IDENTIFYING THE FACTORS ASSOCIATED WITH EMERGENCY BOARDING TIME

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Abstract

Background: Patients' Emergency Boarding Time (EBT) at the Emergency Department (ED) is holding up their admissions as inpatients. If prolonged, EBT can contribute to higher mortality rate, thereby highlighting the ineffectiveness of hospital resources.

Aim: This study aims to measure patients' boarding time at the Emergency Department of a hospital by also identifying the effectiveness of its resources.

Methods: This study uses observations to measure time discrepancy after admissions decision. Descriptive analysis was used to illustrate the service process for 30 patients who had agreed to participate in this study. EBT was measured by the Joint Commission Standard's magnitude which set timing to be less than four hours. Results of the time measurement will be measured against the Emergency Severity Index (ESI) of Levels 1,2 and 3.

Results: Findings showed that 33% of the patients who were admitted to the hospital have an EBT of more than four hours. Patients with higher ESI urgency had longer EBT. The time measured for ESI priority varied: Level 1 was 269.5 minutes, Level 2 was 189.3 minutes, and Level 3 was 162.5 minutes. Further, the main factor contributing to the EBT was waiting for laboratory results. This study also found that the hospital's resources that were attending to the emergency care patients during EBT displayed a gradual upward trend, driving the ESI priority level higher.

Conclusion: The higher the ESI priority at the hospital, the higher the EBT, and the utilization of resources for emergency treatment on patients.

Keywords: *Emergency severity index, Emergency boarding time, Resource consumption*

Introduction

The number of patients visiting the emergency department (ED) increases every year. The increase of patient visiting EDs worldwide is 30% (1). The increasing number of hospital visit is directly associated with patients patronizing the Emergency Department. This will lead to the ED being overcrowded and cause a longer boarding time for admission Overcrowd at the Emergency Department has been considered as an "international crisis" for more than 15 years (2), a "ticking time bomb" (3), and mounting evidence with myriad negative downstream effects, impacting the entire process of patient care (4,5).

ED boarding and crowd are detrimental to the quality of care, patient safety, and satisfaction goals. Reducing crowd and boarding duration would likely lead to improve patient satisfaction and potential cost saving for the ED (6). It is also associated with higher morbidity and mortality, delayed pain control, and inferior health care. The patient visits at the ED Hospital of Haji Surabaya are increasing each year. The number of patient visits each day reaches up to 100, and boarding time can be more than four hours daily. For that reason, ED staff is faced with a big challenge to provide an efficient and optimal quality of service.

In Emergency Department (ED), time is considered as a significant tool to measure the quality of service as waiting time can affect the outcome of a patient condition and satisfaction. Also, long waiting time indicates poor resource management and/or coordinated department. The Joint Commission International recommended that boarding time frame should not exceed four hours for the sake of patient's safety and quality of care (7). In this study, a four-hour target waiting time has been adapted among ED patients to measure the factors influencing waiting time (8). This study is aimed to measure patient boarding time at the Emergency Department and to identify the resources used.

Methods

This study was observational and descriptive. Accidental sampling technique with 30 patients was used as samples with Emergency Severity Index Level 1, Level 2 and Level 3. Data were collected in six days from 07.00 to 17.00 WIB at the Emergency Department Hospital of Haji Surabaya. Primary data were obtained from hospital observation and measurement of boarding time with a watch. Observation was conducted when patients were decided to be hospitalized until they are moved to another room. Time observed include waiting time for laboratory results, admission, medical consultation, room transfer and resources utilized. Activities and time adopt the time motion study.

Results

Univariate analysis was done to obtain the distribution of frequency and percentage for each variable. Based on the record, the average age of patients is mostly 40.5 year. Females were the most responsive with 20 responses (66.7%). There were 26 respondents (86.7%) who used Social Agency Security for Health as their payment method.

Table 1 shows factors that influence EBT. Overall, laboratory examination contributes to patient boarding time at the Emergency Department. In this case, laboratory examination requires 7.4 minutes in average. Additionally, Table 2 indicates boarding time for patients with Emergency Severity Level 1 as the highest with 269.5 minutes in average. Accordingly, patients with ESI Level 1 and 2 use more resources as shown in Table 3.

Table 1: Distribution of Respondents

	Characteristics	Frequency	Percentage (%)
Age (years)	50-65	12	40
Gender	Male	10	33.3
	Female	20	66.7
Payment	National Social Insurance	26	86.7
	Non Insurance	4	13.3
Emergency Severity	Level 1	2	6.6
	Level 2	8	26.7
	Level 3	10	66.7

**Table 2:** Time Consumption of Emergency Boarding Time (n=30)

Variable	Mean (Minutes)	Deviation Standard	Min-Max (Minutes)
Length of Specialist Consultation	2.9	1.03	2-10
Length of Laboratory Examination	70.4	43.22	0-204
Length of Administration	69.0	36.43	19-195
Length of Patient Transfer	49.3	30.14	4-125
Boarding Time	176.7	64.12	100-300

Table 3: Boarding Time Based On Emergency Severity Index

Boarding Time	Resources Consumed	Boarding Time (Minute)			Standard Deviation
		Mean	Min	Max	
Level 1 (High Priority)	36	269,5	244	295	36,02
Level 2 (High Priority)	36	189,3	117	300	70,76
Level 3 (Medium Priority)	20	162,5	100	270	56,35

The examination of Emergency Boarding Time based on ESI Level and the use of resources indicated in the following Graph:
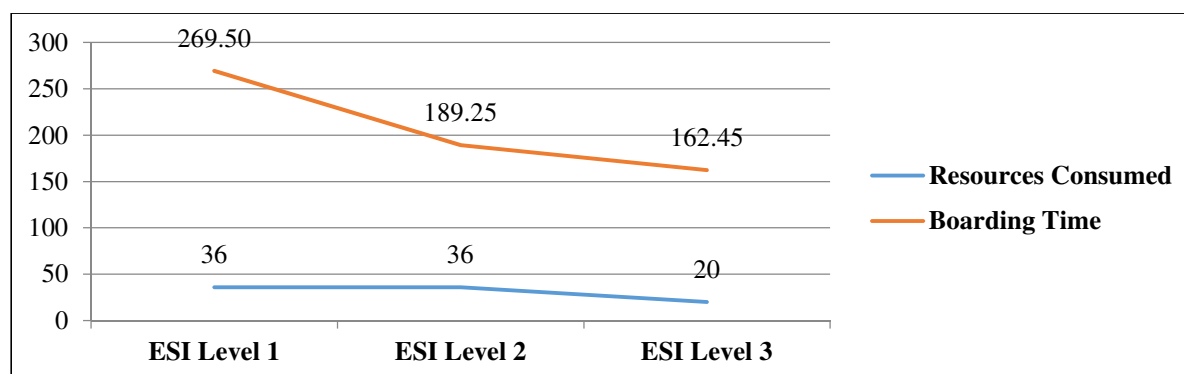
Figure 1: Correlation of ESI level Emergency Boarding Time with Resources Utilized

Based on Graph 1, the ESI Level 1 and Level 2 Emergency Boarding time indicates a decrease, with the same use of resources. Meanwhile at Level 2 and Level 3, shows a decrease in Emergency Boarding Time and resources utilized.

Discussion

Observation based from 30 respondents indicates an average patient boarding time for a specialist consultation is 2.91 minutes. The quickest boarding time for consultation takes 2 minutes, and 5 minutes being the longest. According to Asplin et al (9), specialist consultation is a throughput factor that affects long boarding time at Emergency Department. From the observation, time taken by doctors in charge at the Emergency Department to report the patient's condition to specialist doctors as the coordinator do not take much time. Thus, this will shorten patient boarding time at the Emergency Department.

The average boarding time for laboratory examination is 70.4 minutes, and the longest being 204 minutes. All patients who are hospitalized will undergo a laboratory check for their condition. Gill et al (10) asserted that laboratory examination is done to more than 50% patients who visit the Emergency Department and get hospitalized and discharged. According to Hawkins (11), time required from ordering the doctor consultation until laboratory examination results in boarding time target of less than 60 minutes. A research conducted by Pakpahan et al (12) shows that there was a statistically significant correlation (p= 0.006) between the speed of laboratory examination and boarding time. This is in line with the research of Bukhari et al (8) which found there was a significant influence between the speed of laboratory examination and patient boarding time. Quick laboratory service can help fasten the patient diagnosis so that it maintains the quality of service at the Emergency Department. However, the quick service at laboratory is also influenced by the number of medical check-up in one shift. During morning shifts, the laboratory unit receives high service demands from inpatient, outpatient, and intensive unit.

In addition, the average boarding time for administration is 69.0 minutes. The quickest administration takes 19 minutes, and the longest is 195 minutes. Based on the research conducted by Romiko (13), there was a significant correlation between administration and boarding time (p= 0.001 or p value < 0.05). The quick or long administration at the Emergency Department and outpatient unit determines patient wellbeing towards the services provided. Richardson et al (14) also have the same idea that 51% of patients at 38 hospitals wait for inpatient patients for more than 12 hours. It is seen that long boarding time at the Emergency Department is caused by the limited inpatient beds due to the delay discharge in the afternoon. American College of Emergency Physicians is in the opinion that the short-term solution for inpatient approach is efficiency and competency of every aspect at the hospital level to discharge patients before 12 am. In this case, doctors, nurses, pharmacists, radiologists, staff in laboratories and rooms are responsible in managing it (15).

Patient transfer takes approximately 49.3 minutes in average. The fastest patient transfer spends 4 minutes while the longest is 125 minutes. A study done by Rabin et al (16) demonstrates that time required to transfer a patient to an inpatient room is less than 2 hours. Long boarding time at the Emergency Department can affect patient dissatisfaction which can lead to mortality. Based on the research of Deviantony et al (17), the value of regression coefficient from the most dominant preparation time was 0.620 with a correlation coefficient of 0.747. It shows every delay in patient transfer to an inpatient room within 60 minutes will improve the waiting time after inpatient decision for the patient with a strong correlation that spends 0.620 minutes.

According to Bukhari et al (8), overcrowded situation at the Emergency Department happens because of the delayed process in patient treatment and boarding time at the Emergency Department. Time is considered as an important tool to measure the quality of service at the Emergency Department. Long boarding time will cause overcrowded

situation which affects patient care. Out of 30 respondents, 33% patients had more than four hour boarding time even though the average boarding time was actually 176.7 minutes. There were some factors that contributed to long boarding time. The quickest boarding time is 100 minutes, whereas, the longest boarding time is 300 minutes. The average boarding time based on ESI Level 1 is 269.5 minutes. Meanwhile, ESI Level 2 has average boarding time of 189.3 minutes, and ESI Level 3 has 162.5 minutes. Patients with ESL Level 1 had boarding time of more than four hours because the inpatient decision was made after the patient boarding at the Emergency Department based on the emergence and resources utilized by patients with ESI Level 1 and 2 than those with ESI Level 3. Patients with ESI Level 1 and 2 used 36 while those with ESI Level 3 utilized 20 resources. Other than the 36 resources, human resources, diagnostic tools, life support tools and other instruments are also used to support the health care services. The weak correlation between Emergency Boarding Time and resources utilized shows inefficiency. The longer the Emergency Boarding Time takes, the more resources will be utilized. As such, the more resources are utilized, the cost becomes higher. The research conducted by McHugh et al (18) found that Emergency Department crowding and ambulance diversion of new patients might deflect patients who generate inferior revenue margins. In fact, one study of hospital admissions of Medicare patients found that non-emergency department admissions are barely profitable, while emergency department admissions incur an average revenue loss of more than $700. Moreover, Falvo T et al (19) discover boarding in the Emergency Department and crowding in hospitals can negatively affect hospital revenue and create financial losses.

Limitation
The analysis is limited as it is based on data from one hospital at one point of time. The sample is too small (n=30), but it can be used as a basic data to further research about Emergency Boarding Time. This study has not been conducted before at Hospital Haji of Surabaya.

Conclusion
Higher ESI priority at the hospital tends to use more resources in providing emergency treatment to patients. Long boarding time is caused by several factors, but the most dominant factor is waiting time for the laboratory results. It is recommended to do further study which uses larger samples correlating to Emergency Boarding Time and financial loss in the Hospital.

Acknowledgments
We thank the Dean of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia and the directors of the Hospital of Haji, Surabaya, Indonesia.

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