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Research Article

STUDY OF PATIENT WAITING TIME AT EMERGENCY DEPARTMENT OF A TERTIARY CARE HOSPITAL IN INDIA

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ABSTRACT

The study was conducted in the Emergency Department of a 2000 bedded tertiary care hospital in India for duration of 4 months beginning August 2013. All 26702 patients who arrived during the study period were taken as the sample. The aim was to evaluate the waiting time of patient's in emergency department by studying the patient care events and their process delays during the stay at emergency department. 26702 samples registered during study period were observed for the arrival pattern. Real-time mapping of 500 randomly picked samples was observed for calculating time taken to initiate (delays) various patient care activities. Waiting line model was applied and the waiting line, server utilization, waiting time, and the Poisson distribution of the patients arriving at the New Emergency Department were calculated. Average time taken for various activities in delivery of definitive emergency care to the patient was noted as under:

- Avg. Delay in first interaction with doctor – 22min
- Avg. Time spent in triage & screening – 4min
- Avg. Time spent for patient registration – 8min
- Avg. Delay in initiation of clinical examination – 9min
- Avg. Time spent in clinical examination- 11min
- Avg. Time for sampling for lab investigations – 2min
- Avg. Time delay in initiation nursing care - 28min

The main action points contributing to delay in delivery of emergency services were:
- First interaction with the Emergency Physicians
- Time spent in getting registered
- Initiation of nursing care after prescription by doctors

These were further compounded due to diversion of OPD patients to the Emergency Department and due to mis-match between total activity time of doctors & nurses.

Keywords: *Emergency Department, Waiting Time, Patient, Hospital*

INTRODUCTION

Emergency Department is one of the most traffic intense departments of a hospital, working round the clock to deliver health-care services to patients in their acute health. Human Resources, Equipment & Standard operating procedures are the tripods of the emergency department and a minor deviation in any one or more of these may hinder the emergency service delivery rate leading to waiting lines build up.

Research on models for evaluating the impact of bed assignment policies on utilization, waiting time, and the probability of turning away patients are frequently used globally. The concept dates back to early seventies where in McClain (1976) reviewed research on models for evaluating the impact of bed assignment policies on utilization, *waiting time*, and the probability of turning away patients. Green (2006) presented the theory of queuing as applied in healthcare in which she proposed the relationship amongst delays, utilization and the number of servers; the basic M/M/s model, its assumptions and extensions; and the applications of the theory to determine the required number of servers.

The study was conducted in the Emergency Department of a 2200 bedded tertiary care hospital in India for duration of 2 months starting from May 2013 with an aim to evaluate the waiting time of patient's in emergency department by studying the patient care events and their process delays during the stay at emergency department.

MATERIALS AND METHODS

Methodology

All 13200 patients who arrived during the study period were taken as the sample. Various steps involved in the delivery of emergency healthcare services were studied by observing and conducting in-depth interview of all the stakeholders involved in emergency treatment of patient i.e. doctors, nursing staff, patient, attendant of patient, patient assistance personnel.

1. Real time observance of 500 patients was done to document time spent in delivery of emergency care.
2. Arrival Rate of patients per hour was observed amongst 13,200 patients during study period.
3. An Activity Diagram was prepared for the emergency health delivery process and then waiting line was calculated per day in per 60 min slots
4. Questionnaire was analyzed to factorize and cluster the process responsible for the delay
5. Waiting line model was applied and the queue length, server utilization & waiting time of the patients arriving at the Emergency Department were calculated.

RESULTS

Average time taken for various activities in delivery of definitive emergency care to the patient was noted as under:

- Avg. Delay in first interaction with doctor – 22min
- Avg. Time spent in triage & screening – 4min
- Avg. Time spent for patient registration – 8min
- Avg. Delay in initiation of clinical examination – 9min
- Avg. Time spent in clinical examination- 11min
- Avg. Time delay in initiation nursing care - 29min

DISCUSSION

A waiting line system (or queuing system) is defined by two elements: the population source of its patients and the process or service system itself. The models used in this supplement assume that patients - primary input into the queue - do not balk, renege, or jockey; and come from an infinite population.

The number of waiting lines, the number of servers, the arrangement of the servers, the arrival and service patterns, and the service priority rules characterize the service system. The Emergency Department under consideration is a multi-phase multi-server system, as a total of 4 junior resident doctors (servers) are deployed to tackle the single waiting line of the patients in the first phase followed by nursing staff who execute the prescription in the second phase. The arrival pattern at this emergency department is found to follow the negative exponential distribution as the spacing between the arrivals does not occur uniformly. Also, data collected from a random sample of 500 patients shows that the variability in the service delivery time stretched between 1 min to 21 minutes and hence it can be concluded that the service time also follows negative exponential distribution pattern. Further, the average service rate per server was calculated as 5.5/hr.

Thus, the queuing model classification this emergency department is M/M/4, where:

- Arrival Process (M): negative exponential
- Service Process (M): negative exponential
- Number of Servers: 4
- Queue: infinite

This information was analyzed with WIN QSB and QTP tools for XCEL sheets. The inferences drawn were as follows (figures 1-4):

- Arrival pattern, Server Utilization & Queue lengths are all found to be maximum on Monday's.
- These are further found to be the highest in the time slot of 1pm – 7pm i.e. after the hospital's outpatient departments close as few patients who have been unable to get outpatient consultation come to the emergency department or after examination have been referred for admission / treatment.

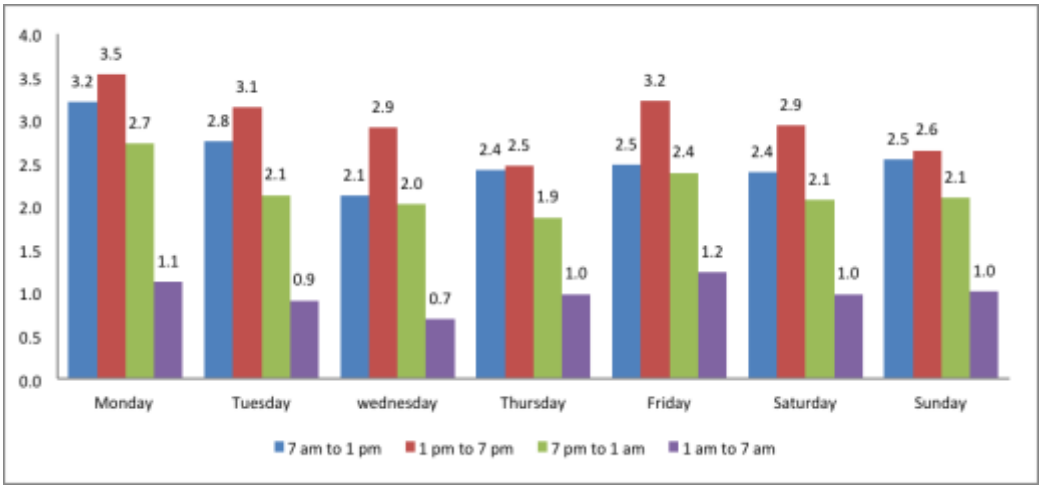

Figure 1: Arrival Pattern

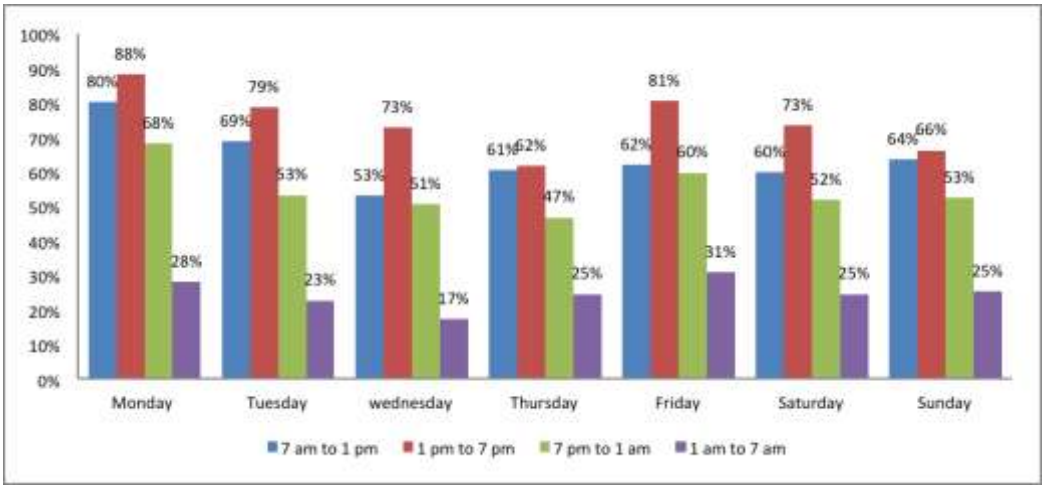

Figure 2: Percentage utilization of the servers

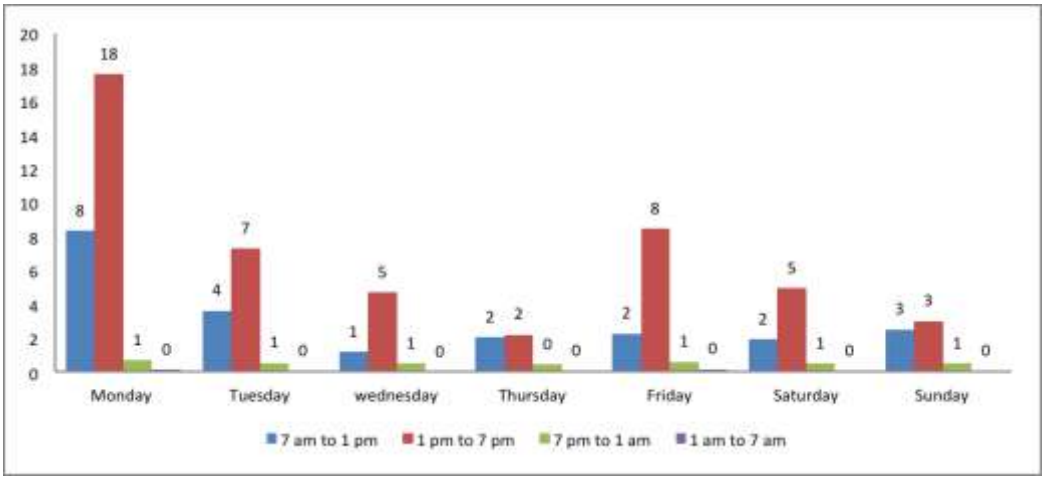

Figure 3: Queue Length

Average time taken for various activities in delivery of definitive emergency care to the patient was noted as under:

- Avg. Delay in first interaction with doctor – 22min

- Avg. Time spent in triage & screening – 4min
- Avg. Time spent for patient registration – 8min
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- Avg. Time spent in clinical examination- 11min
- Avg. Time delay in initiation nursing care - 29min

A correlation for each of the aforementioned timings with the process mapping along with possible solutions to reduce the delay is discussed as under:

The patients queue up for seeking care and are seen on first come first serve basis by the available servers (doctors). Hence, due to the limited availability of doctors vis a vis the arrival rate of patients, the queue length increases and so does the delay in first interaction with the doctor. A solution to this could be to make additional doctors from other areas of the hospital to be available on call during peak hours.

The doctors first screen the patients following which the patients attendant is asked to get the patient's registration formalities completed depending upon whether the said patient is a medico-legal case or not. This screening happens when the patient makes first contact with the doctor after waiting in the queue for a long time. In certain cases, patients especially outpatient diversion ones are turned back from this point. It is possible to shorten the total time taken till this point by adopting better Triage methods and utilizing additional nursing staff for the same.

The registration process also takes substantial time as the patient's attendant's have to walk some distance for the same. The number of registration counters being limited, leads to further queuing and delays. It is proposed that number of registration counters can be increased and basic demographic data of the patient could be entered at these counters as soon as the patient arrives. This shall avoid the queuing, which currently occurs after registration.

Beyond this, the major delay which impacts the patient care is the time taken to initiate nursing care of the patient which includes taking samples for lab investigations, administration of drugs, etc. This delay is primarily because the number of nursing staff vis a vis the demand are inadequate. A deeper analysis of this shows that nursing care in itself is a time consuming activity. As the Hospital provides all drugs to the patients in Emergency Department from their stores free of cost, the nurses take a substantial time in arranging the drugs from their stores, etc. Further, this two phase system in which the doctors and nurses interface with the patient in different phases could be converted into a single phase with nurses being attached to the doctors to make it a team.

Conclusion

One of the most important managerial applications of random processes is the prediction of congestion is a system, as measured by delays caused by waiting in line for a service. Repeated and excessive delays may ultimately influence the patients' perception about the brand and experience. The challenge is designing service systems with adequate but not excessive amounts of capacity. An emergency department of a hospital experiences variable demand and variable service times. The hospital cannot be sure how much emergency patient demand there will be and it does not know exactly what each patient will be presented with—each patient can be unique and require a different service time.

In the case of Hospital under consideration, the main action points contributing to delay in delivery of emergency services were found as:

- First interaction with the Emergency Physicians
- Time spent in getting registered
- Initiation of nursing care after prescription by doctors

These were further compounded due to diversion of OPD patients to the Emergency Department and due to mis-match between total activity time of doctors & nurses despite the fact that almost four times the nurses are deployed as compared to doctors.

This study highlights the importance of activity time analysis and of adoption of newer technology and tools in modern day hospitals to reduce patient waiting times.

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