of critically ill patients.
Conclusion: The study found that there was a delay in ICU admission of critically ill patients from the ED. Delay in admission to ER, time for resuscitation and other organizational factors were among the reasons for the prolonged ED stay.
Keywords: Emergency, Intensive Care Unit, Death on admission, Delay, Critical, Hold time.

INTRODUCTION

An emergency department (ED) is a hospital unit that handles and stabilizes patients who need urgent care before transferring them to the right healthcare provider. However, patients who are critically ill and need intensive care and monitoring must be admitted to the intensive care unit as soon as possible.[1-5]

The Society of Critical Care Medicine recommends that critically sick patients should be transferred from the ED to the intensive care unit (ICU) as quickly as possible 2. Given the frequent lack of ICU beds, emergency medicine professionals should be prepared to offer critical care in the ED. Nonetheless, research suggests that patients who fulfil the requirements for ICU admission and receive treatment there have a greater chance of surviving than those who do not receive treatment there.[2,6-8] ICU outcome can be independently predicted by the length of hospital stay prior to ICU admission 9,10. Therefore, early detection of critical illness is crucial for facilitating the timely transfer of patients who might benefit from intensive care.[11-13] The provision of critical care services is still neglected in low-income nations, according to research, and many patients with potentially curable diseases are unable to access these facilities.[14-17] Transfers from the ED to the ICU may be delayed for a variety of reasons, including patient-related concerns, administrative hold-ups, ED-level complications, or ICU-level issues.[18-20] Furthermore, there is disagreement about the definition of a delay because different authors have used different time thresholds as the cut off of delays, based on the ED's resources, staffing levels, and approach. Outcome for critically ill patients often depends on time- sensitive critical care interventions ; thus, the impact of delays in transfer to an intensive care unit (ICU) on outcome could be substantial. However, the impact of such delays on patient outcome is currently unclear. Emergency department (ED) "boarding" of critically ill patients (holding admitted patients pending ICU bed availability) is common, resulting in a prolonged ED length of stay. For critically ill ED patients, there are three primary reasons for ED boarding: a) an increasing volume of critically ill patients presenting to the ED; b) hospital and ED overcrowding; and c) a lack of available staffed ICU beds.

We aim to determine the association between emergency department "boarding" (holding admitted patients in the emergency department pending intensive care unit transfer) and outcomes for critically ill patients, presenting to the Emergency department of Indraprastha Apollo Hospital, Delhi.

Emergency department: Emergency Department defines an emergency department as a hospital facility that is staffed 24 hours a day, 7 days a week, and provides unscheduled outpatient services to patients whose condition requires immediate attention.

With a competent emergency room team, many lives could have been saved under the guidance of an experienced physician and aided by advanced medical equipment.

The emergency Department is the first point of contact for any critically ill patient, needing immediate medical attention. Modern Emergency Departments are managed by qualified Emergency Physicians and nurses, trained specifically for providing emergent care to save a life or limb.

In order to prioritize treatment for most sick patients, EDs use a tool called Triage which means sorting out. Those patients needing immediate life-threatening measures are treated first. Those with minor ailments may have to wait. After resuscitation and initial stabilization patients are either admitted to the indoor area or discharged to home with a prescription.

A good ED is equipped with monitors, point-of-care diagnostics, essential drugs, and other equipment needed for high-quality medical care to the patient. ED works in close association with other departments like radiology, laboratory, blood bank, etc.

Emergency Physicians are well supported by other clinical specialists for optimum care of the patient. EDs also provide initial critical care for patients waiting for ICU transfer. Accreditation with International and national bodies such as JCI and NABH, ensures that the quality of care is maintained by the ED.[21]

ICU

Intensive Care Unit (ICU) refers to a place where specialized treatment is given to patients who are acutely unwell and need special attention and support. It provides critical care and life support for acutely ill and injured patients.

Admission criteria for ICU

The ICU is a special area of the hospital where the focus is on intense observation and treatment with increased staff and resources. This helps healthcare providers to respond immediately during emergency conditions. The trained doctors and nurses with the help of a multi-disciplinary team makes sure that the critical patient recovers rapidly and goes home. Patient who needs close monitoring and treatment are admitted to an Intensive Care Unit (ICU). Some examples of patients needing ICU care include:

- Patients with difficulty in breathing needing special machines called, ventilators
- Patients with low blood pressure needing monitoring and medicines to treat it
- Patients with infections causing septic shock
- Patients who need close observation after certain surgeries, such as brain surgery, heart bypass and trauma surgery.

ICU is a place where patients are monitored acutely. ICU patients are monitored and treated by critical care team which include critical care specialists (intensivists), resident doctors, nurses, respiratory therapists, etc. Other staff at ICU include dieticians, physiotherapists, clinical pharmacists and other supportive staff like cleaning staff, security guards, etc. Fortunately, modern technology has progressed a

lot and we can get intricate details of a patient's vital parameters like heart rate, breathing rate, oxygen level and blood pressure. This is done by making use of multiple devices with numerous wires that are seen, which are constantly monitoring the patient.

Some studies revealed that lack of critical care beds, delay in radiology and laboratory test services, and limited ICU resources were the common reasons which predisposed patients to prolonged emergency department stay.[22]

ICU admission protocol from emergency Department: When critically ill patients were admitted to the ED, the physician in the ED carried out appropriate clinical interventions including resuscitation and stabilisation. Along with this, a decision on ICU admission is to be taken by the attending clinical team. Emergency physicians directly consults ICU in charge about the ICU admission priority according to the clinical decision.

Indraprastha Apollo Hospital: Indraprastha Apollo Hospital is an Indian hospital owned by Apollo Hospital group, India's largest healthcare chain. Established in 1995, it is the third super specialty tertiary care hospital set by the Apollo Hospitals Group, jointly with the Govt. of India. It is a 700-bed hospital, with the provision for expansion to 1000 beds in future. The hospital is spread over 15 acres, and has a built-up area of 600,000 square feet.

Some of the features that makes Indraprastha Apollo one of the bests hospitals in India are:
1. 52 Specialties under one roof
2. Maximum number of ICU Beds in a private hospital in India
3. NABL accredited clinical laboratories
4. Largest Sleep Lab in Asia
5. One of the largest Dialysis Units in India
6. Dedicated Bone Marrow Transplant Unit with stringent infection control practices.
7. Latest and Best-in-Class Medical technologies like: PET-MR, PET-CT, Da Vinci, Robotic Surgery System, Brain Lab Navigation System, Portable CT Scanner, Novalis Tx, Tilting MRI, Cobalt based HDR Brachytherapy, DSA Lab, Hyperbaric Chamber, Fibro scan, Endosonographic, 3 Tesla MRI, 128 Slice CT scanner and many more are used to provide world-class care.
8. Experienced and renowned doctors in all medical and surgical specialties and super specialties like Cardiac sciences (Cardiology & Cardio-thoracic Surgery) and Neurological sciences (Neurology & Neuro-surgery)
9. Apollo Cancer Centre is a Comprehensive Cancer care center with management of cancers as a multi-specialty concerted approach including the most advanced
10. Radiation Oncology Centre with Novalis Tx, Clinac iX and HDR-Brachytherapy and recently installed Radixact-X9 the next generation Tomotherapy.

Objective
To determine the incidence of delayed transfer from the emergency department (ED) to the intensive care unit (ICU) and identify contributing factors influencing transfer time.

MATERIALS AND METHODS

Study Design: This study employs a retrospective cross-sectional design to analyse factors associated with delayed transfer of critically ill patients from the emergency department (ED) to the intensive care unit (ICU).

Study Setting: The study was conducted at the Accident & Emergency Department and Intensive Care Units (ICUs) of Indraprastha Apollo Hospitals, a tertiary care centre.

Study Population: The study included critically ill adult patients (aged ≥18 years) who required ICU admission from the ED during the study period.

Exclusion criteria:
Patients declared dead on arrival (DOA) and those with incomplete transfer records.

Study Period: The study was conducted over a three-month period (March 25, 2023 – June 25, 2023).

Data Collection: Data were extracted from hospital records of patients requiring ICU admission. The following tools were used:
• Medical Records Review: Included ICU admission time, severity of illness, and length of hospital stay.
• Time-Motion Study: Measured delays at different stages of patient transfer.
• Ishikawa (Fishbone) Analysis: Used to categorize root causes of transfer delays (e.g., patient-related, administrative, ICU bed availability).

Sample Size & Selection
• A total of 50 patient records were analysed using convenience sampling.
• The sample included all eligible ICU transfers within the study period.

Data Analysis
• Descriptive statistics (means, medians, standard deviations) were used for patient demographics and transfer times.
• Inferential analysis (Chi-square test, logistic regression) was conducted to identify significant predictors of transfer delays.
• The Statistical data was entered and analyzed in SPSS version 23.

RESULTS

A study was conducted from 25th March 2023 to 25th June 2023 at the emergency department of Indraprastha Apollo Hospital, New Delhi. All critically ill patients who need intensive care unit admission during the study period were included in the study. The data were collected by chart review and observation.

From the total of 50 critically ill patients who need ICU admission 36 (72%) stayed more than 6 hours in the ED and majority of critically ill patients 26.5% had acute respiratory failure that requires ventilator support. The median length of stay was 13.5 hours.

For 36 patients that were late admitted in ICU, delay in admission in emergency (12 patients) and resuscitation (9 patients) were found to be the most important factors that delay ICU admission.

Table 1: Socio-demographic profile of critically ill patients

Variables	Category	Frequency (N=50)	Percentage (%)
Age group (years)	<18	5	10%
	18-50	25	50%
	>50	20	40%
Sex	Male	42	84%
	Female	8	16%
Residence	Delhi NCR	43	86%
	Out of Delhi NCR	7	14%

Baseline information of critically ill patients

The result revealed that, from the total critically ill patients who consulted for ICU admission 10 were trauma patients and the rest 40 were non trauma patients. Majority of the critically ill patients whose consulted for ICU care were high risk patients. Most patients were also having a known chronic medical illness, whereas some had no known chronic medical illness and the rest few patients had no record on their medical chart.

Management given at ED for critically ill patients

Majority of critically ill patients (93.1%) were on ventilator support, from those (27.5%) were on a mechanical ventilator through endotracheal intubation and the rest were on non-invasive ventilation. Most of the patients (85.3%) were started broad spectrum antibiotic and those who was admitted due to shock (33.3%) were on vasopressor in the ED and all patients were on monitoring.

Critically ill patients Length of Stay at ED

Critically ill 36 patients (72%) stayed for more than 6 hours in the ED before transfer to ICU or they had a delayed ICU admission. Rest 14 patients (28%) were in emergency department for less than 6 hours.
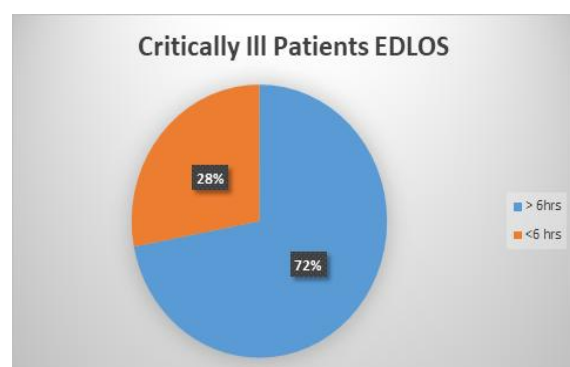

Figure 1: EDLOS of adult critically ill patients from March- June 2023

The highest length of stay of critically ill patients in the ED who consulted for ICU admission was 144 hours or 6 days, but most critically ill patients had an emergency department length of stay of 6-12 hours. The length of stay ranged from 1 hour to 144 hours. The median length of stay was 13.5 hours.

Factors that delay ICU admission of critically ill patients

For the reasons that delay ICU admission of critically ill patients who need intensive care, the most common factor (for 12 patients) was delay in admission to ER and the second most common reason (for 9 patients) was time taken for resuscitation.

There are also other reasons which cause delayed ICU admission like Non availability of ICU beds, Shift Out bed, Equipment's availability in ICU, Change from ward to ICU and MISC.
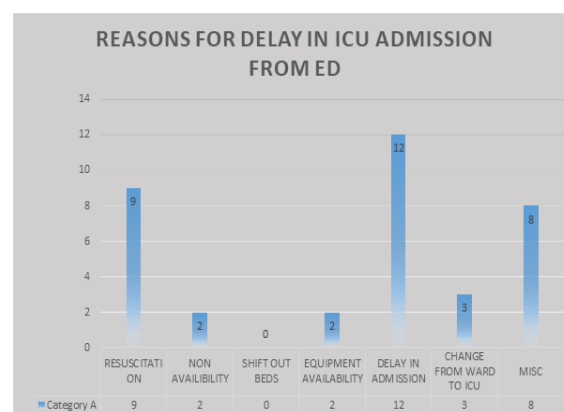

Figure 2: Factors that affect ICU admission of critically ill patients from the ED

REASON FOR DELAY ICU SHIFTING	Category A
RESUSCITATION	9
NON AVAILIBILITY	2
SHIFT OUT BEDS	0
EQUIPMENT AVAILABILITY	2
DELAY IN ADMISSION	12
CHANGE FROM WARD TO ICU	3
MISC	8

Total number of patients allotted vacant bed- 22 average time in emergency after getting vacant ICU bed- 74 minutes.

MISC: primary team to review or pending reference or non-availability of nursing staff or free ICU patients.

DISCUSSION

This study tried to find out factors that affect ICU admission of critically ill patients and their length of stay in the ED. Emergency Department Length of stay is considered a key measure of emergency department throughput, and from the perspective of the patient, it is perceived as a measure of healthcare service quality, especially for those who need ICU care they don't have to spend more time in the ED. The society of critical care medicine, suggests the transfer time of critically ill patients from the ED to the ICU should be minimized or < 6 hours.[22-25]

The result of the current study revealed that most 36 (72%) of the critically ill patients stayed more than 6 hours in the ED, while 14 (28%) of them were transferred to the ICU in less than 6 hours of ED stay. This result implies that majority of patients who need ICU care; spending more hours in the ED.[26]

This particular research is conducted at Emergency department and ICU of Indraprastha Apollo Hospital, Sarita Vihar, New Delhi. There are numerous factors that contribute to the delay in transfers from ED to ICU. In our study we have considered the following main factors that affect the transfer of critically ill patients to the ICU:

1. Resuscitation
2. Non availability of ICU beds
3. Shift Out beds
4. Equipment's availability in ICU
5. Delay in admission
6. Change from ward to ICU
7. MISC

Out of the factors above, the most common factors that caused delay in ICU admission from ED are admission delays in ER and time taken for resuscitation of critically ill patients.

As the study was based on only one institution, generalization as a whole was not considered. The study period was very short to study prospectively and data collection and analysis was very difficult. In addition, a cross-sectional study by its nature cannot establish a definitive cause and effect relationship to identify the risk factors. Also, the study did not assess the outcome of those critically ill patients who had delayed ICU admission due to short study period.

Based on the findings of this study, the hospital should plan to improve the critical care service by following the mitigation steps mentioned like quick resuscitation, increasing the ICU capacity etc. Radiology and laboratory services are also the cause for the prolonged ED stay; many patients get these services in other diagnostic centers, so the hospital must improve it by allocating resources. Availability of ICU admission guideline should be mandatory to prioritize patients based on their illness severity.

More research is necessary to assess the outcome of prolonged ED stay of critically ill patients with regard to enhancing quality critical care.

Mitigation Steps

1. Time taken for resuscitation can be reduced by enhanced training of clinical staff for resuscitation and other critical interventions.
2. Creation of a critical transfers team which has multi-departmental representation including, clinical team, administrative & admissions teams, ICU teams, nursing and support staff (Housekeeping).
3. Creation of active communications channels through options like WhatsApp, Slack, Yammer or other such solutions for tracking, management and transfer.
4. Sensitization and training of non-clinical teams on criticality of transfers
5. Transfer stratification tool for admissions teams where prioritization can take place for critical patients in ER
6. Transfer protocols with clearly defined roles and responsibilities for the critical transfers team and relevant departments like radiology, diagnostics, labs, housekeeping, security etc.
7. Working Group that includes the critical transfers team, OT teams and clinical directorate to better plan and align multiple transfer taking place in the hospital on any given day – viz. ER to ICU, ICU to ward, OT to ICU etc.
8. Monthly reviews on progress by the Working Group
9. Study possibility of creating a step-down ICU holding unit for interim transfers
10. Study possibility of increasing ICU bed strength

CONCLUSION

The study found that there was a delay in ICU admission of critically ill patients from the ED. Delay in admission to ER, time for resuscitation and other organizational factors were among the reasons for the prolonged ED stay.

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