ScientificScholar®
Knowledge is power
Publisher of Scientific Journals

https://nams-annals.in

Annals of the National Academy of Medical Sciences (India)

Article in Press

*Original Article*

# Factors affecting turnaround time in the emergency room

Priyanka Rathi[1], Sakshi Sharma[2], Himanshu Singh[1], Manish Jain[3]

[1]Department of Pharmacology, [2]National Institute of Medical Sciences and Research, NIMS University, Jaipur, [3]Department of Plastic and Reconstructive Surgery, Mahatma Gandhi Medical College and Hospital, Jaipur, Rajasthan, India

## ABSTRACT

**Objectives:** Timely and efficient treatment of patients with acute medical disorders depends on the efficient management of emergency healthcare services in the emergency room (ER). Turnaround time (TAT), which is the amount of time between a patient's arrival and their discharge or admission, is a crucial indicator of the overall efficacy of the emergency care system because longer hospital stays are associated with higher treatment costs and worse patient satisfaction, particularly when they are exacerbated by an increase in the number of patients receiving care.The aim of this study was to conduct a thorough analysis of the ER TAT, pinpoint the underlying reasons, and provide evidence-based tactics for streamlining and improving the process.

**Material and Methods:** A cross-sectional observational study was conducted on patients who were admitted to the emergency department of a tertiary care private teaching hospital during the study period. TATs were computed using time-stamped data, electronic health records, and patient information. To better understand the difficulties related to workflow and potential areas for improvement, a questionnaire-based interview of ER staff members, which included physicians, nurses, and administrative workers, was done.

**Results:** The average length of stay (LOS) of the study population in the ER was under the recommended standard of 4 hours. The patient's third-party administrator (TPA) status had influenced the patient's response time for decision-making resulting in longer LOS of the patient in the ER. A delay in receipt of test results from the central laboratory and specialists' consultation has been observed. A communication gap between the emergency staff and specialists for consultation has been reported by the staff.

**Conclusion:** Based upon these observations, we conclude that TAT can be shortened by introducing small reforms such as enhancing duty rosters for improved collaboration, continuous training for emergency staff proficiency, and establishing a satellite laboratory for expedited test results

**Keywords:** Emergency room, Healthcare services, Turnaround time

## INTRODUCTION

In the realm of healthcare, the emergency room (ER) serves as the frontline for acute medical interventions, demanding a delicate balance between rapid response and optimal patient care.

Implementing efficient emergency and critical care could prevent more than half of the deaths and more than a third of disabilities in low- and middle-income nations.[1] The efficiency and effectiveness of emergency medical services are critical in ensuring the timely delivery of care to patients in need. Among the key metrics that gauge this efficiency, turnaround time (TAT) in the ER stands out as a crucial indicator.[2] TAT refers to the duration taken from a patient's arrival at the emergency department (ED) to the completion of their treatment and subsequent discharge or admission.[3] In the context of India, a nation witnessing rapid demographic shifts, urbanization, and evolving healthcare infrastructure, understanding and optimizing TAT in the ER is paramount for providing quality emergency care.[4] Further, for a tertiary care private teaching hospital, where complex cases are managed and medical education is imparted, optimizing TAT becomes imperative for upgrading the prevailing emergency care services and meeting the standardized norms.[5]

India's healthcare landscape presents a unique set of challenges and opportunities concerning emergency medical services. With a population exceeding 1.3 billion and a diverse socioeconomic spectrum, the demand for emergency care services is constantly escalating.[6] Urban centers, in particular,

***Corresponding author:** Dr. Priyanka Rathi, MD, MBA, Department of Pharmacology, National Institute of Medical Sciences and Research, NIMS University, Jaipur, India.drpriyankarathi@gmail.com

**Received:** 27 July 2024 **Accepted:** 29 November 2024 **Epub Ahead of Print:** 27 May 2025 **Published:** *** **DOI:** 10.25259/ANAMS_137_2024

grapple with overcrowded ERs, resource limitations, and inadequate infrastructure, thereby posing significant challenges to achieving optimal TATs.[7]

Factors such as patient flow dynamics, clinical decision-making processes, resource allocation, and interdepartmental coordination, all influence the efficiency of emergency care delivery.[8] A thorough investigation encompassing these diverse facets may help identify bottlenecks and implement targeted interventions to expedite patient care pathways.

One of the primary factors influencing TAT in Indian ERs is the sheer volume of patients seeking care.[3] Overcrowding exacerbates delays in triage, assessment, and treatment initiation, leading to potential adverse outcomes for patients with time-sensitive conditions. In addition, the lack of standardized triage protocols and variability in clinical workflows across healthcare facilities contribute to inconsistencies in TAT metrics.

Moreover, socioeconomic factors such as financial constraints and geographic barriers play a significant role in shaping patient flow and healthcare-seeking behavior.[9] Patients from underserved communities may face delays in accessing emergency care due to transportation issues or financial constraints, resulting in advanced disease progression and poorer outcomes.

Capacity-building initiatives focusing on training emergency care providers, enhancing triage protocols, and implementing evidence-based practices can contribute to more efficient patient management and reduced TATs.

This study aligns with the broader goal of enhancing healthcare delivery in line with international standards of excellence. As healthcare systems worldwide strive to cope with rising patient demands and evolving clinical complexities, optimizing ED operations emerges as a critical imperative. This study seeks to contribute to the body of knowledge surrounding TAT optimization in tertiary care settings. By addressing the multifaceted challenges inherent in emergency care delivery, this research endeavors to improve patient outcomes, enhance operational efficiency, and uphold the commitment to excellence in healthcare provision.

The aim of this study was to comprehensively investigate and optimize the TAT in the ER of a tertiary care private teaching hospital by observing the process flow of the ER, identifying contributing factors causing a delay in the TAT by studying the time motion in ER, and proposing evidence-based strategies to optimize the TAT.

## MATERIAL AND METHODS

It was a hospital-based cross-sectional study conducted in the ED of a tertiary care private teaching hospital at Jaipur, Rajasthan. A convenient sampling technique was used for recruiting the study population. All adult patients >18 years of age and of any gender who presented to the ED at the National institute of medical science and research (NIMS) Hospital and willing to give their informed written consent to participate in the study were enrolled.

Data was collected from the ER after obtaining permission from the relevant authorities. Primary data were collected by direct observation, while secondary data were recorded from the case record file and the electronic records. Primary data included the observation of the process flow, various TATs like time from patient arrival to initial assessment, initial assessment to diagnostic procedures, and diagnostic procedures to disposition, duration of stay, and patient outcome. The secondary data included the patient's sociodemographic details and their diagnosis. All the observations were done by the researchers. The observation time entirely covered all the three shifts, viz., morning, evening, and night. Since the researchers in this study also included medical undergraduate and postgraduate students, they collected the data for the night shifts and the remaining collected the morning and evening shift data. The data were collected by quietly observing the patient and the workflow. No assistance of any kind was taken from the emergency duty staff, and the observers only took note of the various time points, which were later used to calculate the TATs. The collection of data was simple and required a keen observation, and all the study researchers had adequate training in patient care and emergency.

### Baseline assessment by observing the process flow of the ED

The data on ER TATs were first collected, and the key performance indicators (KPIs) related to TAT, including patient arrival to initial assessment, initial assessment to diagnostic procedures, and diagnostic procedures to disposition, were identified. Interviews with the ER staff, including physicians, nurses, and support personnel, were conducted to identify potential bottlenecks and challenges in the current workflow. The interviews were conducted by the principal investigator. All interviews were conducted on one to one basis, with each interview lasting for 5–10 minutes and ensuring that the patient's care was not affected in the process.

Data collected were entered in Microsoft Excel Sheet, and statistical analysis was done using Excel.

### Workflow analysis

The current ER workflow was analyzed to identify critical points in the workflow where delays commonly occur and evaluate the efficiency of communication and coordination

among the ED staff. The time spent by healthcare professionals at different stages of patient care was also noted.

## RESULTS

The present cross-sectional study recorded data of a total of 86 patients who visited the ED during the study period. The sociodemographic characteristics, arrival time, presenting complaints, and triage category of the study population is described in Table 1. The common complaints at the time of presentation included trauma (road traffic accident, 23.26%), shortness of breath (18.6%), poisoning (11.63%), pain in the abdomen (9.30%), etc. Other presenting complaints included burn, chronic obstructive pulmonary disorder (COPD), type-2 diabetes mellitus, diarrhea, electric shock, fall from tree, seizures (2.32 % each).

**Table 1:** Description of the study population.

| Variable | Frequency (N=86) | Percentage |
|---|---|---|
| **Age** | | |
| <20 | 14 | 16.28 |
| 20–39 | 22 | 25.58 |
| 40–59 | 22 | 25.58 |
| ≥60 | 28 | 32.56 |
| **Gender** | | |
| Female | 28 | 32.56 |
| Male | 58 | 67.44 |
| **Arrival time** | | |
| Morning (8 am–2 pm) | 13 | 15.12 |
| Evening (2 pm–8 pm) | 16 | 18.60 |
| Night (8 pm–8 am) | 14 | 16.28 |
| **TPA** | | |
| Yes | 74 | 86 |
| No | 12 | 14 |
| **Presenting Complaints** | | |
| Road traffic accident | 20 | 23.26 |
| Shortness of breath | 16 | 18.60 |
| Poisoning | 10 | 11.63 |
| Pain in abdomen | 8 | 9.30 |
| Chest pain | 4 | 4.65 |
| Head injury | 4 | 4.65 |
| Loss of consciousness | 4 | 4.65 |
| Hypertension | 4 | 4.65 |
| Others | 16 | 18.60 |
| **Triage Category** | | |
| Green | 10 | 11.63 |
| Yellow | 66 | 76.74 |
| | | |
| Red | 8 | 9.30 |
| Black | 2 | 2.33 |

TPA: Third-part administrator

The first point of contact of the patients brought to the ED was the emergency nursing staff who immediately triaged the patient and performed the initial work-up in consultation with the ED resident doctor on duty. The triage categories were defined as *green:* minimal, i.e., ambulatory patients with no impaired function who can self-treat or be cared for by nonprofessional; *yellow:* delayed, i.e., can wait for care after simple first aid; *Red:* critical, i.e., seriously injured, but have a reasonable chance of survival; *Black:* deceased or expectant, i.e., patient showing obvious signs of death.

Subsequent to the medical assessment, further treatment was initiated, investigations ordered, and specialist consultation referred.

### Turnaround time

Figure 1 illustrates the distribution of TAT from patient arrival to initial medical assessment according to the triage category of the patients. The mean TAT was 1.76 minutes, and the longest time was 10 minutes. The TAT was <1 minute in 69.7 % of yellow triage patients, 50% of red triage patients, and 40 % of green triage patients.

The category-wise distribution of TAT from initial medical assessment to treatment initiation is illustrated in Figure 2. The mean TAT was 12 minutes with the longest time of 84 minutes. In the majority of yellow and red triage patients (60.6% and 67%, respectively), this TAT was <5 minutes.

The TAT from the order of diagnostic tests to the receipt of test results is described in Figure 3. The initial diagnostic tests were electrocardiogram (ECG), ultra sonography (USG), arterial blood gas (ABG) analyzer. Other investigations required blood samples to be sent to the laboratory. These test results, therefore were received after 30 minutes. The mean TAT was 17.5 minutes with the longest time of 62 minutes.

During the initial medical assessment, a reference to the concerned specialist consultant was also sent for 60 patients. The TAT from the referral request to the specialist consultation is shown in Table 2. The specialty-wise distribution of this TAT is depicted in Figure 4.

Table 3 shows the distribution of length of stay (LOS) among the study population. The average LOS of patients in the ED was 138 minutes with the shortest LOS being 10 minutes and the longest LOS being 1440 minutes. There were four outliers in the observation, i.e., four patients had an LOS of 2 days (14440 minutes) in the ED therefore, the average LOS does

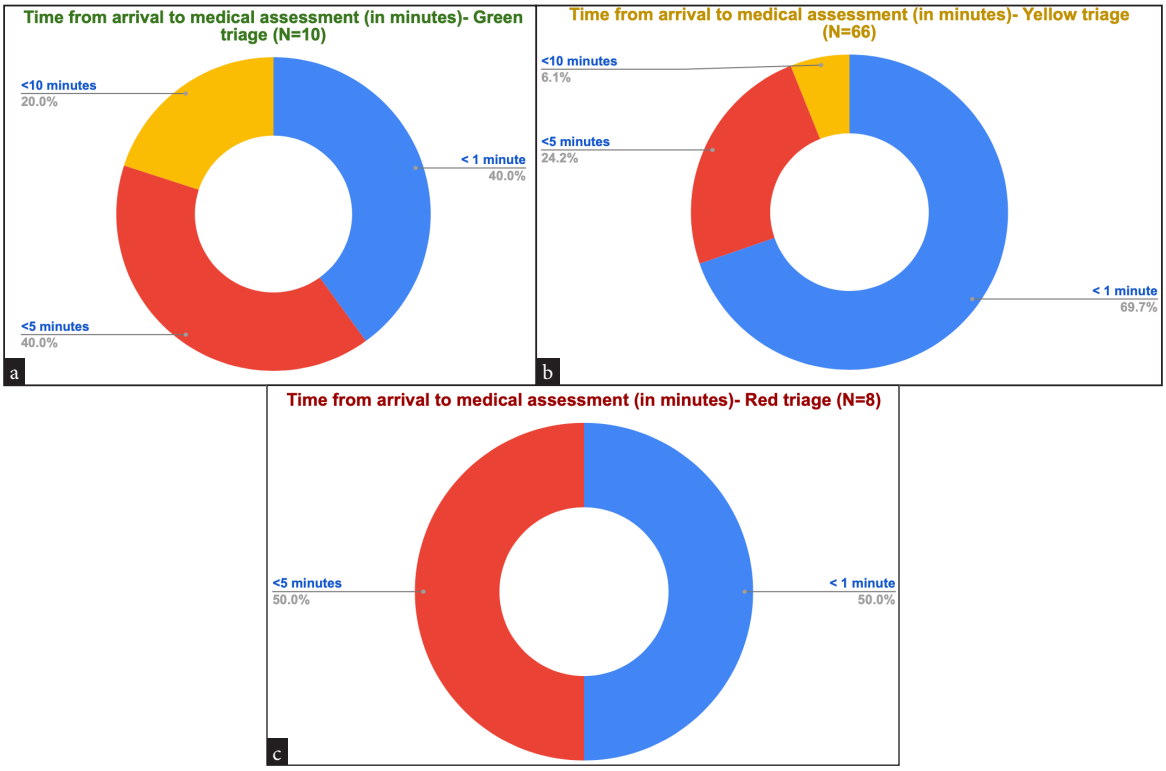


**Figure 1:** Distribution of turnaround time (TAT) from patient arrival to initial medical assessment in (a) Green triage, (b) Yellow triage, and (c) Red triage patients.

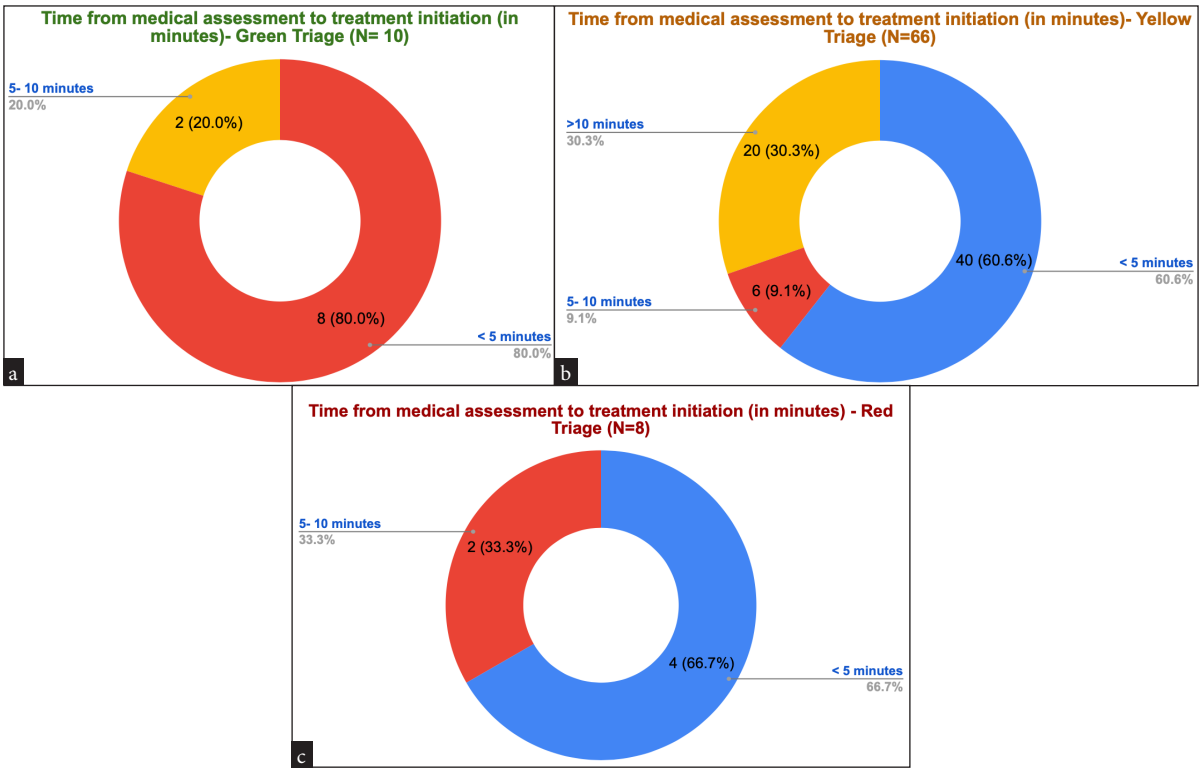


**Figure 2:** Distribution of turnaround time (TAT) from initial medical assessment to treatment initiation in (a) Green triage, (b) Yellow triage, and (c) Red triage patients.

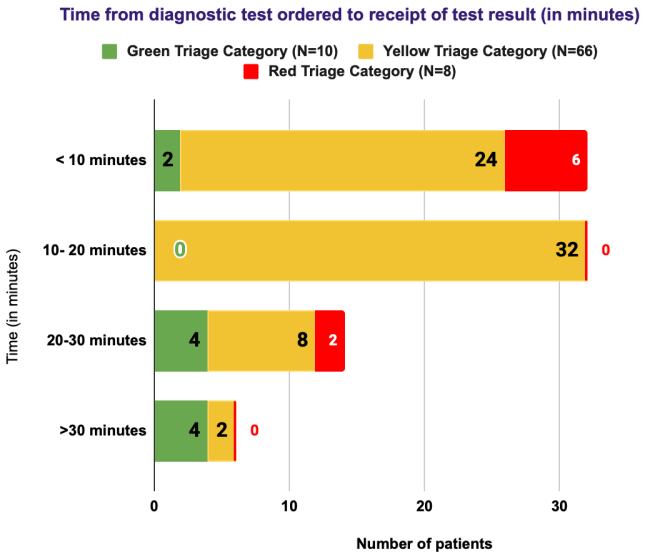


**Figure 3:** Distribution of turnaround time (TAT) from the order of diagnostic tests to the receipt of test results in Green triage, Yellow triage, and Red triage patients.

**Table 2:** TAT of the study population from the referral request to the specialist consultation.

| S. No. | Time from the initial assessment to specialist consultation (in minutes) | Frequency (n) | Percentage |
|---|---|---|---|
| **1.** | <15 | 30 | 50 |
| **2.** | 15–30 | 10 | 16.7 |
| **3.** | 30–45 | 6 | 10.0 |
| **4.** | 45–60 | 14 | 23.3 |

TAT: Turnaround time

not represent the true LOS. The median LOS was 68 minutes, which is a better representative of the majority of the study population.

Figure 5 illustrates the scatter diagram of the LOS of the study population. Majority of the study population had LOS scattered around the range between 1 hour and 4 hours. Four outlier points can also be observed [Figure 5].

Table 4 shows the patient outcome with 60 patients admitted in various departments of the hospital: 14 were discharged, 8 left against medical advice (LAMA), and 4 died.

## DISCUSSION

TAT in the ER is a critical performance metric that reflects the efficiency and effectiveness of emergency medical services in India. Optimizing TAT thereby ensures timely and quality emergency care for the patients.[10,11]

The primary objective of this study was to comprehensively analyze TAT in the ER by observing the process flow of the ER. This objective formed the foundation of the study since understanding the existent TAT is crucial for identifying areas for improvement.

Longer LOS in the ED may significantly contribute to overcrowding in EDs, which is now recognized as a public health concern. Crowding in the ED can result in longer wait times for patient evaluations and higher patient dissatisfaction rates. A number of negative outcomes have been linked to this prolonged LOS in ED, including an increase in in-patient mortality, prescription mistakes and delays, and undetected problems.

In the present study, the mean LOS was 138.9 minutes while the median LOS was 68 minutes. This difference between the mean and median LOS is due to outliers in the study population with respect to an extended LOS (2 days) in the ED. These four patients were diagnosed with COPD and type 2 diabetes mellitus (two each) and were eventually admitted in the medicine ward. Their extended LOS was primarily because of time lag in decision-making by the patient's attendants. Since all these four patients were non-TPA patients, cash arrangements for completing the admission prerequisites caused a delay. In the present study, 86% of the study population were covered under Bhamasha Yojna (TPA), while the remaining 14% (12 patients) were non-TPA. Further, it was also observed that 8 out of these 12 non-TPA patients eventually refused admission in the hospital and left against medical advice (LAMA). All these eight LAMA patients were cases of Road traffic accident (RTA) and in the yellow triage category. Since they were non-TPA patients with no immediate threat to survival, their attendants took them to a public healthcare facility because of their inability to pay the treatment bills. Hence, the majority of the study population had their LOS within the recommended standard time of 4 hours or less and did not raise any concern.

The total LOS of the study population was further subdivided into various TAT in order to understand any bottlenecks in the workflow. These included:

TAT from patient arrival to initial medical assessment: The average time was 1.76 minutes with the shortest time of <1 minute and the longest time of 10 minutes. There was no lag observed in the process.

TAT from the initial medical assessment to initiation of treatment: The average time was 12 minutes with the shortest time of <1 minute and the longest time of 84 minutes. A delayed TAT was noted in the management of four patients, i.e., >60 minutes (case of diarrhea) and >80 minutes (case of loss of consciousness). All these patients were yellow triage, stable

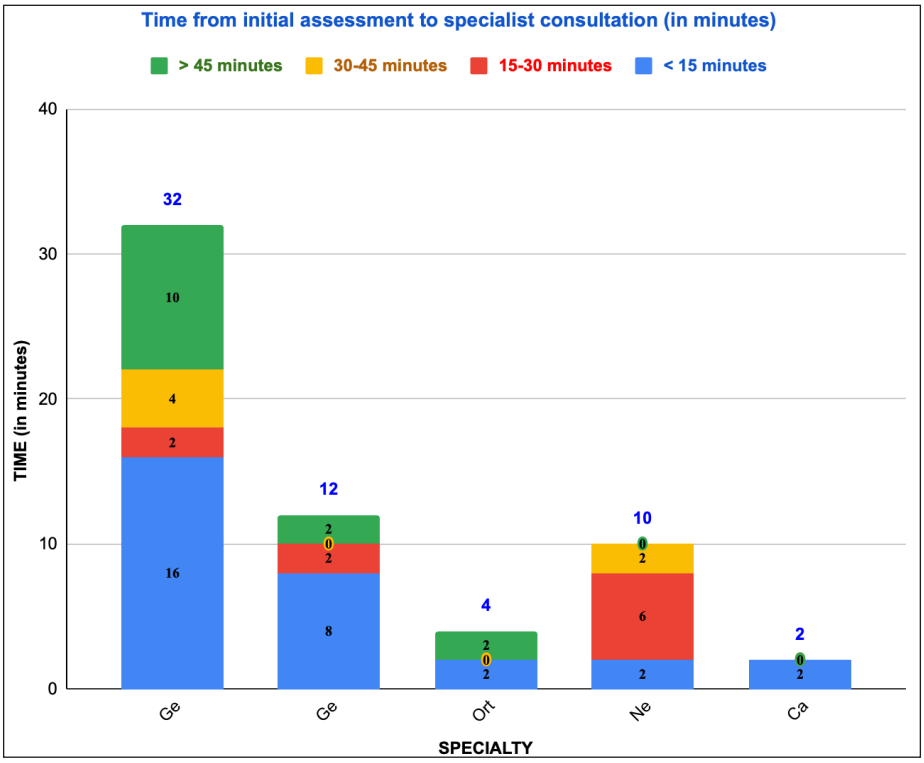


**Figure 4:** Specialty-wise distribution of turnaround time (TAT) from initial assessment to specialist consultation.

**Table 3:** Patient distribution in the emergency department (ED) based on the length of stay (LOS).

| S. No. | Length of stay in ED (in minutes) | Frequency (N=86) | Percentage |
|---|---|---|---|
| **1.** | <60 | 38 | 44.19 |
| **2.** | 60–120 | 30 | 34.88 |
| **3.** | 120–180 | 12 | 13.95 |
| **4.** | 180–240 | 2 | 2.33 |
| **5.** | >240 | 4 | 4.65 |

patients and were eventually admitted in the department of medicine. The delay in treatment initiation was due to delay in obtaining consent from the patient's attendants and also a delayed consultation from general medicine specialists.

TAT from the order of diagnostic tests to receipt of test results: The average time was 17.6 minutes with the shortest time of <1 minute and the longest time of 62 minutes. However, a noteworthy observation was that diagnostic tests like ECG and USG were done within a very brief time span due to the availability of portable ECG and USG machines with round the clock duty of a resident doctor from the radiology department for the interpretation of the test results. Blood investigations were sent to the central laboratory, which resulted in a longer time lag for these tests.

TAT from the initial medical assessment to specialty consultation: The average time was 20 minutes with the shortest time of <1 minute and the longest time of 74 minutes. It was further observed that consultations of general surgery took the least time.

Verma *et al.*[12,13] (2021) reported that the longer the critically ill patients are boarded in the ED, the higher is the chance for mortality. Processes should be implemented to ease the throughput from the ED. In the present study, we could not conclusively comment on this association between the LOS and patient outcome. Out of 86 patients, there were 60 admissions, 14 discharges, 4 deaths, and 8 LAMA.

Research has shown numerous contributing factors to the overpopulation in EDs. These include, among other things, nonurgent visits, a mismatch between supply and demand, a lack of properly qualified personnel, and an inadequate number of inpatient beds.[14-16] However, in the present study, the majority of the patients were brought to the ED with acute and serious health concerns like RTA, shortness of breath, poisoning, pain in abdomen, etc. Nearly 10% of the study population presented with nonserious chronic complaints like diabetes mellitus, hypertension, COPD, etc., which resulted in an unnecessary bed occupancy.

The preliminary analysis of staff perception provides a baseline understanding of the ER's functioning and serves as

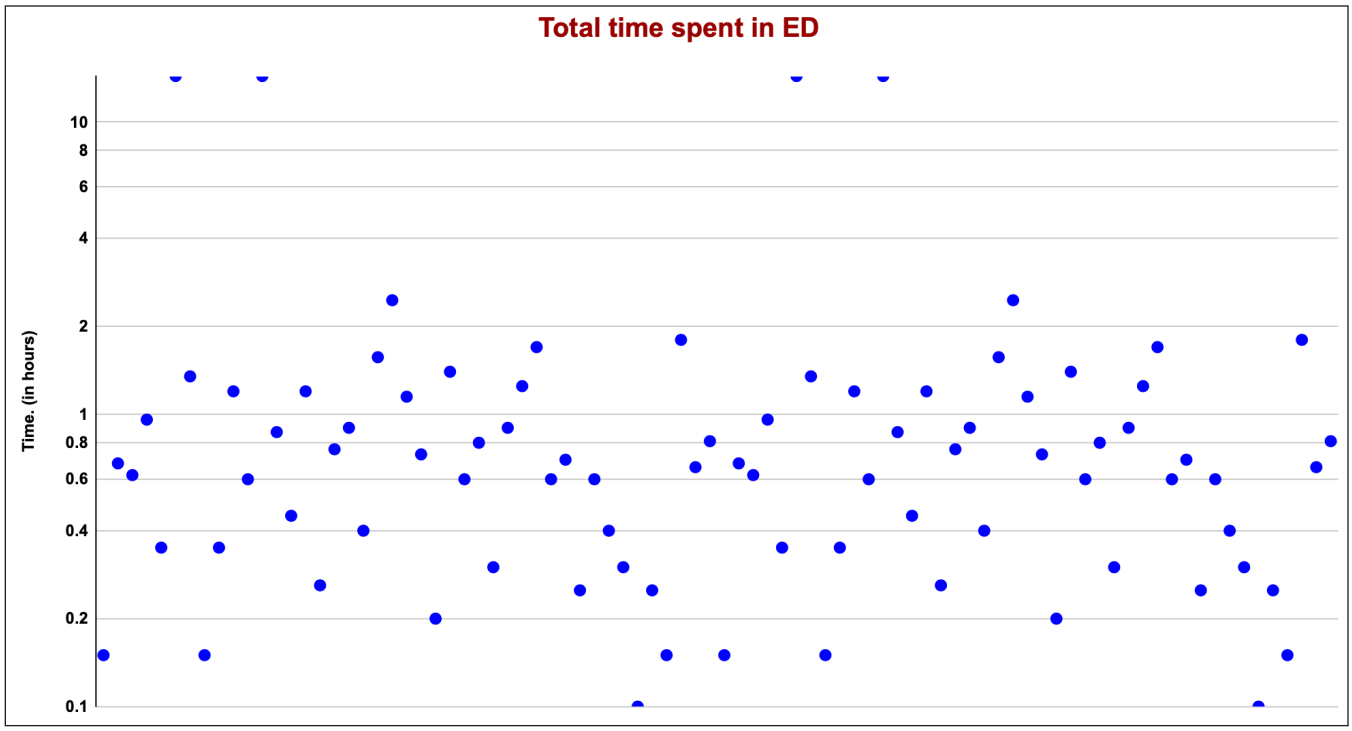


**Figure 5:** Distribution of the total length of stay of the study population in the emergency department. ED: Emergency department.

**Table 4:** Outcome of the study population.

| S. No. | Patient outcome | Frequency (N=86) | Percentage |
|---|---|---|---|
| **1.** | Admission | 60 | 69.8 |
| **2.** | Discharge | 14 | 16.3 |
| **3.** | Leave against medical advice | 8 | 9.3 |
| **4.** | Death | 4 | 4.6 |

a benchmark for evaluating the effectiveness of interventions aimed at reducing TAT. A significant number of emergency staff feels that a communication gap exists between the emergency staff and specialty consultants. The study observations also suggest that nearly 30% of the specialty consultations had a lag of 30 minutes or more in attending the emergency patient. Further, a significant percent of staff is not very confident in handling the advanced emergency equipment present in the ER. Lastly, the emergency staff, especially the security guards, reported facing regular challenges in dealing with the patient's attendants.

## CONCLUSION

The average LOS of the study population in the ER was under the recommended standard of 4 hours. A delay in receipt of test results from the central laboratory and specialists' consultation has been observed. A communication gap between the emergency staff and specialists for consultation has been reported by the staff. Further research to understand the factors contributing to those bottlenecks in the workflow resulting in longer TAT can be undertaken.

**Authors' contributions:** PR: Conceptualization, methodology, formal analysis, writing original draft; SS: Methodology, writing original draft; HS: Conceptualization, methodology; MJ: Conceptualization, reviewing and editing.

**Ethical approval:** Institutional Review Board approval is not required as it is a cross-sectional study.

**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent.

**Financial support and sponsorship:** Nil.

**Conflicts of interest:** There are no conflicts of interest.

**Use of artificial intelligence (AI)-assisted technology for manuscript preparation:** The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

## REFERENCES

1. WHO. Available from: https://www.who.int/health-topics/emergency-care#tab=tab_1 [Last accessed 2024 Jul 27].
2. Da Ros F, Di Gaspero L, Roitero K, La Barbera D, Mizzaro S, Della Mea V, *et al*. Supporting fair and efficient emergency medical services in a large heterogeneous region. J Healthc Inform Res 2024;8:400-37.

3. Joshi DC, Saini RR, Samant S, Kanchan N. turnaround time of patients in emergency department at a tertiary care teaching hospital in Uttarakhand, India: A cross-sectional study. J Clini Diag Res 2024;18:IC01-IC05.
4. Kumar A. The transformation of the indian healthcare system. Cureus 2023;15:e39079.
5. NITI Aayog. Emergency and Injury Care at Secondary and Tertiary Level Centres in India. Available from: https://www.niti.gov.in/sites/default/files/2021-12/AIIMS_STUDY_1.pdf [Last Accessed 2024 Jun 10].
6. Misra A, Yadav DC, Kole T. Emergency care in India beyond 75 years of independence - problems and solutions. J Glob Health 2023;13:03015 [Last accessed 2024 Jul 27].
7. Sartini M, Carbone A, Demartini A, Giribone L, Oliva M, Spagnolo AM, *et al*. Overcrowding in emergency department: Causes, consequences, and solutions-A narrative review. Healthcare (Basel) 2022;10:1625.
8. Mostafa R, El-Atawi K. Strategies to measure and improve emergency department performance: A review. Cureus 2024;16:e52879.
9. Paccoud I, Baumann M, Le Bihan E, Pétré B, Breinbauer M, Böhme P, *et al*. Socioeconomic and behavioural factors associated with access to and use of personal health records. BMC Med Inform Decis Mak 2021;21:18.
10. Puls HA, Haas NL, Cranford JA, Medlin RP, Bassin BS. Emergency department length of stay and outcomes of emergency department-based intensive care unit patients. J Am Coll Emerg Physicians Open 2022;3:e12684.
11. Pothen B, Tiwari SS. A study on turn around time of patients at emergency unit of a tertiary care hospital at Delhi NCR. Journal of Pharmaceutical Negative Results. 2022;13 (Special Issue 7):5755-5761.
12. Verma A, Shishodia S, Jaiswal S, Sheikh WR, Haldar M, Vishen A, *et al*. Increased length of stay of critically ill patients in the emergency department associated with higher in-hospital mortality. Indian J Crit Care Med 2021;25:1221-5.
13. Alemu GH, Negari KG, Rodamo KM, Hirigo AT. Factors associated with the length of stay in emergency departments in Southern-Ethiopia. BMC Res Notes 2019;12:239.
14. Salehi L, Phalpher P, Valani R, Meaney C, Amin Q, Ferrari K, *et al*. Emergency department boarding: A descriptive analysis and measurement of impact on outcomes. CJEM 2018;20:929-37.
15. Pandit A, Kulkarni M. To Study the Emergency Department Patient Process Flow in Hospital. Indian Journal of Public Health Research & Development. July-September 2017;8 (3):286-290
16. Hoot NR, Aronsky D. Systematic review of emergency department crowding: causes, effects, and solutions. Ann Emerg Med. 2008;52(2):126–136.

**How to cite this article:** Rathi P, Sharma S, Singh H, Jain M. Factors affecting turnaround time in the emergency room. Ann Natl Acad Med Sci (India). doi: 10.25259/ANAMS_137_2024