DETERMINANTS AND MANAGEMENT OF PATIENT WAITING TIME IN THE GENERAL OUTPATIENT DEPARTMENT IN KIBABII UNIVERSITY HEALTH CLINIC, KENYA

ABSTRACT

The purpose of this paper is to determine the time that a patient can spend waiting for service in Kibabii University Healthcare Clinic in Bungoma County (Kenya). The main objective was to provide necessary information to service facility managers, stakeholders, hospital staffs and other related institutions with the knowledge to improve the queuing system or to curb long waiting time of patients seeking services which can cause deterioration of the disease and sudden demise. This project also aims at providing suggestions to various factors identified to be the causes of long waiting time in the outpatient department at Kibabii University healthcare to help the smooth running of the clinic. The ODK tool was used in data collection procedure to capture the opinions of the respondents. The results from the ODK Tool was exported to XLS which is an export feature of data to excel, later data was exported to SPSS for analysis from excel.

Keywords: Average Patient Treatment, Markov Chain, Outpatient Department (OPD) and Queuing Models

1.0 INTRODUCTION

Queuing is by all accounts evident in the present society. Waiting Lines form when the demand for a service surpasses its supply. In hospitals, patients can hold up a certain timeframe (minutes, hours, days or months) to get healthcare service. For some patients or customers, waiting in lines or queuing is annoying or negative understanding. The offensive experience of waiting in line can regularly have a negative outcome on whatever is left of a customer's involvement with a specific firm. The way in which the supervisors see the queuing issue is imperative to the long haul accomplishment of their organizations.

The literature on queuing models indicates that waiting in line or line makes an issue monetary cost to people and institutions. Hospitals, airline organizations, banks, and industrialized firms endeavor to diminish the aggregate waiting price, and the expense of service gave to their customers. From this time forward, the speed of service is quickly becoming a vital focused issue. Davis [1] declares that providing ever-quicker service with a definitive objective of having zero customers waiting time has as of late gotten administrative consideration for a few reasons. To begin with, in the more exceedingly created nations, where standards of living are high, time turns out to be more significant as a ware and subsequently, customers are less willing to sit tight for service. Also, this is an upcoming acknowledgment by firms that the way they treat their

customers at present essentially determine on regardless of whether they will remain, faithful customers tomorrow.

Finally, progresses in innovation, for example, PCs, internet and so forth, have furnished firms with the capacity to give quicker services. Therefore, doctor's facility supervisors and wellbeing suppliers are continually finding an approach to convey all the more quickly services, believing that the waiting will contrarily influence the association execution assessment. Cochran and Bharti [2] additionally contend that higher operational productivity of the healing center is probably going to control the expense of restorative services and subsequently to give more reasonable consideration and enhance access to people in general.

Researchers like Green, Linda V [3] have contended that service holds up can be controlled by two procedures: operations management or perceptions management. The operation management highlight manages the association of how customers (patients), lines and servers can be coordinated towards the objective of rendering proficient service at the minimum expense. Queuing effectively affects patients' fulfillment. The time that customers spend waiting for service can essentially influence their dimension of fulfillment. According to Chadha and colleagues [4] inquire about queues has shown that customer fulfillment is influenced by waiting time as well as by customer desires or attribution of the foundations for the waiting. Therefore, one of the issues in line management isn't just the real measure of time the customer needs to pause yet additionally the customer's perceptions of that pause. Unmistakably, there are two ways to deal with increasing customer fulfillment as to waiting time: through decreasing genuine waiting time and in addition through enhancing customers' waiting background, according to Singh, V. [5].

1.1 Theoretical Review

1.1.1 Queuing Theory

Queuing theory is by and large considered as a part of operations research in light of the fact that the results are often utilized when making business choices about the resources expected to give a service according to Ferreira and Manuel Alberto M [6]. Queuing theory has its origins in research by Azriel et al [7] when he created models to portray the Copenhagen phone trade. The thoughts have since seen applications including media transmission, movement engineering, computing and the structure of factories, shops, offices and hospitals.

1.1.2 Essential segments to depict a phenomenon of the waiting line

The following segments are basic to depict a phenomenon of waiting line according to Sundarapandian, V [8]: the populace source, the landing, queues, queue discipline, service mechanism, departure or exit.

a. Population source

The populace source fills in as where landings are produced. The landings of patients at the doctor's facility can be separated from either a finite or an infinite arrangement of the populace. Finite populace sources infer to the predetermined number of the customer pool. On the other hand, an infinite source is forever.

b. Queue discipline

The General discipline of service is the succession in which customers or patients are served.

The most widely recognized discipline is first in, first served (FIFS). Other disciplines include rearward in, first served (LIFS) and random order (RD).

c. Service mechanism

The service mechanism portrays how the customer is served. It involves the number of servers and additionally the time of the service time, the two of which may fluctuate and can be in a random form. The number of lines and servers greatly affect the decision of service office structures. The normal service office structures are single-channel, single-stage; single-channel, multiphase; multichannel, single stage and multi-channel, multiphase.

d. Departure or exit

The departure or exit happens when a customer is served. The two conceivable exit situations as specified by are:

(a) The customer may return to the source populace and promptly turn into a competing candidate for service again;

(b) There might be a low likelihood of re-service.

1.2 Statement of the Problem

Long waiting time of patients before being served by health service deliverers has been a danger to patients in Kibabii University health clinic as well as an overall debacle to health care institutions prompting kept affliction, exacerbating of the infection coming about to the sudden deaths of our dearest. The absence of technicality in the topic about the reasons for long waiting time has caused torment in numerous families prompting the declination of the nation economy. This tests a requirement for more inquiries about the administration of patient waiting time all in all.

1.3 Significance of the study.

This text is based on the perceptive that most of these challenges can be managed by using queuing model to determine the waiting time performance such as average arrival rate of patients, average service rate of patients and related factors leading to long waiting time. This will help the various stakeholders, facility managers, CEO'S of various health institutions to come up with related mechanisms to minimize long waiting time in hospitals mostly in the outpatient department (OPD)

2.0 RESEARCH METHODOLOGY

The text used the Queuing theory model with different queuing disciplines including first-in-first serve (FIFS) and last-in-last serve excluding the random order (RO) and the last- come- first serve (FCFS) since the arrival time was directly proportional to the service time therefore resulting to formation of the Que.

2.0.1 Queuing theory

Waiting for services has become an integral part of daily life, generally the queuing system consists of one or more queues and one or more servers that operates under set procedures according to Ameh and his colleagues [9]. Many researchers used the queuing theory including Stordahl [10, 11] Christian Huygens [12] and both have described it as the best method of analyzing the queuing problem.

2.0.2 Kendall notation

The basic queuing model can be categorized using the Kendall [13] notation describing the queuing models using the factor described below.

2.0.2.1 The M/M/c Queuing System

The model used was MMC FIFS/∞/∞ by Kleinrock, 1975 [14] where;

M=Markovian (or Poisson) arrivals and exponential service time.

C= Multi-server; where in our case *c* is equal to three nurses working in outpatient department. According to a copy made in 2000 by William Stallings [15] available at (WilliamStallings.com/student Support)

FIFS = First in, first served (Queuing discipline).

∞ = Infinite system limit.
∞ = Infinite source limit.
n= are the number of outpatients
Size of the calling source is infinite

The steady state formula to obtain the probability of having n number of out-patient in the system p_n and the formula for p_0, $l_s, l_q,$ $w_s, and\ w_q$ are abbreviated below

p_n Probability of having n patients in the system

p_o: Probability of having zero patients in the system

$$p_0=\left(\sum_n^{c-1}\frac{(c\rho)^n}{n!}+\left(\frac{(c\rho)^c}{c!(1-\rho)}\right)\right)^{-1}$$

l_s Average number of patients in the system $l_s = l_q + \rho$

l_q Average number of patients waiting in the queue

$$l_q = \frac{\rho^{c+1}}{(c-1)!\ (c-\rho)^2} \times P_O$$

w_s Average waiting time of patients in the system

$$w_s = {}^{L_s}/_{\lambda}$$

w_q Average waiting time of patients in the queue

$$w_q = \frac{l_q}{\lambda}$$

This system can be modeled as a birth-and-death process with the coefficients

$$p_n = \begin{cases} \frac{\rho^n}{n!} p_0 & 0 \le n \le c, \quad where\ \frac{\rho}{c} < 1\ or\ \frac{\delta}{\mu c} < 1 \\ \frac{\rho^n}{c^{n-c} c!} p_0 & n > c \end{cases}$$

$\rho = \frac{\lambda}{c\mu}$ Where c is the number of servers

ρ =Utilization factor of the server

λ = Arrival rate of patients

μ = Service rate of patients

3.0 RESULTS AND DISCUSSION.

In this chapter, the impression of the study is brought out clearly using the results obtained during the data analysis, necessary discussions are made which help in drawing of various conclusions, as follows

3.0.1 Data Analysis

From the study done at Kibabii University health clinic the following were the results using the queuing theory.

$$\lambda = 16\, patients\ arrived\ \ per\ hour$$

This implied that for every 3.75 minutes one patient arrived in the system.

$$\mu = nurses\ managed\ to\ serve\ 3\ patients\ per\ hour$$

$$c = 3\ service\ providers.$$

3.0.1.1 The Utilization Factor

The utilization factor has been calculated below to compare or find out the ratio between the arrival rate and the service rate of patients.

$\rho = \frac{16}{3\times3}$= 1.778

Since the utilization factor is greater than 1, it indicates that the line will grow without bound and hence the probability of having zero patients in the system must be zero and hence something must be done.

3.1.1 The gender of the respondents

The table below shows the frequency of the gender of the respondents.

Gender of the respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	33	45.2	45.2	45.2
	Female	40	54.8	54.8	100.0
	Total	73	100.0	100.0	

Table 3.1.0: Gender of the Respondents

In the table, the gender of the respondents shows that out of 73 respondent's 33 were female and 40 were male which indicates that the female respondents were more than male respondents

3.1.2 Waiting time of patients

The figure below gives the analysis of the frequencies of each range of waiting time of the respondents.

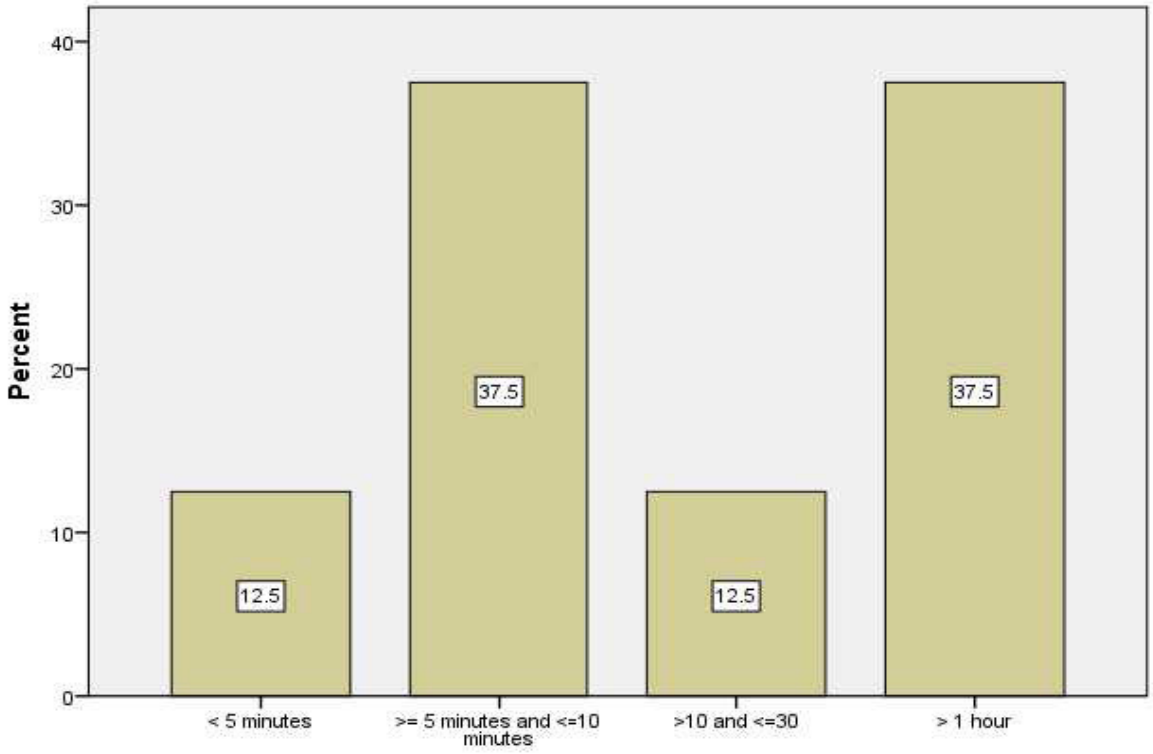

Fig 3.1.1 Waiting time of patients in OPD

In figure 3.1.1 above, it is clear that 37.5 of the patients waited for time between 5 and 10 minutes. The worst part of the analysis is that also some other 37.5% of the patients wait for more than an hour in the outpatient department for service. Only a small percentage is seen waiting for service for few minutes which clearly indicates that something has to be done to reduce the long waiting time in Kibabii university health clinic.

3.1.3 Attitude of the patients towards the waiting Time

The figure below illustrates the attitude of the respondents towards the waiting time and the discussion is given below.

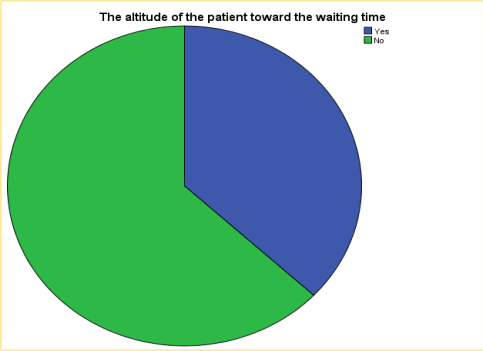

Fig 3.1.4: Attitude of the respondents towards the waiting Time

In the figure above, it is clear that the majority of the respondents had a negative attitude towards the long waiting time while a few of the respondents were just okay with the long waiting time. Since the majority was not comfortable in the long waiting hours, then some action must be taken.

3.1.4 Causes of long waiting time

The table below gives a report on the causes of long waiting time and its corresponding frequencies according to the respondents.

Causes of long wating time in an outpatient department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	shortage of nurses and pysicians	20	27.4	27.4	27.4
	Lack of dedication of staff to their duty	21	28.8	28.8	56.2
	Shortage of consultation rooms	10	13.7	13.7	69.9
	Heavy flow of patients in the clinic	22	30.1	30.1	100.0
	Total	73	100.0	100.0	

Table 3.1.5: Causes of long waiting time in the outpatient department

This showed that that the interviewed students and staffs raised up that 30.1% heavy flow of patients in the clinic is the main reason, followed by lack of dedication of staff to their duty 28.8% also shortage of staffs which amounted to 27.4% for long waiting time in Kibabii university health clinic in an OPD. Since most of

the respondents said that the long waiting time is caused by the large number of patients flowing in the clinic per hour and also that there is shortage of nurses in the clinic, then remedies have to be put right away to minimize this problem.

3.1.5 Solutions for the long waiting time

The figure below gives the frequencies of the respondents according to the proposed solutions.

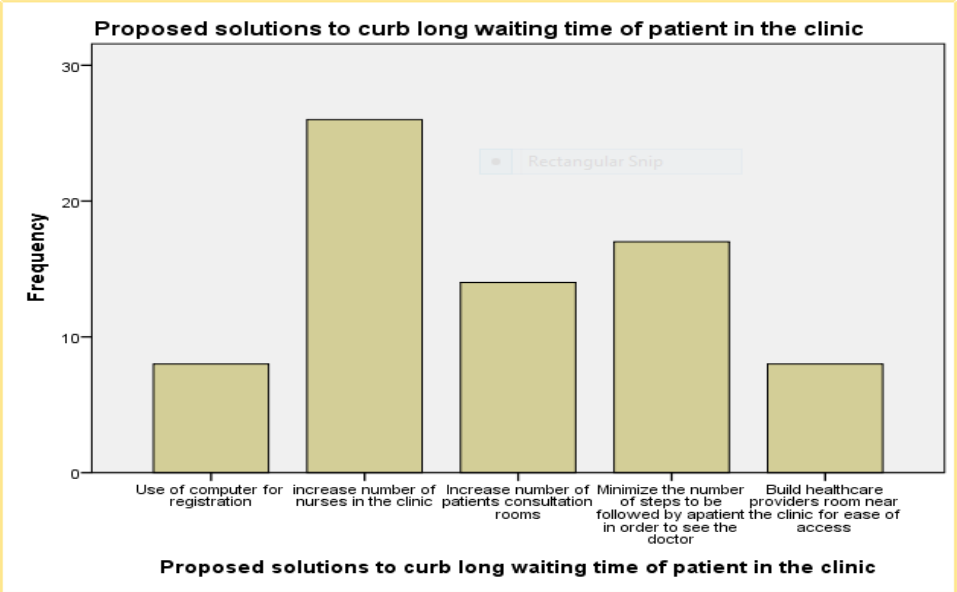

Figure 3.1.6: Proposed solutions to reduce the long waiting time

Figure 3.0.6 above shows the results of the interview conducted on students and staff about the long waiting time in Kibabii University clinic. It is clear the highest number of the respondents proposed increase of number of nurses, 23.3% proposed reduction of the steps followed by a patient before being seen by a nurse. These results are so significant since they clearly indicates that if the number of nurses is increased then the service rate could also increase.

3.2 CONCLUSION

This study has clearly revealed that Kibabii University health clinic is affected by the queuing problem. The study showed that most of patients waited for more than 52 minutes before being served by the service providers. The study showed that the main cause of long waiting time in an outpatient department was the high number of patients in the line. This can caused a lot of discomforts to the patients and to some instances can lead to death of patients. The possible suggestion made to the most trouble shouting problem was, increasing number of physicians and nurses to assist in provision of services. This is seen to be the best method of reducing the long waiting times of patients. In conclusion, the queuing theory with the help of the survey is seen to be the best tools in analyzing the waiting time of patients.

3.3 RECOMMENDATIONS

The following were the recommendations.

i. Since the service providers are the subject to the long waiting time they should be highly dedicated to serve so as to minimize the long waiting time that cause prolonged pain and sudden death.
ii. Since long waiting time has been a threat to health facilities worldwide studies should be done to come up with various methods of minimizing long waiting time not in OPD but also in IPD.
iii. The government should provide support by providing more training of nurses to help in various hospitals.

3.4 COMPETING INTEREST

The authors declare that no competing interest exists.

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