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Waiting Time to Receive Healthcare Services and Factors Affecting It: Case Study in a University Hospital

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ABSTRACT

Background: The clinic in a hospital is usually the first place to which patients are referred. A long queue, which results in dissatisfaction among patients, is economically costly for managers; medical institutions can, therefore, determine the level of required resources for optimum investment through management tools like queue theory and waiting time caused by it. The current study was conducted to evaluate waiting time at various clinics of Amir Alam Hospital in Tehran.

Methods: The analytical study was conducted in the period from April to August in 2015 on 150 patients who were referred to five clinics of Amir Alam Hospital. The samples were selected through stratified random proportion to sample size and data was collected in a designed frame through $SPSS_{21}$ and descriptive tests of mean, standard deviation and regression analysis.

Results: The longest waiting time for patients was related to the surgery clinic at 61.05 minutes. Also, the longest time to provide service was related to the surgery unit at 26.84 minutes. Results obtained from univariate logistic regression test indicated that all evaluated variables—including time to receive service, capacity of providing service, order of queues and number of doctors—exert a significant effect on waiting time of patients in the hospital (P-value < 0.05).

Conclusion: Increasing capacities, keeping adequate number of doctors, reforms, removal of unnecessary works and using scientific tools to manage queues can be effective in reducing waiting time for patients. Owing to its importance for patient satisfaction, it is necessary for managers to think of ways to shorten queues in hospitals.

Keywords: Clinic, Teaching Hospital, Outpatients Waiting Time

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Introduction

Waiting in queues, which is caused by the population density and disproportion between supply and demand, is prevalent in many organizations. In urban societies (3–1), the phenomenon has been acceptable for a long time, although it leads to the wastage of people's time, creation of dissatisfaction, disruption in the process of providing services, and reduction in the quality of services.

Queues usually occur in systems where customers come for reference various times and also where the time of providing services is different (4). Hospitals are obvious examples of such organizations, which have wide structures and complex interactions with people around them. Hospital customers are patients and, if the queues are prolonged, it could lead to irreparable financial and physical losses. On the other hand, the quantum of demand for health services is higher than the capacity and this problem has made waiting queues in hospitals longer. So, in order to balance the optimum level of hospital investments in this field, managers have to manage it.

Unfortunately, sometimes decision-makers in hospitals pay no attention to the matter and problems of waiting time with no feedback of the services from customers continue in many countries as a result of improper management. For example, in a survey conducted by hospital managers in the United States of America (5), 91% of managers stated that congestion of patients was one of their key problems. In a study conducted in northern Nigeria (6), it was found that more than 96% of people waited more than an hour in waiting rooms of doctors while the waiting time required for treatment was lower than 30 minutes in 55% of the cases

A clinic is the first place to familiarize patients with a hospital and the quality of services in it creates an impression on patients going to the hospital (7). Some factors, such as shortage of doctors, delay on the part of doctors to enter clinics, and the small space in clinics, can lead to creation of long queues and dissatisfaction in patients. It causes a reduction in the quality of services provided due to high congestion of patients and increased workload for personnel (8, 9).

Various factors affect the waiting time of outpatients. Some cases, such as motivation of service providers, number of stations for providing services and also their required space, are important variables that are effective in managing hospital queues. Managers require some information about the length of queues and waiting time of patients to take a decision about the number of required units needed to provide service in each department of the hospital (1) in order to increase efficiency and effectiveness of their organizations in today's turbulent world. This will lead to an improvement of the organization and correct management as well as optimal use of resources and time (4).

Using scientific tools like queuing networks theory provide the ground to know the problems and difficulties of the service providers and helps solve problems by using mathematical calculations and analyses (1). The queuing system-which is named electronic queuing management system or electronic queuing system—is an invention in the automation field. By using it, the physical queue (in its traditional concept) is completely removed and a virtual queue in the software is formed and managed.

The application of this type of system is very useful and necessary for all centers which have large numbers of clients. Researches have indicated that an effective queuing system not only increases the organization's productivity but also considerably reduces the creation of mental and psychological problems in the work environment. The implementation of the hospital queuing system causes easy and rapid responsiveness to patients and reduction of traffic and bustle in health centers. This system meets all hospital needs through experiences of medical record specialists and programmers. Preventing congestion of patients in front of the examination room, creating a quiet environment, organizing a queue and speeding up service providing, separation of

special patients, limiting number of admissions by doctor, and debriefing number and times of admitted patients are the various benefits of the system.

Amir Alam Hospital, due to its local situation, provides healthcare services to a large number of patients and has various clinics. But there is a large number of patients and the lack of a queuing system along with incorrect management of patients have created financial and psychological problems for the hospital management as well as the patients. The hospital's management, in order to mitigate the problems, is reviewing the existing situation as well as the queuing system. The study was conducted by the Tehran Amir Alam Hospital management team to evaluate waiting time in various clinics of the hospital in 2015 in order to reduce it by using the extracted results.

Materials and Methods

The present research was an analytical study, conducted as a cross-sectional one in the period from April to August in 2015 in clinics of Amir Alam Teaching Hospital. The evaluated clinics were: ear, nose and throat clinic, surgery clinic, internal medicine clinic, anesthesia clinic and pain clinic.

The research environment was Amir Alam Subspecialty Hospital, affiliated to Tehran University of Medical Sciences, with specialization in ear, nose and throat. Since the number of patients in spring and summer is more than in other seasons, the study was conducted in the first half of the year.

The following formula used to estimate the sample size is:

$$n \geq \frac{\left(z_1 - \frac{\alpha}{2}\right)\sigma^2}{d^2}$$

Given that in previous studies, the standard deviation, reliability and sampling coefficient were at 0.31, 0.95 and 0.393 respectively, the sample number was obtained from 150 patients. The researcher, who wanted to time the services provided, referred to each clinic and completed the information. In the study, the stratified random sampling proportional to sample size was used. The researcher, by referring to each clinic (based on codified times of providing services in clinics), recorded waiting time before receiving a turn and waiting period in the interval between receiving turn and visiting patients. The number of the sample studied was equal to the number of patients in each clinic (30 patients from each professional clinic) and the results were recorded. The inclusion criterion was the tendency to participate in the study and the exclusion criterion was previously having the doctor's opinion because of a history of hospitalization.

The tool used was the designed form that included information such as the name of the clinic, waiting time, waiting time in the interval between receiving turn and visit, number of doctors, and some questions about the order of queues and demographic characteristics of patients like age, sex, marital status and level of education in each offices of the clinics. The content validity of the form was confirmed through comments of hospital managers and faculty members of the department of health economics and management of the health services, Tehran University of Medical Sciences. The researcher would randomly refer the volunteers to various clinics during different working times and various days of the week and record information related to waiting time and duration of providing services. With the help of $SPSS_{21}$ software and descriptive statistics like average, standard deviation and logistic regression analysis, tests were used for statistical analysis.

Further, in the current study all ethical issues were observed based on the Helsinki Declaration.

Results

About 12 percent of the evaluated patients were under 20, nearly 59.3 percent between 20 and 40, and the rest were over 40. Again, 65.3 percent were male and the rest female. Also, 28.7 percent were single and the rest were married (Table 1).

The average waiting time in each clinic of doctors had been in minutes. So, the longest waiting time was related to patients referred to the surgery clinic at 61.05 minutes. Findings related to

average duration for providing services in each of the doctors' clinics show that the longest time related to patients referred were in the surgery unit (26.84 minutes) (Table 2).

Results from univariate logistic regression test indicated that all evaluated variables, such as duration to receive service, capacity of providing service, order of queues and number of doctors, have a significant effect on waiting time in clinics and the variables are suitable predictors for clinic waiting time. Based on the multivariate regression, duration of providing service and number of doctors have significant effect on the waiting time (P-value < 0.05) (Table 3).

Table 1. Frequency distribution of demographic characteristics of the studied patients

Demographic Characteristics		Number	Percentage (%)
Clinic	Ear nose and throat	30	20
	Surgery	30	20
	Internal medicine	30	20
	Anesthesia	30	20
	Pain clinic	30	20
Age group	1-20	18	12
	21-40	89	59.3
	41-60	41	27.3
	61-80	2	1.4
Gender	Male	98	65.3
	Female	52	34.7
Marital status	Single	43	28.7
	Married	107	71.3
Level of education	illiterate	5	3.3
	Primary and secondary	27	18
	Diploma	55	36.7
	College education	63	42

Table 2. Average waiting time and providing service in each of doctors' offices in evaluated clinics

Clinic	Average of waiting time (in minutes)	Average time of providing service (in minutes)
Ear nose and throat	36.12	9.21
Surgery	61.05	26.84
Internal medicine	48.44	18.30
Anesthesia	52.31	15.96
Pain clinic	35.15	12.56

Table 3. Evaluating amount of effect of studied variables on waiting time of patients

Variable	Univariate logistic Regression			Multivariate logistic Regression		
	OR	CI (OR)	P	OR	CI (OR)	P
Waiting time	1.11	1.038-1.192	0.002*	1.01	0.861-1.18	0.897
Waiting time in interval between receiving turn and visit	1.15	1.066-1.257	0.001*	1.161	1.072-1.257	0.001*
Capacity of providing service	1.14	1.007-1.301	0.039*	0.962	0.803-1.15	0.672
Order of queues	1.35	1.051-1.426	0.048*	0.987	0.904-1.07	0.765
Number of doctors	1.096	1.016-1.182	0.018*	1.09	1.014-1.171	0.019*

*Significant at the 0.05 level

Discussion

Given that the standard waiting time presented by the Institute of Medicine (IOM) is 30 minutes (maximum) for at least 90% of patients (10), it can be concluded that the average time of providing services is high in the hospital (46.61 minutes for all patients). This is consistent with other studies in various units of governmental university hospitals (11, 12) and indicates the existence of some problems in the service-providing system in various units. This time has been 34.3 minutes in the study by Bai Lian Chen et al. (8), which was conducted on 10,092 Chinese patients referred to governmental hospitals in 2006.

This difference can be caused by differences in the type of hospitals. The hospital in China that was studied has been a non-teaching governmental hospital while the hospital studied in this research is a teaching hospital in which many students operate. The presence of students and allocating a time to teach leads to a slow treatment process. Owing to their low experience and defensive medicine, patients are usually asked to conduct diagnostic and clinical tests, such as sonography, radiology and laboratory. If more patients are referred to such units, it will result in disorder in provision of services and increase waiting time.

On the other hand, there are some differences in effective indexes on waiting time, such as the index of ratio of personnel to population in the two countries. For example, the ratio of doctors to 1,000 people in China is 1.47 people against 1.11 people in Iran (13). Above all, times of data collection are different in the two studies. Given that Amir Alam Hospital is a teaching hospital, peak working hours in clinics are in the morning. So, data has been collected from various clinics in hours of morning shift while data in the clinics of Chinese hospitals has been collected in morning and evening shifts. Average waiting times are different in each shift—it is 43.6 minutes in the morning shift and 19.1 minutes in the evening shift. Therefore, using a flexible plan based on the number of patients in various times can be effective in reducing waiting time for patients.

It seems that several reasons affect services to patients in clinics, such as the presence of patients before clinic hours, congestion caused by a large number of caregivers, irregular reference of patients to hospital receptions in order to receive their turn, incorrect information about the timing of doctors and prioritization of some patients, among others. Other bottlenecks could be inappropriate space at reception, shortage of doctors in the early hours of the day, patients' unawareness about the reception process, lack of punctuality among personnel and doctors at workplace, and the deployment of personnel in various units simultaneously for different roles and duties. Also, providing unnecessary diagnostic and therapeutic services by general practitioners, interns and residents in training are other hindrance factors. Some of them have been mentioned in the study of Moradi and Razavi, who evaluated paraclinic units

of Hafez Hospital in Shiraz (14).

The results of this study showed that the variable of duration to receive service have a significant effect on waiting time of patients. The same result has been confirmed in the research of Aeenparast et al., who have determined predicator factors of waiting time by using a simulation technique. They could reduce waiting time of patients for examination by various doctors from 63 minutes to 44 minutes by making changes in opening hours of doctors in clinics and reducing the interval between reception and examination of patients, which led to an increase in the duration of receiving services (11). Moradi and Razavi obtained the very same results in Hafez Hospital by changing the duration of receiving service as well as revamping things like scheduling system and human resource (personnel and doctors). This showed a considerable effect on reduction of waiting time for patients (14).

Also, this research confirmed the effect of a number of doctors on the waiting time of patients, which is similar to the results of Sepehri et al. (15), while the study of Farzdi et al. (16), which was about waiting time to provide service by endocrinologists to patients in their first reference, showed that by increasing the number of doctors, the waiting time is not reduced and most patients' congestion is related to their willingness to visit special doctors and not their shortage. This finding can be caused by differences in the population studied in the researches. In the current study, various units of clinics in the governmental hospital have been evaluated, where doctors have no motivation to increase their working hours, since payments in this section come as salaries and spending longer time entails no financial advantage for them. In short, the results of the study indicated that duration of receiving service, the capacity of providing service, the order of queues and the number of doctors present in a clinic has significant effect on waiting time, and these variables can be suitable predicators of clinic waiting time.

Also, based on multivariate regression, the duration of receiving service and the number of doctors have a significant effect on waiting time. So, trying to improve each of them can exert a considerable effect in the reduction of waiting time. As a result, satisfaction is achieved, since long waiting time is the major reason for patients' dissatisfaction (17). However, Yadovaneshi et al. (18), in their research, showed that patients' satisfaction of waiting time in hospital depends on their mental perception and the quantum of disappointment in an organized system of providing service rather than their real waiting time.

It seems that managers in health centers, if determined, can solve their organizations' problems through scientific tools and updated management technologies. Few studies have looked into the waiting time of patients and solutions to reduce it. Some studies have only focused on changes in the numbers of human resource personnel and physical facilities, and some others have considered reformation and change in processes. Other studies have paid attention to both. In a research conducted by Miler et al. (19), strategies for reduction in the number of incoming patients and also reformation of processes in order to reduce time of processes related to patients have been propounded as strategies for the reduction of waiting time. In another research at a diabetes clinic in Isfahan (20), providing a training plan by a doctor, reservation of referring turn, billing to conduct consultations and determining the volume of tests for each clinic by the laboratory could be solutions for reducing waiting time of patients. Sepehri et al. (15), in their article, have collected some scenarios for reduction of waiting time from other articles and listed them; change in the opening hours of the system, change in scheduling for reference of patients, providing some solutions in order to reduce the interval between reception and visit, balancing the number of doctors and other personnel in units, change in number of personnel based on the number of patients, and other cases have been some scenarios propounded in the article.

Many of the scenarios to reduce waiting time

can be successful by reforming processes and without spending additional money in using new human resources or spending to create a new unit.

For example, in the study of Aeenparast et al. (21), it was determined that more than half the waiting time in orthopedic clinic of a teaching hospital in Tehran is before the visit of doctors. This means that patients visit the clinic soon or doctors visit the clinic late. It also showed that changes in the working hours of doctors help reduce waiting time instead of increasing their number.

Conclusion

The growing trend of reference to clinics at governmental hospitals in Iran along with global trend (22) shows that managers should pay more attention to manage the waiting time of patients in order to increase their satisfactory and quality services.

In this way, some variables such as duration of receiving service, the capacity of providing service, the order of queues and the number of doctors present in a clinic can be suitable predicators of clinical waiting time.

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Conflict of interests

The authors of the study state that there is no conflict of interests.

Authors' contributions

Mousavi S. M, Rajabi GH and Pourshariati F designed research; Mousavi S. M and Rajabi G conducted research; Pourshariati F analyzed data; Mousavi S. M, .letafatnejad M wrote the paper. Letafatnejad S. M had primary responsibility for final content. All authors read and approved the final manuscript.

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