KOFORIDUA TECHNICAL UNIVERSITY
FACULTY OF BUSINESS AND MANAGEMENT STUDIES
DEPARTMENT OF PROCUREMENT AND SUPPLY SCIENCE

THE EFFECTS OF QUEUING AND WAITING TIME IN THE DELIVERY OF HEALTH CARE
(A CASE OF EASTERN REGIONAL HOSPITAL, KOFORIDUA)

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STUDENTS' DECLARATION

We hereby declare that this submission is our own work towards the attainment of the Bachelor of Technology (B.TECH) Procurement and Supply Chain Management and that, to the best of our knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University except where due acknowledgment has been made in the text.

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SUPERVISOR'S CERTIFICATION

I hereby certify that this project work was supervised in accordance with the University guidelines for supervision of project work.

14/12/2022

MR. E, HARRISON NUERTEY DATE

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DEDICATION

This project is dedicated to the Almighty God for his divine guidance and favors, especially for making our academic pursuit a success.

ABSTRACT

We encounter waiting lines while going about our regular business. Individuals (patients) have inconveniences when waiting in a line or queue, and businesses and organizations incur fees. Patients wait for health care services before, during, or after being serviced for a few seconds, an hour, a day, or even months. The study was undertaken to determine the effects of queuing and waiting time in the delivery of health care, using Eastern Regional Hospital, Koforidua as a study area. A descriptive research design guided the study. Purposive and convenient sampling approaches were used to choose the study sample. Ninety five (95) respondents made up the study's sample. Data was gathered via a questionnaire. Descriptive and inferential statistics were used to examine the data, and the findings are shown in figures and tables. It was discovered that patients spend between 90-120 minutes in a queue receiving health care delivery and they suggested that the hospital needs to reduce the steps involved in the queuing systems to improve patient satisfactions. Again, patients and employees agreed queuing systems enhance health care delivery, but most of the patients mentioned that queuing systems promote fairness and transparency in receiving health care services whiles employees stated that queuing systems reduce waiting time on regular basis. The study further found that patients agreed that there are challenges facing the use of queuing systems in the hospital and this challenge is poor design of queuing system which leads to long waiting time. The study recommended management of the hospital to invest more in electronic booking facilities and make more liberal policies for electronic booking appointments to reduce the length of queue in the hospital.

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter introduces the overview of the study. It discusses the background of the study, the research problem and objectives, the research questions, significance and scope of the study, limitation of the study and organization of the study.

1.1 Background of the Study

Customer happiness has grown to be a major priority in the service sector. In the health sector, numerous initiatives have been put in place to raise customer satisfaction. Health care providers around the world are under increasing pressure to save costs while also enhancing access and quality of service (Green, 2019). High wait times, delays, and patient queuing are issues at many healthcare facilities. In any hospital, a long wait time is considered a sign of low quality and should be addressed. Managers wanting to optimize their operations' return on investment have a difficult dilemma when it comes to managing waiting lines (Suleiman, Burodo & Ahmed, 2022).

Customers despise having to wait for long periods of time. Customers may abandon the queue early if the waiting and service times are long, resulting in customer discontent. Customer demand, as well as income and profit, will be reduced as a result of this. Queues develop when individuals or groups seeking services—often referred to as customers—arrive at a location where services are provided but cannot be provided immediately (Sundarapandian, 2019).

Patients are frequently the clients of the outpatient clinics, diagnostic imaging centers, or hospitals that serve as the service providers in healthcare delivery systems. Customers are

typically discrete in queuing models, and the number of customers waiting in the service facility has integer values (Desta & Balete, 2019).

The healthcare facilities that treat the sick and injured come in a wide range of sizes, from specialist outpatient clinics to large city hospitals to regional healthcare systems, according to Burodo, Suleiman, and Shaba (2019). Despite these distinctions, it is nevertheless feasible to imagine the healthcare services provided by these institutions as queuing systems, in which patients enter, wait for service, receive it, and then depart. A patient must go through a series of actions and tasks (both medical and non-medical) in order to receive the treatment they require, regardless of the complexity and scope of the healthcare process. The trained personnel and cutting-edge equipment that these actions and procedures require are the resources (or servers) of these queuing systems.

Effective patient flow management in an outpatient facility is crucial for sustaining operational excellence and guaranteeing clinical quality, according to Burodo, Suleiman and Yusuf (2021). This is especially true for the outpatient department of a sizable medical facility, which manages a sizable patient population with a diverse case mix. Despite the abundance of medical facilities, many people, especially those from the richer strata, still travel abroad for treatment. The Ghanaian healthcare industry must consider why some patients decide to seek treatment abroad. As a result, the purpose of this study is to evaluate the effects of queuing and waiting time in the delivery of health care at Eastern Regional Hospital.

1.2 Statement of Research Problem

Queuing and waiting time have proven to be a significant challenge for organizations, management and employees, particularly in the health sector in Ghana (Ahmed & Ali, 2021). Employees and the health sector institutions both suffer as a result of this predicament. Queuing systems have a favorable effect on the provision of healthcare and the work performance of healthcare workers because they assist in automating the queuing process while boosting service, safety, and customer loyalty that benefits both the customers and the healthcare institutions. Consequently, as health institutions seek to enhance health care delivery and organization performance, it is imperative that focus is placed on improving the quality of the Queuing systems employed. Even though various studies (Siciliani et al., 2019; Obamiro, 2020; Shastrakar & Pokley, 2017; and Koko Burodo & Suleiman, 2018) have underscored the relevance of the Queuing systems in enhancing health care delivery and employee performance on the job, there seems to be a dearth of literature when it comes to the health sector. However, the health sectors play critical role in determining the success of every government and this therefore makes them a key sector for consideration when it comes to making a government system. To enhance the performance of health care delivery and health institutions, Queuing systems such as single-channel, single phase; multi-channel, single phase; multi-channel, multi-phase; and single-channel, multiple phases can be adopted (Adeleye, et al., 2018).

This study therefore seeks to assess the effects of Queuing and waiting time in the delivery of health care in Eastern Regional Hospital, Koforidua

1.3 Research Objectives

The main objective of the study is to assess the effects of Queuing and waiting time in the delivery of health care at Eastern Regional Hospital, Koforidua.

The specific objectives include

1. To identify the Queuing systems used by Eastern Regional Hospital, Koforidua
2. To access how the Queuing systems help in ensuring health care delivery in Eastern Regional Hospital, Koforidua.
3. To outline the challenges associated with the Queuing systems in Eastern Regional Hospital, Koforidua.

1.4 Research Questions

The study will be guided by the following research questions

1. What are the Queuing systems used by Eastern Regional Hospital, Koforidua?
2. How do the Queuing systems help in ensuring health care delivery in Eastern Regional Hospital, Koforidua?
3. What are the challenges associated with the Queuing systems in Eastern Regional Hospital, Koforidua?

1.5 Significance of the study

This study could be considered important because it aims to evaluate the actual Queuing systems used by the health sector institutions to enhance health care delivery, highlight their shortcomings and eventually bring them to light.

The management of Eastern Regional Hospital will gain a great deal from this study because it will give the hospital a basis for determining whether workflows and procedures should be revisited, planning and operation need to be reviewed, and service time should be reduced, which will improve customer satisfaction and overall service delivery efficiency. Most significantly, it will benefit the hospital's patients (the general public) by enhancing service speed, making things more convenient, and saving precious time.

Academics and researchers will utilize the findings as a base for further researches in the future in the health sector and other areas of endeavour.

Finally, research work is a requirement for the Bachelor of Technology (B-Tech) in Procurement and Supply Chain Management Degree.

1.6 Scope of the Study

Conceptually, the research focused on assessing the effects of Queuing and waiting time in the delivery of health care system.

Geographically, the research is restricted to the Eastern Regional Hospital, in the New Juaben South Municipal, Eastern Region of Ghana.

1.7 Limitations of the Study

During the course of this study, the researchers ran into some difficulties, particularly in terms of data collection. The following are the issues:

The researchers will have resorted to two or more public health institutions or get access to more respondents to obtain information but due to financial constraint, the research will be limited to one hospital, particularly Eastern Regional Hospital, Koforidua.

Also, due to time constraint, the researchers will not expand the work to reach the whole institution because they will not able to balance their academics and the research.

Finally, the researchers obtaining information from the employees of Eastern Regional Hospital will be difficult because of the issues regarding confidentiality and bureaucracy.

1.8 Organization of the Study

The study is organized into five chapters. The first chapter covers the background of the study, statement of the problem, objectives of the study, research questions, significance of the study, limitations of the study, scope of the study, as well as the organization of the study. Chapter two presents literature relevant to the study concepts and theories such as Queuing systems and how the Queuing system promotes health care delivery as well as the challenges and difficulties associated with Queuing systems. Chapter three describes the methodology that will be used by the researchers to solicit information for the study. Research design, target population, sample and sampling techniques, source of data, research instruments, data analysis and presentation and profile of the organization will be captured. Chapter four depicts the presentation and discussion of results and analysis of the data collected using Statistical Package for the Social Sciences and tables. Chapter five consists of summary of the major findings, conclusions and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

On the subject of queuing and wait times in Ghana's healthcare system, there have not been many scientific studies. International initiatives have, however, been made to study this area of interest. They will be reviewed in this chapter. Both general material about the queuing system and specific literature about wait times in healthcare are pertinent to the topic of this research project. The chapter includes a discussion on the ideas that serve as the foundation for the research, conceptual analysis and empirical literature.

2.2 Theoretical Framework

Two theories provided direction for this study. These two theories are described.

2.2.1 Strategic Choice Theory (SCT)

The strategic choice theory emphasized interactions between a company's internal and external environments as well as the relationship between managerial decisions and corporate success. The focus of Child's (2019) thesis was on the significance of management choices and how they impact both the quality of healthcare provided and the performance of the healthcare institutions. A strategic choice model was created by Michelson, (2018) to show the connections between businesses, the environment, and human behavior. The strategic approach only concentrated on how a firm's structure contributes to the delivery of high-quality healthcare, failing to give greater weight to contextual aspects like environment, technology, and level of operation.

In order to improve efficiency, particularly in light of scarce resources, the approach focused on achieving a greater quality of healthcare delivery. The management considered a variety of choices, including waiting lines and wait times, while determining how to improve the quality of

healthcare delivery and organizational performance. In order to minimize waiting times and increase profitability, quality, efficiency, optimal production, production targets, and on-time delivery in the provision of healthcare, managers must decide which queuing system to use.

2.2.2 Transaction Cost Analysis theory

According to Hall (2017), Transaction Cost Analysis (TCA) is a theory that ensures costs related to the delivery of healthcare are kept to a minimum. TCA was widely used in many academic fields, especially in the study of economics and organization effectiveness. Williamson, an economist and mathematician, developed his transaction costs economics in the 1970s and incorporated TCA into the general equilibrium model. According to Williamson (2018), companies can use vertical integration to reduce transaction costs and boost levels of confidence.

Achieving this level of integration will probably save healthcare costs, improve the standard of services provided to internal and external clients, and free up money for use in other areas of the organization. The reduction of expenses, which includes the transaction costs incurred across the supply chain, is one of a company's primary objectives. In most cases, a reduction in transaction costs resulted in an increase in profitability. On the other side, queueing systems were expected to dramatically increase the effectiveness of healthcare delivery. The goal of this study was to ascertain whether healthcare facilities' employment of queueing techniques enhances the standard of care.

2.3 Conceptual Literature Reviews

2.3.1 Healthcare system

A nation's economy must grow and improve for its citizens to live in good health. Health care is the category of service delivery that is characterized by a high level of consumer involvement in

the consuming process. Clients and patients are involved at every step of the process. Poor service delivery could cause injury to the patient or even result in their death. It is important to analyze patient/client satisfaction in order to raise the standard of the healthcare system (Nkrumah et. al., 2018). Because they believe that improving patient satisfaction will enhance patient flow, which will improve quality, researchers and practitioners are particularly interested in patient flow in hospitals (Armony et. al., 2020). The patient satisfaction perspective has received significantly greater attention in recent years in hospital care (Khamis & Njau, 2018). Good service quality motivates patients to pursue a close relationship with the particular institution, and patient happiness and service quality are closely associated (Surydana, 2017; Kalwar, 2020).

According to Surydana, (2017) service quality is the difference between what consumers actually receive and what they anticipate receiving. Nowadays, patients consider a variety of factors before choosing a specific healthcare practitioner (Yeddula, 2019). Companies must consider their reputation and customer satisfaction in order to impact their customers' actual loyalty to return and refer them to others (Kalwar et. al., 2018). Among the most significant connections in the healthcare service system, hospitals have a direct impact on people's lives (Dong, et al., 2019). The hospital is the key component of healthcare environments since it has been shown to significantly affect illness prevention, early disease identification, treatment, and patient recovery (Haghighinejad, 2018).

2.3.2 Health System in Ghana

In Ghana, both the public and private sectors offer healthcare. The Ministry of Health (MOH) is particularly responsible for systemic oversight, policy development, goal-achievement

evaluation, and progress monitoring. The Ghana Health Service (GHS) and teaching hospitals are the main institutions in charge of providing services within the public health system. They also control the establishments that fall under the Ministry of Health. Other institutions, such as public entities and quasi-government entities, also provide health services (Adegoke et al., 2018).

The Ghanaian government undertook reforms to the health sector between 1998 and 2002 as a part of the Health Sector Support Project (HSSP), which was funded by the World Bank. Under a second, five-year medium-term health plan for the period of 2002–2006, the healthcare industry underwent continued reforms. In an effort to put the reform packages into action, several health reform initiatives were launched. To increase management effectiveness, the sector used integrated supply systems and decentralized administration (Bossert et al., 2020). The five-tier systems at the national, regional, district, sub-district, and community levels illustrate the decentralized structure of the service delivery system.

The national health care system's policy framework is centered on the main problems the country is now experiencing. The Ghanaian government is dedicated to improving equity and access to fundamental healthcare services and making ensuring that the health sector is a key component of the nation's plan to fight poverty. Constructing CHPS Zones (Community based Health Planning and Services), which will be established across the nation, and setting up Health Points with a Community Health Officer in isolated rural areas are the next strategic goals. These actions will increase geographic accessibility to primary services and emergency services. Priorities include enhancing sociocultural access for priority groups as well as financial access for those who are financially weak (children, women, elderly, people with chronic diseases and the disabled).

There are no medical services available in the great majority of towns. The national and regional health administrations of the Ghana Health Service as a result give the CHPS System strong support. A recent effort has been to establish CHPS zones around the country, and the majority of sub districts have plans to do so in the next years.

2.3.2.1 Problems of Healthcare in Ghana

Access to pharmaceuticals and medical experts was hampered by the lack of doctors; the study revealed that management rather than financial constraints were to blame for these two issues. Despite Ghana's broad, dispersed, and universally accessible public healthcare system, there was a problem with the absence of such resources (Callen et. al., 2019). A study was done empirically to reveal the issues that patients in hospitals that provide public health care encounter. According to the study, 36.4% of hospital visitors were low-income, and 41.8% of those patients reported that staff members were impatient with them. Additionally, 96.4% of patients claimed that doctors favored treating their relatives and known patients, while 72.7% of respondents believed that poor patients do not receive proper care (Ahmad et. al., 2020).

An additional investigation into Ghana's public hospitals revealed that the vast majority of its sick patients were poor and had a range of problems with the facilities and treatment they received. A fair distribution of resources between urban and rural areas is demonstrated by the example of public healthcare services. Rural residents who lack access to primary and tertiary public healthcare facilities are also less likely to enroll their children in immunization programs offered by the government (Afzal & Yusuf, 2017). Patients suffer greatly as a result of substandard health services, particularly children and women.

At addition to the issues listed above, delays are one of the biggest issues that patients in public hospitals experience. In hospitals, there are too many patients waiting to be served, which poses a possible threat to healthcare services and is becoming more prevalent (Obulor 2018). Delays are a concern in the healthcare sector. Customers all have to wait for appointments at hospitals for health issues, and after patients arrive at the institution; they are expected to wait even longer to see the doctor. Hospitals frequently have a large number of people waiting for various services, such as surgeries, diagnostic testing, outpatient appointments, and emergencies (Green, 2018).

Present-day hospitals' biggest challenge is the congestion of patients in waiting areas, emergency rooms, outpatient departments (OPDs), and intensive care units (ICUs). This is a result of the various hospital departments' intended queue systems being inaccurate. At hospitals, waiting in a line is a common occurrence (Kembe et al., 2020). The line forms when there are more patients than there are doctors. The most frequently frequented hospital departments are the outdoor patient departments (OPDs) and emergency departments (EDs), where patients first interact with hospital employees in order to receive care (Wang et. al., 2019). Long lines that hinder patients from seeing doctors are the main issue that they experience. The majority of patients pass away before receiving the service. Vital parts of the healthcare system are OPDs and emergency departments (EDs). Industrialized countries have concentrated substantially on emergency departments (EDs) over the past ten years, paying special attention to the issue of overcrowding and how it affects service times as well as closely observing the hospital's capacity to handle medical emergencies (Haghighinejad, 2018). The needs of the services may interfere with the capacity planning of the particular department because there is no control over the client services (Uriarte et. al., 2017). Delay is the amount of time between when a service is required and when

it can be given (Green, 2018). Long line waits often have a detrimental impact on the happiness of the patients (Obamiro, 2020). This is referred to as the "cost of dissatisfied customers" and affects firms financially (Kembe et al., 2020). Ghana's overall growth is constrained by inadequate health services (Mustafa, 2019).

2.3.3 Concept of Queueing and Waiting Time

The primary premise of the queueing theory is that clients, on the one hand, may utilize any amount of a specific service at any time (arrival rate). Contrarily, the provider offers a service to the customer at a predetermined time and in a predetermined amount (service rate). A line forms when more customers request services than suppliers can fulfill (Desta & Balete, 2019). In the area of operations management, queuing systems are essentially a mathematical technique used to assess waiting lines (Nosek & Wilson 2020). A queue system is any arrangement in which new arrivals impose demands on resources with constrained capacities (Singh, 2017).

Queuing systems are frequently used by numerous organizations, including banks, airlines, telecommunications firms, and police agencies, to help identify the capacity levels required to respond to experienced requests in a timely manner. Long wait times are frequently associated with poor quality and a need for reform in hospitals. For managers looking to increase the return on investment for their organization, managing waiting lines is a significant problem. Customers dislike waiting for a lengthy period as well. If the waiting and service times are lengthy, clients may leave the line early, which results in unsatisfied customers. This will eventually lower income and profit as well as decrease client demand (Biju, Naeema, & Faisal, 2020).

Despite being employed in hospitals and other healthcare facilities, queuing systems are not frequently used in this industry. Due to the healthcare system's quick growth and reconfiguration,

new service lines and the infrastructure needed to supply them, heavy financial pressure on healthcare organizations, and extensive application of improved managerial skills, queuing systems are now widely used in the sector. Healthcare reform has made it even more crucial to increase quality and safety while lowering costs. Queuing systems have gained popularity as an analytical tool as a result of the healthcare system's quick development and realignment, new service lines and facilities to provide the same, significant financial pressure on healthcare organizations, and extensive use of improved managerial skills in healthcare settings (Singh, 2017). The institution's ability to achieve these goals is largely contingent on the rational management of patient flow. While institutions struggle with crowded facilities on the one hand, the industry's financial predicament limits a significant increase in resources.

The institution's ability to balance fixed capacity with unpredictable patient demand is a major concern. A methodology that deals with this issue is the queuing system. All major sectors, including airlines, the internet, and the majority of service-delivery firms, began using queueing systems after they were developed for the telecommunications sector. But until recently, queuing systems were not used in the healthcare sector. When applied properly, the effects can be rather dramatic, including time savings, income growth, and improvements in staff and patient satisfaction.

2.3.3.1 Queue Discipline (Order of Service/ Priority Rule)

The queue discipline controls how waiting clients are attended to. First-come, first-served, or the principle that the first person or item in line will be served, is the most common type of queue discipline (Krajewski, Ritzman & Malhotra, 2018; Russell & Taylor, 2020; Heizer & Render, 2018). Other approaches include last-in, first-out, random selection (where the last person is chosen first), and according to predetermined schedule (where customers are scheduled for

service in accordance with a predetermined appointment or prearranged schedule regardless of when they arrive at the facility) (Russell & Taylor, 2020).

Customers with the earliest promised due dates (EDD), the quickest expected processing times (SPT), or preemptive disciplines, which allow a high priority client to obstruct the service of a lower priority client (for instance, in emergency rooms, patients with the most life-threatening injuries receive treatment first, regardless of their arrival order), may also be included in the priority disciplines (Krajewski, Ritzman and Malhotra 2018).

2.3.4 Queuing System and its Classification

Ineffective queueing systems at public hospitals have come to symbolize inefficiency all throughout the world, and Ghana is no exception. The majority of Ghanaian hospitals struggle with managing long lines, which is one of their issues. Any system in which there is a demand for a finite amount of a resource is considered a queuing system, according to Singh (2017). Since a fundamental concept of a queuing system has been established, (Gomey, 2020) asserted that queuing systems are categorized according to the effectiveness and the measures to evaluate and, ideally, improve the flow of consumers through a queuing system. The hospitals must learn more about the characteristics of a queuing system that affect its performance based on client arrival patterns at the resource and custodial staff service patterns in order to have a deeper knowledge. According to Stewart (2020), there might not be enough room to detain all of the people waiting in line for service. Customers who arrive to find the line full are referred to as being lost. When the line has achieved its maximum capacity, it is considered to be full.

2.3.5 Types of Queuing Models

Examples of queuing models that can be defined with these conventions include:

2.3.5.1 M/M/1

One of the earliest systems examined was the queue M/M/1 (Poisson arrival, exponential service, single server). Simple balances of state equations and recursive arguments are used to determine the limiting distribution of the queue size in statistical equilibrium. A time-dependent solution, however, requires more sophisticated mathematical methods. Adeleye et al. (2018) claimed that the M/M/1 queuing model is the easiest to understand because the arrival and service time have negative exponential distributions (Poisson process). The authors also said that there is only one server in the model. A single server, an exponentially distributed distribution of service times, and a Poisson distribution of arrivals make up the queuing model. It is a single-channel, poisson input system with an exponential waiting time, to put it another way.

3.2.5 M/M/C: FCFS

The M/M/C architecture, according to Adeleye et al., has multiple servers C, a First Come, First Served (FCFS) queuing discipline, unbounded system limitations, and indefinite source limits (2018). Markovian, deterministic, and with a poisson arrival process is the service time distribution. The M/M/C queue model with exponentially distributed vacation times was initially studied by Levy and Yechiali (2017). In this model, each server separately takes a vacation after completing a service and realizing that there are no customers in the line. Asynchronous vacation policies are the name given to this form of vacation policy in the literature.

3.2.6 G/G/n

The most general queuing system where the arrival and service time processes are both arbitrary is the G/G/n model, according to Doshi & Yao (2017). There is no known analytical solution for this single-server queuing system. Anything can be kept in the queue. The system's interarrival

and service times are governed by a general distribution with a known mean and variance, as indicated by the notation G/G/1, which also shows that there is only one server in the system. Customers can change the variances of the uniform distributions. (Stewart,2020)

2.3.6 Types of Queuing System

Adeleye, et al. (2018) claimed that system characteristics tend to be described as stochastic processes due to random variations in input and service processes. According to Adeleye et al. (2018), the health sector uses four main types of queuing systems to deliver quality health care services to patients. These are Single-Channel, Single Phase; Multi-Channel, Single Phase; Single-Channel, Multiple Phases; and Multi-Channel, Multi-Phase.

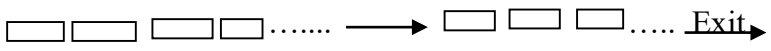
2.3.6.1 Single-Channel, Single Phase

Customers waiting to be served in line at a single service point are considered to be in the most basic form of waiting line (Gorney, 2020). Single phase refers to the entry of a single channel, a single channel, a single service facility, or both, into the service system. It is acceptable at establishments including banks, bakeries, and post offices, among others. The single-channel, single-phase system, according to Krajewski, Ritzman, and Malhotra (2018), requires clients to form a single line, move through the service center one at a time, and receive service from a single server. Customers are called to arrive, enter, form a single channel, single phase in a single line/service flow, and then confront a single service facility in a single-channel, single-phase queuing system, according to Heizer and Render (2018). The author also claimed that hospitals and other service-providing locations frequently use single-channel, single-phase queuing systems.

Lack of customer service management in the health sector can cause customers to become disoriented about which line to stand in and distracted by a busy atmosphere. Single-channel,

single-phase systems can ensure that client waiting times in the hospitals are reduced; preventing frustrated and bored consumers from leaving the hospital with a negative view (Adeleye, et al., 2018). This kind of queueing system simultaneously decrease customer annoyance and enhance the hospital brand reputation. In its most basic version, the system's goal is to lessen the amount of time people spend in line waiting time to receive health care service. Single-channel, single phase also boost hospital employee productivity (Adaora, 2019). When customers in a queue move quickly and efficiently to receive health care services, fewer employees are needed to manage the services. If customers are efficiently led to each counter to receive their medications, more customers can be served.

The staff and management may efficiently control patient flow thanks to the single-channel, single-phase queuing system that was created especially for hospitals, clinics, laboratories, testing centers, healthcare institutions, and pharmacies (Heizer & Render, 2018). The authors further stated that the patient wait time will be greatly decreased as a result, and service delivery will also be improved. This queuing system will automatically manage the lines according to each patient's needs because different patients have varied needs and require different treatments (Adaora, 2019). As a result, they should queue for various counters or departments. With this queuing system, management will be able to quickly adopt their patient handling laws and regulations, and the system will do it automatically in order to control patient flow.



Waiting line Server

Figure 2.1

2.3.6.2 Multi-Channel, Single Phase

Imagine a scenario where there is just one line and many servicing points. In a multi-channel, single phase operation, one queue is used to travel through two or more service facilities. According to Krajewski, Ritzman, and Malhotra (2018), the multiple-channel, single-phase may need customers to set up more than one line and offer the same or different services at several locations, depending on the architecture. Customers are all asked to come, enter, and create a queue in one line/service flow of the multiple-channel, single-phase queuing system before being shown a range of parallel, identical service facilities.

The primary goal of a multi-channel, single phase queuing system is to provide patients with greater quality medical services. This system provides a customer reference for each entering customer, with each reference indicating that client's place in the queue. This eliminates the need to wait in line (Callen et al., 2019). Multi-channel, single phase systems contribute to comfort and fairness by allowing consumers to keep their place in line while they are sitting pleasantly to receive health care services. So that the staff can monitor the operations as effectively as possible, the systems maintain an organized atmosphere for customers to receive their treatments or medications. This expedites health care delivery while reducing time wasted waiting, consumption, and fixer frauds (Adeleye, et al., 2018).

According to Gorney (2020) this queuing system was created specifically to meet the demands of hospitals and other healthcare organizations. The system lets management specify and design protocols for various routes, and it then automatically transports patients in accordance with those rules. The wait time and time it takes to deliver services are greatly decreased. Each patient can be directed automatically to the appropriate counters, departments, facilities, and physicians. If not, patients would have to wait in a single line that typically moves according to first come,

first served, and they will have to wait in a long line before being sent to the section or department they need. This greatly enhances the patient experience and aids the management in creating a calm and cozy environment for the patients and their companions (Bossert et al., 2020).

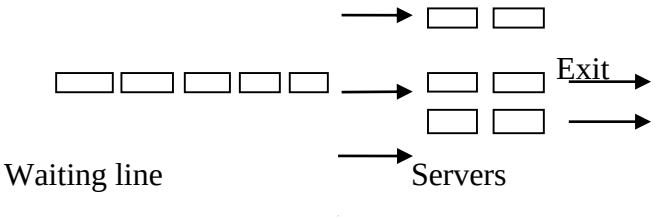


Figure 2.2

2.3.6.3 Single-Channel, Multiple Phases

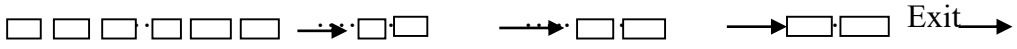
This technology is widely used in supermarkets, medical facilities, and shopping malls. In this case, a single queue must proceed through numerous stages. Single channel, multi-phase denotes the delivery of two or more services in succession. According to Krajewski, Ritzman, and Malhotra (2018), clients are expected to form a single line and move sequentially from one service location to the next during the single-channel multiple phase. Additionally, the authors noted that in this queueing system, customers are invited to arrive, enter, and form a line in a number of service streams before being catered to by a single facility until the service is finished.

By reducing actual and perceived wait times, this approach improves customer happiness. The usage of single-channel, multiple phase systems, according to Adeleye et al. (2018), aids in managing the healthcare sector by generating statistical reports on data including arrival rates and patterns, waiting and service times, and default and reneging situations. Systems with a single channel, multiple phases enable management in the health sector to fully comprehend

customer flow. It can give the healthcare industry valuable information about consumer wealth, behavior patterns, and distribution within the health care delivery system. This information can be used to develop a strategic plan for the placement of staff members by health institution managers throughout the day (Adeleye et al., 2018).

According to Ahmad (2020) this queuing system guarantees a shorter wait time, automatic patient path management, quick service delivery, and excellent patient experience, all of which contribute to delighted customers. A positive reputation results from content clients or patients. The power of word-of-mouth marketing can't be overstated, particularly in the healthcare sector where patients frequently consult with friends, family, and coworkers before choosing a facility for their care (Ahmad, 2020).

One of the numerous advantages of this queuing system for clinics, hospitals, testing facilities, immunization centers, labs, and pharmacies is automation, which considerably decreases staff workload and assures fulfilled and happy workers. The quality of services provided and patient satisfaction are both positively impacted by these two variables. A more positive patient experience is a promise of consistent, long-term business success. Great profitability is the outcome of the cost reduction and effective management (Krajewski, Ritzman, & Malhotra, 2018).



Waiting line Servers

Figure 2.3

2.3.6.4 Multi-Channel, Multi-Phase

This system can be represented by two or more parallel production lines. This system contains several channels, multiple phases, and numerous servicing facilities at each stage. The multiple-channel, multiple-phase system, according to Krajewski, Ritzman, and Malhotra (2018), requires that consumers first receive service from one of the first-phase facilities before seeking assistance from a second-phase facility, and so on. Customers are welcomed to enter the service system in this queue system, which is run by numerous concurrent, similar service facilities that lead to the next service facility until the service is complete (Adeleye, et al., 2018).

The checkout and cashier lines have often been sped up in hospitals, banks, and retail stores in an effort to lessen customer aggravation (Ahmad, 2020). While the majority of grocery stores appear to have continued to use the multiple-channel, multiple-phase model, many banks, hospitals, credit unions, and fast food chains have switched in recent years to a queuing system where customers wait for the next cashier to become available (Krajewski, Ritzman & Malhotra, 2018). Being in a long queue is no longer frustrating because the throughput of the other costumer is not impacted by that one slow transaction (Ahmad, 2020). As a result, the multi-channel, multi-phase system is able to reduce customer complaints in the health sector and also achieve hospital staff satisfaction.

This system enables medical facilities to provide their patients the option to join the queue before they even arrive at the hospital (Green, 2018). There are several ways to accomplish this feature. Patients can register for the waitlist remotely via a smartphone app, an email, a phone call, or an SMS. The most popular methods are phone calls and smartphone apps. There is a significant reduction in both patient and service delivery times (Dong et al., 2019). It makes the patient experience even better and gives the patient journey management more freedom. Additionally,

the queuing system's smartphone app can offer real-time updates and other features that benefit both the patient and the staff (Kalwar, 2020).

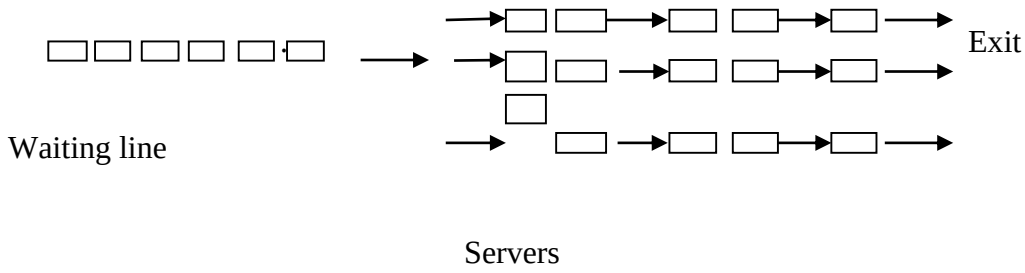


Figure 2.4

2.3.7 Application of Queuing Systems for the Improvement of Healthcare Operations

Hospitals are thought of as complex systems with significant societal advantages and financial limitations. Process inefficiencies brought on by delays and congestion in the patient care systems are the cause of these rising expenses. Green (2018) argued that it is challenging to forecast the degree of congestion and the required capacity without the usage of queuing systems. It is appropriate to view the facility through the lens of a queueing system in order to assess and improve patient flow (Armony et al., 2020). A small amount of data must be entered into queueing systems in order to calculate outcomes in terms of performance metrics; this is a simpler method of determining the best solutions than attempting to estimate the system's performance in the given context (Green, 2018). A waiting line's major elements are the people receiving the services, the admission process, queue formation, queue discipline, and service methods. Waiting times for clients or patients must be anticipated at different service levels in service sectors like hospitals (Fitzsimmons, Fitzsimmons & Bordoli, 2018).

When people are forced to wait in hospitals, there is a correlation between the length of the line and the expense of the wait (Kembe et. al., 2020; Khaskheli, 2020). The use of queuing systems

facilitates and simplifies the resolution of these issues, wherein waiting times and service times are computed, together with the ideal level of service and the patient's waiting time (Varma, 2017). The goal of queue system is to offer quick health care delivery and to quantify the phenomenon of standing in lines by employing benchmark performance indicators like average system utilization and average queue length and waiting times (Adaora, 2019). Systematic queue studies are conducted using queuing systems (Bastani, 2019; Kandemir & Cavas, 2017). Queuing systems are also known as the overcrowding system since they deal with crowded conditions (Adaora, 2019). The author further stated that it is frequently used in service organizations to study and model the processes of waiting lines. Driving aggressively has become more common (Kalwar et. al., 2018: Khaskheli, 2020).

Recently, there has been an issue with healthcare services (Ikwunne & Onyesolu, 2020). By lowering wait times, boosting service, and offering quick health care delivery services, it is crucial to raise customer satisfaction (Fomundam & Herrmann, 2017). The usage of queueing systems in healthcare organizations is designed to lower both the organization's direct and indirect expenditures. In order to lower the cost of providing healthcare services, a queuing system tries to decrease system inefficiencies and delays (Singh, 2017). Queuing models, mathematical models, and performance measurements are employed to enhance the flow of clients through a queuing system (Gorney, 2020). Green (2018) asserted that the adoption and application of queuing systems in the healthcare industry ensures that patient satisfaction is improved through improved health care delivery. In order to lower the cost of providing healthcare services, Singh (2017) said that queuing systems eliminate system inefficiencies, encourage fairness, improve patient experience, and provide quick waiting times.

Kembe, et al. (2020) asserted that a queuing system's primary objective is to reduce system costs as a whole. Two main costs are mentioned: the wait cost (related to patients or customers having to wait for service), which includes lost revenue because some patients might not want to wait for service and might choose to patronize competing organizations, the cost associated with a delay in care or the value of the patient's time (opportunity cost of the time spent in queuing), and a decline in patient satisfaction and quality of care. However, service costs are a part of the price of giving services. These comprise salaries as well as payments paid to servers or staff (Singh, 2017).

Costs associated with waiting areas, facilities, tools, and supplies. By minimizing both the overall cost and the waiting cost, decision-makers can calculate the ideal number of servers by using the estimation of waiting cost. The price of waiting for each person varies according to how much they make every hour. The costs of waiting for some individuals may exceed their value. Although providing a high quality of service will cost more, the cost of customer dissatisfaction will be cheaper (Kembe, et al., 2020). Queuing systems reduce customer frustration through good customer service, which simultaneously decrease customer annoyance and enhance the hospital brand reputation (Adeleye, et al., 2018). The author further added that queuing systems ensure operational transparency through the institution purposefully exposing its processes to customers to help them understand the work being done on their behalf.

2.3.9 The Challenges Associated With the Queuing Systems

Health institutions can benefit greatly from queuing systems, but there are several obstacles that prevent them from working as intended. For example, (Fawcett et al., 2018) evaluated literature on internal and external obstacles to queuing systems and came to the conclusion that the opposing forces are caused by both the nature of the organization and the individuals who make

up the organization. The authors examined these obstacles under the classifications of "inter-firm competition and managerial complexity (Christopher, 2017). Internal and external turf wars, inadequate queuing system design, a lack of queuing system vision, a lack of channel trust, a lack of executive commitment, and inadequate queuing system comprehension are just a few examples of how intra-firm rivalry presents itself. Inadequate measuring systems, mismatched information systems and technology, and opposing organizational structures and cultures are a few examples of managerial complexity.

According to Cooper et al. (2020), ineffective organizational structures and technological difficulties are obstacles to effective queuing systems. Culture, technology, finance, and organizations were mentioned by Bakker et al., (2020) as queuing system hurdles. The author also examined the numerous independent and weakly coupled information systems that exist in the analyzed firms. The end-to-end patient information exchange provided by these systems is weak and insufficient, which greatly lowers the efficiency of queuing systems. According to Akkermans et al. (2019), factors that affect queuing systems include a company's weak organizational structure and culture, functional silos, short-term thinking, a history of local optimization, a lack of top management awareness, partners' short-term focus, a lack of infrastructure, a lack of a shared goal and vision, and fear of being penalized for disclosing open information. Inconsistent objectives and subpar assessment techniques are two more elements that operate as roadblocks to effective queuing systems. Fragmentation and misalignment pose a challenge to the queuing mechanism (Bakker, 2019). Managers make self-interested decisions that are consistently at odds with those of other employees as a result of conflicting aims. As a result, collaboration is hindered. In addition, measurement hurdles make it difficult to design and operate a queuing system on a regular basis. Finding the best designer partners would be

problematic if a health institution failed to appropriately cost a process. It will also be challenging to quantify and, hence, communicate cost reductions. Additionally, managers are unable to effectively determine priorities for ongoing improvement projects without accurate costing (Ellinger, 2020). Unaligned performance metrics are another obstacle that is considered significant for queuing systems.

It is inefficient and the outcome of misaligned measurements when managers alter their conduct to maximize performance in the area being monitored. As a result, conflicting conclusions are based on non-aligned activities. Again, several queueing system team members would pull in different directions. Even when a health institution invests a significant amount of resources in meeting the needs of the customer, poorly linked measures might nevertheless result in unhappiness on the part of the client. According to Gorney, (2020) queuing systems in the health sector fail to achieve it intended purpose as a result the following reasons: Poor design of queuing system which leads to long waiting; and when there is no employee to guide customers, they may get confused;

Queuing system may be hampered by the lack of a systematic method for evaluating client requirements. A health institution cannot customize its value-added operations to meet the needs and requirements of customers if it lacks precise consumer information. It is very ineffective to try to predict what the demands of the consumer are. Understanding what customers actually value is essential to making better design choices for queuing systems. The final measuring challenge is the challenge of evaluating the contribution of each queueing system participant. Queuing systems are designed to enable communication between organizations and the best possible suppliers, customers, and service providers. It indicates that healthcare businesses must be able to keep an eye on potential team members' skills and value-added contributions. As

queuing systems advance, this issue is anticipated to become more important in their development and management (Cooper, 2020).

The insufficient information systems seem to be a major impediment to larger queuing systems. Since collaboration is essentially highly dependent on information, inadequate support for information systems demonstrates to be a key impediment. Without shared knowledge, coordinating value-added activities across organizational and functional boundaries is thought to be nearly impossible. The integration of information and technology into the queueing system would benefit the delivery of healthcare (Dubihlela & Omoruyi, 2018). The poor information systems present a dual conundrum. Health institutions must first manage complex queuing systems, which demand the gathering and analysis of vast amounts of data.

2.4 Empirical Literature Review

This section discusses previous academic empirical research that looked at the usage of a queuing system in hospitals both inside and outside of poor countries. The majority of the case studies are comparable in a variety of areas; therefore this is done to enable comparisons. However, a synopsis of the few chosen works is provided below.

To maximize the effectiveness of the current queue systems at the outpatient departments, Khaskheli et al. (2020) employed the appropriate number of physicians and receptionists (OPDs). The study was conducted in the public hospital in Sindh, Pakistan, with the busiest medical OPD. Following that, the same public hospital (case hospital 2) was chosen. Over the course of two weeks, data were gathered for the study. Arrival rate, patient service rate, server count, server pay, and patient waiting time expenses were among the variables used to collect the data. The input analyzer of Rockwell Arena 14.5 was used to confirm that the patient arrival and

service distribution matched the assumptions of the multi-server queuing model (M/M/c). Performance measurements for the queuing system were computed using the TORA optimization tool. MS Excel was utilized for cost calculations and graph plotting. In order to reduce patient congestion and wait times, each OPD should have one more doctor and one more receptionist. The study focused on a public hospital in Sindh, Pakistan, rather than a public hospital in Ghana.

Segun (2020) used queueing theory to do research at Nigeria's Adekunle Ajasin University in Akungba-Akoko on the performance modeling of healthcare service delivery. In order to create and test a functional queuing system, this study set out to determine the patient waiting, arrival, and service times at the AAUA Health setting. At the Akungba Akoko AAUA Health Center, the investigation was carried out. To create the right model, it combined simulation and analytical techniques. Each patient's journey from the reception area, where they arrived, to the final destination, when they picked up their hospital cards or registered, was timed using a stopwatch (the consulting room section). On weekdays, data about each patient's arrival time, wait time, and service time were collected for three weeks (Mondays through Fridays). Excel was used to generate and analyze the data. A model of the patient's current queue system was built using PYTHON software based on the investigated data. The result of the simulation model revealed a discrepancy between the mean patient arrival rate and the mean patient service rate on Friday of Week 1 (5.33>5.625 (>). This implies that a waiting line would form and lengthen over time, and that the service site would be consistently busy. Wait times increase when the system is extremely active, according to research done on the entire system at the AAUA health center. The AAUA Health-Centre is urged by the report to raise the standard of care provided to

patients. Instead of focusing on the Ghanaian healthcare system, the study is focused on Nigeria's AAUA Health- Centre Akungba Akoko.

In a study by Nor and Binti, (2018) the patient flow in the outpatient department was simulated and modelled using queueing theory. The goals of this study are to establish an acceptable queuing system using simulation technique and to ascertain the waiting arrival time and service time of patients at the outpatient counter. In Southern Malaysia, at the Public Health Clinic, this experiment was conducted. To create an appropriate model, describing analytical and simulating techniques were used. The waiting time for this enquiry was calculated using the patient arrival and service rates at the outpatient counter. Excel was used to generate and analyze the data. Based on the reviewed data, ARENA was used to model and duplicate the patient's current queue system. The time it took for patients to see a pharmacist at the outpatient clinic after enrolling was calculated using descriptive analysis and observations. According to the outcomes of the ARENA simulation, patients must wait an average of 54.295 minutes before receiving treatment, with the longest wait being 144.48 minutes. While the average treatment duration for a single patient is 13.48 minutes, the highest treatment time for many patients is 23.724 minutes. Patients spend an average of 68.315 minutes in the outpatient department and a maximum of 156.718 minutes there as a result. 327 patients check in at the outpatient counter each day on average. Based on the average total number of patients served, the outpatient department's server utilization is 78.84 percent. The study focuses on the Public Health Clinic in southern Malaysia rather than the public health system in Ghana.

Shastrakar and Pokley (2017) looked into several aspects of queuing theory in relation to the length of patient wait times in a public hospital in Nigeria. The average patient count, average patient count in the queue, average patient count in the system, and average patient duration in

the system and queue were some of these characteristics. Others included the arrival rate, service rate, utilization factor, and average patient count. The lack of vacant workstations and the high usage rate led them to the conclusion that the service facility needed to be improved. The analysis gave more weight to Ghana's public health sector than Nigeria's.

Rotich (2016) looked at how the queuing theory affected the emergency room at Moi Teaching and Referral Hospital (MTRH). The purpose of this study was to establish the most affordable waiting and service expenses for a hospital's emergency ICU service. The study used secondary data on the arrival and service rates of emergency patients at MTRH as well as the estimated service costs of the six available beds to examine ICU services using the Use of M/M/s queuing model. An original Modified Normal Loss function was devised to evaluate waiting costs. To create a usable model, modeling and simulation techniques were used. According to the findings, MTRH's six active ICU beds now cost Ksh 60 per service and Ksh 415.53 per hour for patient waiting time. Individual tolerance was 0.083 hours on average, and 0.083 hours on average for reaction time. There are 34 people waiting each day on average, which is 1.4 hours. By increasing the number of ICU beds to 18, it is possible to lower the number of patients queuing by six per day, the cost of queuing by 76%, and overall expenditures by 65%. As a result, patients will experience less financial hardship and have a higher likelihood of surviving emergencies. To give a more thorough and accurate picture of the facility, the administration of the hospital needs to be improved and related services added. The study's target was the emergency medical services section of the Moi Teaching and Referral Hospital, and it had a distinct objective from the current one (MTRH).

Despite the fact that the subject has been the subject of several studies both domestically and internationally, there are gaps in the existing literature. The aforementioned empirical analyses

make it abundantly evident that numerous scholars have looked into the use of queuing theory in healthcare services in Nigeria and other nations across the world. However, the researchers were unable to locate any research papers that specifically used Eastern Regional Hospital in Ghana as a case study to examine the effects of queuing systems and waiting times in the health sector of Ghana.

Due to the fact that the aforementioned empirical investigations used a diversity of analytical methodologies, there is also a methodological gap. For example, Segun (2020); Nor and Binti (2018) used simulation and analytical techniques to create a practical model. On the other hand, modeling and simulation techniques were used by Rotich (2016). Similar to this, input analyzers from Rockwell Arena 14.5 were used by Khaskheli et al. (2020) to create their multi-server queuing model (M/M/c). This study employed primary data collected using questionnaire methods as its analysis tools to close the current gap. Studies of a similar nature were carried out in the southwest of Nigeria (Segun, 2020). As a result, no comparable research has been conducted in Ghana.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter contains the research design, population of the study, sample size and sampling technique, sources of data, data collection instrument and procedures, data analysis as well as the profile of the organization.

3.1 Research Design

A descriptive research design was used for the purposes of this study. This is so that the features of the population can be adequately portrayed. Descriptive research design is characterized by the reporting of events in a properly organized method.

A quantitative approach to research was used in this study. This is so because the quantitative approach uses statistics to analyze data. The study employed a self-administered, structured questionnaire. Employees involve in the hospital's queuing procedures and systems were given self-administered questionnaires to complete in order to collect data for the study.

3.2 Population of the Study

The target population for this study comprises the staffs of Eastern Regional Hospital, Koforidua. The hospital has staff strength of (1,004). The subdivision populations are grouped into two parts namely clinical and non- clinical Department. The clinical departments have the following department: Obstertric and Gyneacology (102); Internal Medicine (105); Pediatrics (50); Surgical (40); Nursing Administration (205); Pharmacy (45); Dental (16); Radiology (30); E.N.T. (10); Eye (14); Laboratory (45); Physiotherapy (19); Public health (108); Herbal (6); and Psychiatry (87); and Nutrition (27).

The Non - Clinical Department has the following departments: Administration (35); Finance (25) Information Technology (15); Occupational Health and Safety (12); Internal Audit (10); Quality Assurance (8); Medical Records (7); Social Welfare (10); and Birth and Death Registry (14)

3.3 Sample and Sampling Techniques

Purposive sampling technique was used to select employees to be included in sample. Purposive sampling technique was used to sample the employees because it focuses on particular characteristics of a population that are of interest and provide expert opinion on the subject under study (Queuing systems). The study also made used of purposive sampling technique since it allows researchers to describe the major impact their findings have on the population.

A sample size of (362) was chosen for the study. The researchers focused on the staffs within the following departments of the hospital: Obstetrics and Gynecology (102); Surgical (40); Pharmacy (45); Dental (16); Radiology (30); E.N.T. (10); Eye (14); Laboratory (45); Administration (35); and Finance (25)

Convenience sampling technique was used sample one hundred (100) employees form a sample size of (362). Convenience sampling techniques was used to sample the employees because it selected employees who happen to be most accessible to the researchers. Obstetrics and Gynecology (8); Surgical (9); Pharmacy (8); Dental (6); Radiology (10); E.N.T. (8); Eye (8); Laboratory (15); Administration (20); and Finance (8).

Whiles ten (10) patients were selected using a clustered sample technique. Patients were chosen using the clustered sampling technique because, in a clustered sample, subgroups of the population rather than individuals serve as the sampling unit. Clusters were formed by subgrouping the patients, and participants in the study were chosen at random from each cluster.

The researchers selected these departments and patients to answer the study questions because of the in-depth knowledge and experience they have on queuing and waiting

3.4 Sources of Data

Both primary and secondary data were utilized in this study. The primary source of data for this study is a questionnaire that was distributed to employees and patients at the Eastern Regional Hospital in Koforidua. Primary source of data was used because it enabled researchers to gather specific facts and concepts from people who are working in the area of study.

Data from secondary sources, such as books, articles, journals and internet were obtained for this study. The researchers selected the secondary source of data since it educated them about other viewpoints on the subject.

3.5 Data Collection Instrument

Structured questionnaire served as the main means of gathering data. The questionnaire was designed to address the study's objectives and included both open-ended and closed-ended questions. The questionnaire was split into two sections as a result. The respondents' biodata were collected in section (A), whereas sections (B), (C), and (D) addressed the study's objectives.

3.6 Data Collection Procedures

An introductory letter was obtained from the Koforidua Technical University's Department of Procurement and Supply Science and submitted to the case study area prior to the study (Eastern Regional Hospital, Koforidua). Following the Human Resource Manager’s acceptance of the request, the required methods for data collection were used to get the needed information. The

questionnaires were given to the sampled respondents for completion, and the researchers collected them right away. To prevent responses from being repeated, this was done.

3.7 Data Analysis

Descriptive statistics including frequency counts, percentages, and descriptions were used to describe the variables. To make identification simpler, the completed questionnaire was gathered, categorized, and structured. The data was analyzed using the Statistical Package for Social Science (SPSS) version 25.0, and the graphics were created using Microsoft Excel.

The frequency of the variables was calculated from the responses, and the results were then translated to percentages. Data was presented statistically using tables and graphs. Descriptive statistics were used to examine the biodata questions in Section (A). Section (B, C and D) including questions aimed at addressing the study's objective was examined using descriptive statistics.

3.8 Profile of Eastern Regional Hospital

Eastern Regional Hospital, Koforidua (ERHK) was founded in 1926 and serves as a secondary level referral facility for the entire eastern regional as well as serving as the municipal hospital for the New Juaben Municipality, which has approximately 180 000 residents. Since it was founded, it has undergone two significant structural additions. The first occurred in 1972 with the addition of an administration block, dental unit, laboratory departments, adult outpatient department with medical records, internal medicine, kids, surgical, and maternity wards, as well as a theater. The catering, main theater, x-ray, laundry, and mortuary departments were added in 1988. There haven't been any big updates or brand-new building since then. With 356 beds—up from 314 in 2004—the hospital currently acts as a referral hub for about sixteen (16) district hospitals in the Eastern Region.

One of the services offered by the hospital is primary healthcare. Other services include obstetrics and gynecology, internal medicine, including anti-retroviral therapy, pediatrics, surgery, dentistry, ophthalmology, physiotherapy, ear, nose, and throat, laundry, and mortuary. The Ghana Health Service (GHS) manages the non-profit Regional Hospital, Koforidua (RHK) as a medical center. Patients and tourists alike are valued clientele who we strive to please. At the Ministry of Health's 2013 Health Awards ceremony, which was held on November 5 at the State House, the hospital was consequently crowned Ghana's Best Regional Hospital.

3.8.1 Mission of Eastern Regional Hospital

To deliver efficient, high-quality secondary level in-patient and outpatient healthcare in a patient-friendly setting by a motivated, happy, and competent workforce in a hospital infrastructure that has been carefully maintained.

3.8.2 Vision of Eastern Regional Hospital

To become Ghana's premier medical center of excellence for the provision of high-quality healthcare.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.0 Introductions

This chapter presents the analyzed data together with their interpretation as well as the discussion of findings

4.1 Response Rate

One hundred (100) questionnaires were administered to employees and eighty-five (85) were retrieved. This gives 85% response rate ie (85÷100) ×100.

Also, ten (10) questionnaires were administered to patients and all ten (10) were retrieved. This gives 100% responses rate i.e. (10÷100) ×100.

The analysis is based on the responses from the eight-five retrieved questionnaires filled by employees and 10 customers (patients) of Eastern Regional Hospital.

4.2 Biodata of Respondents

The first section of the questionnaire conveys the biodata of the respondents of the study. To check the dependability and trustworthiness of the responses from the questionnaire, the biodata section was categorized according to gender, age, educational level, the department they work under and the years of working experience.

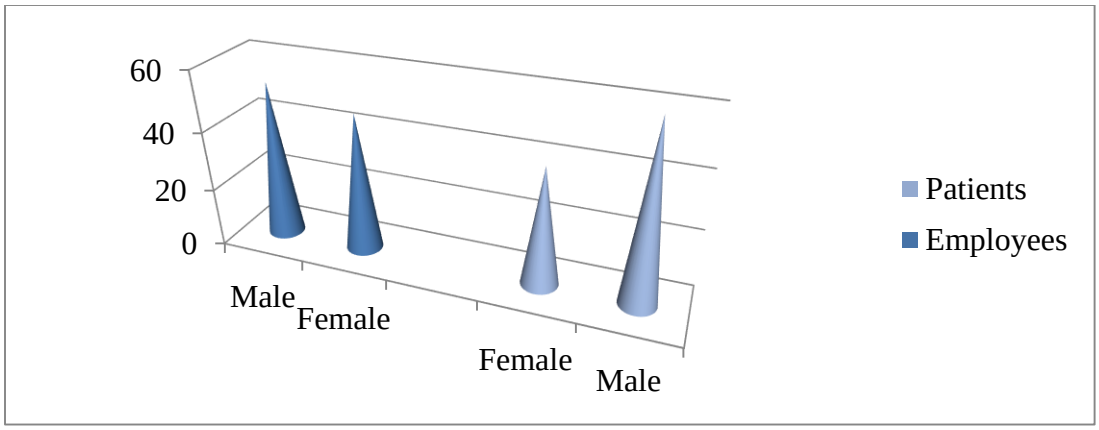


Figure 4.1: Gender of Respondents

Source: Field Survey, 2022

Figure 4.1 shows that female constitutes 40(47%) of the respondents while male constitutes 45(53%). The implications are that there is gender diversity in the Hospital in a sense that men and women are hired at a comparable rate.

Also concerning the gender of patients, the findings shows that female constitutes 4(40%) of the respondents while male constitutes 6(60%). The implications are that both men and women equally receive health care services in the hospital.

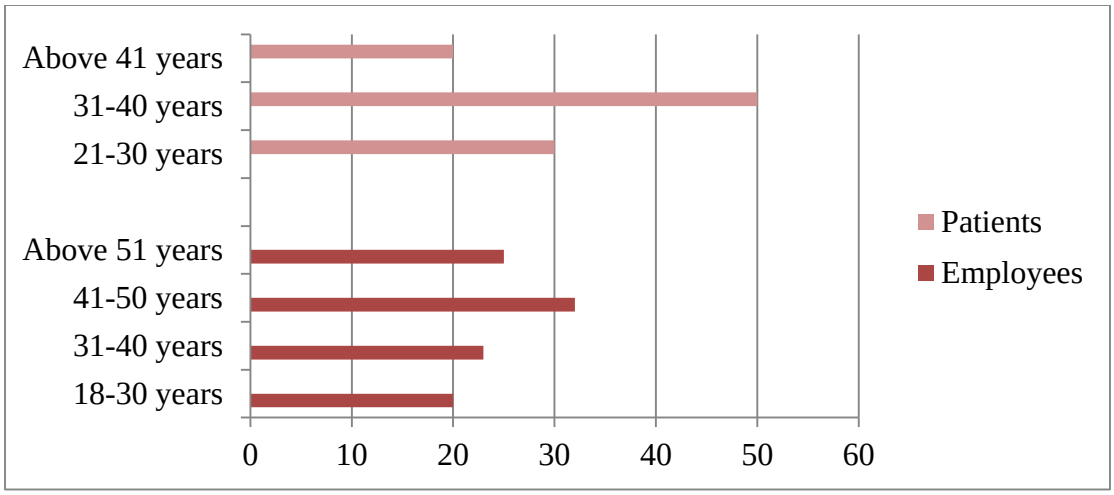


Figure 4.2: Age of Respondents

Source: Field Survey, 2022

From Figure 4.2, 17(20%) of the respondents were between 21-30 years whiles 20(23%) were between 31-40 years. It was also discovered that 41-50 years constitute 27(32%) whereas above 51 years constitute 21(25%) of the respondents. This means that the age range between 41-50 years have the larger population as compare to other years.

In a similar vein, 3(30%) of the respondents were between 21-30 years, majority of the respondents constituting 5(50%) were between 31-40 years whereas minority representing 2(20%) of the respondents were more than 41 years. This implies that most of the patients were between 31-40 years.

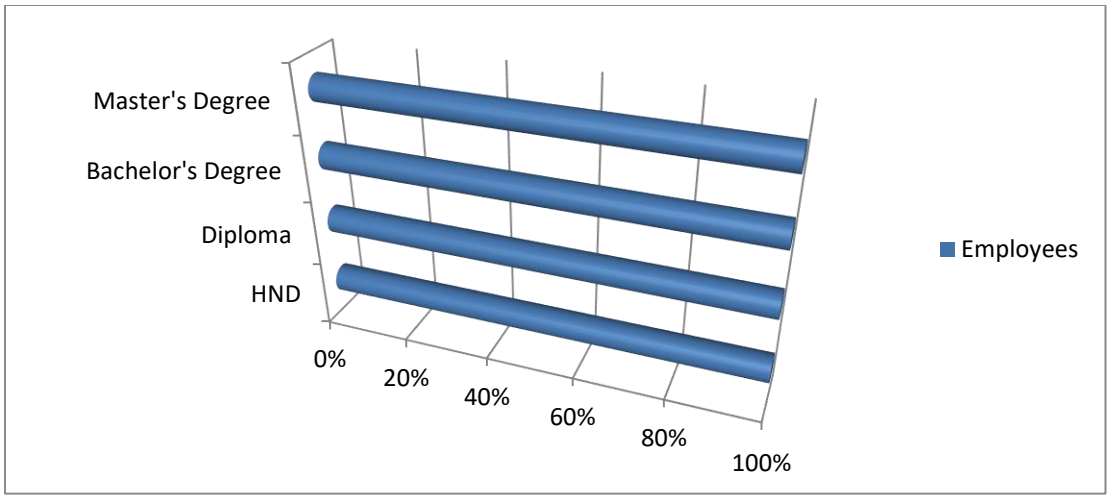


Figure 4.3: Educational Level of Respondents

Source: Field Survey, 2022

Figure 4.3 presents that 10(12%) of the respondents were HND holders, Diploma holders constitute 20(24%), while Bachelor's Degree holders constitute 30(35%) whereas Master's Degree holders constitute 25(29%). This indicates that Bachelor's Degree holders are more than other qualifications because the nature of the job demands for such qualifications.

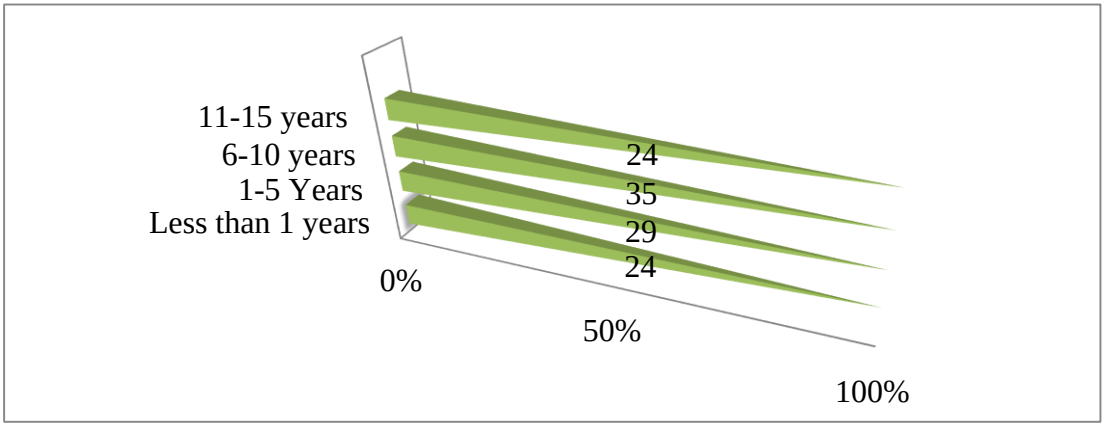


Figure 4.4: Work Experience of Respondents

Source: Field Survey, 2022

From Figure 4.4, 20(24%) of the respondents have worked for less than 1 year, 25(29%) have worked between 1-5 years, 30(35%) have worked between 6-10 years whiles 10(12%) have worked above 11-15 years. This means that most of the respondents have worked between 6-10 years. This suggests that individuals who have worked for the hospital for a longer period of time have a better understanding of how to boost productivity and stay competitive.

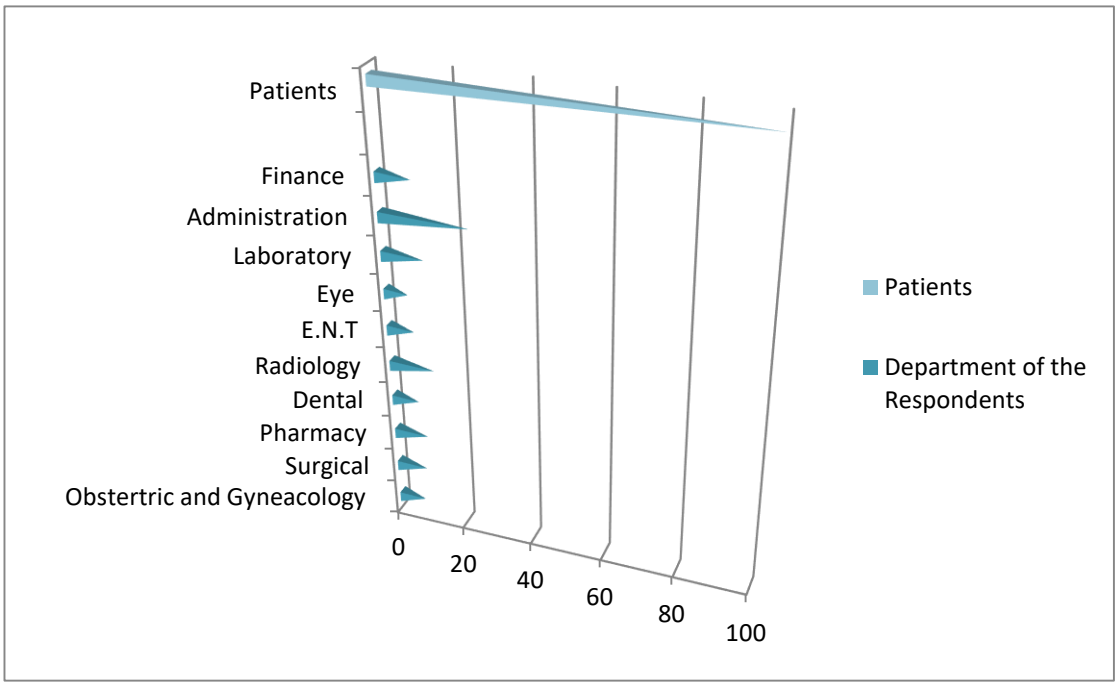


Figure 4.5: Categories of the Respondents

Source: Field Survey, 2022

Figure 4.5 shows that 6(7%) of the respondents worked at Obstertric and Gyneacology Department, 7(8%) worked at the surgical Department whiles Pharmacy Department constitutes 8(9%). It was also discovered that the Dental Department constitute 6(7%), Radiology Department constitute 10(12%) of the respondents whiles E.N.T Department constitute 6(7%). Again, 5(6%) of the respondents worked at the Eye Department, 9(11%) of the respondents

worked at Laboratory whiles Administration constitutes 20(24%) whiles Finance Departments constitutes 8(9%). The implications are that most of the respondents were from the administration department of which procurement and stores form part.

Similarly, all the respondents constituting 10(100%) of the respondents were patients. The implications are that all ten (10) patients provided their view on the subject of the study.

4.3: The Queuing Systems Used By Eastern Regional Hospital, Koforidua

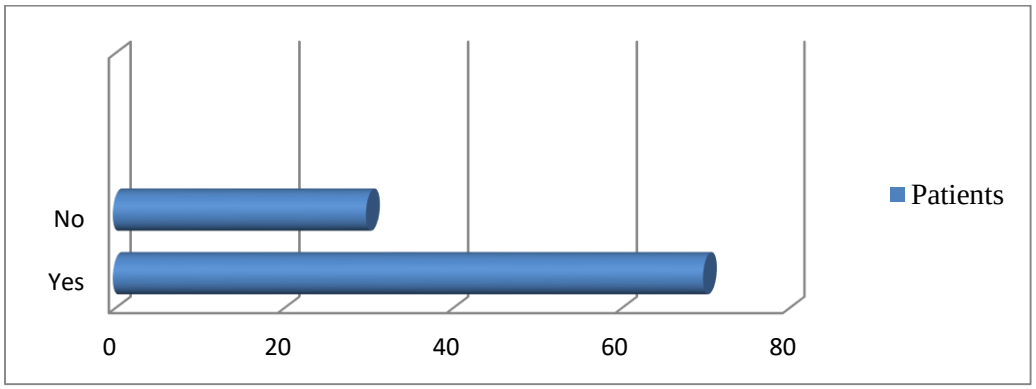


Figure 4.6: Patient Visit to the Hospital

Source: Field Survey, 2022

Figure 4.6 found that the 7(70%) of the respondents agreed that they often visit the hospital for health care services whiles 3(30%) of the respondents said they do not visit the hospital often. The implications are that most of the respondents visit the hospital often; this means that their contributions to the study can be relied upon.

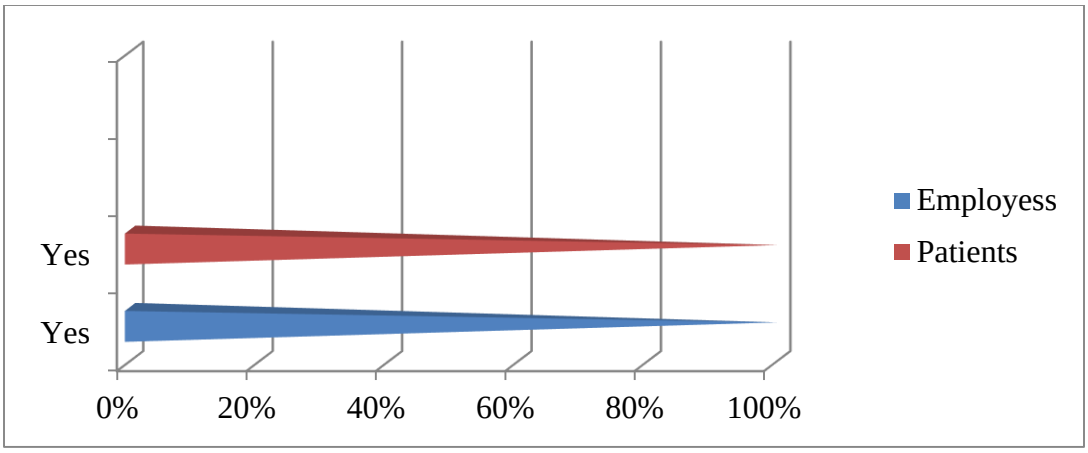


Figure 4.7: Queuing System

Source: Field Survey, 2022

Figure 4.7 depicts that all the respondents representing 85(100%) agreed that there is a queuing system at their department. The implications are that the employees agreed that their department has a queuing systems adopted.

Also, all the respondents constituting 10(100%) agreed that they have seen queuing systems implemented at the hospital. This means the patients agreed that there is a queuing system at the hospital.

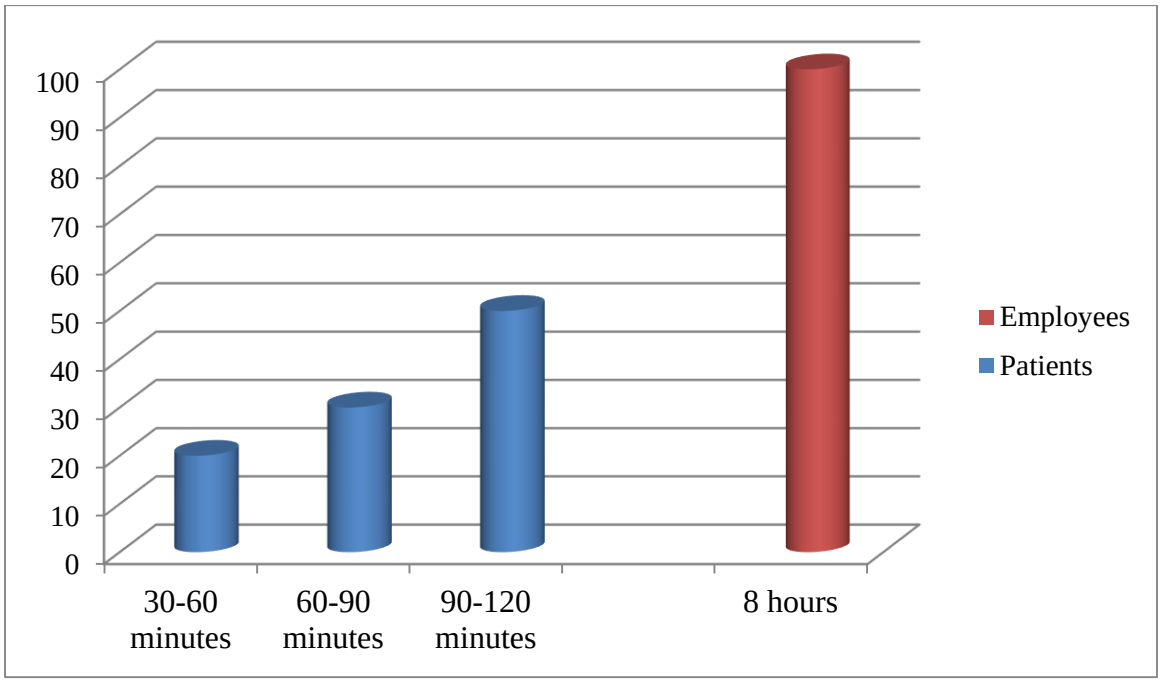


Figure 4.8: Length of Receiving and Providing Service

Source: Field Survey, 2022

Concerning how long patients spend in the queue, Figure 4.8, 2(20%) of the respondents agreed to 30-60 minutes whiles 3(30%) of the respondents agreed to 60-90 minutes. Again majority representing 5(50%) of the respondents agreed that patients spend between 90-120 minutes in a queue to receive health care delivery. This implies that most of the patients spend between 90-120 minutes in a queue when receiving health care delivery.

Also pertaining to how long employees attend to patients in a day, all the respondents constituting 85(100%) agreed to 8 hours. This implies that employees spend 8 hours per a day to attend to patients receiving health care delivery.

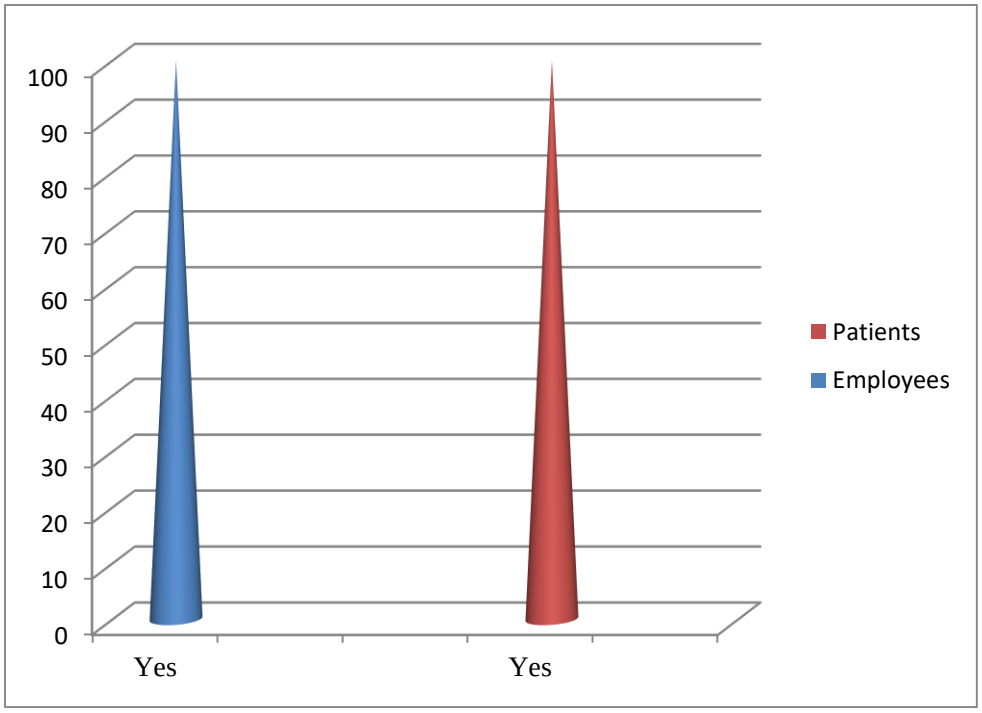


Figure 4.9: First Come First Serve Priority Rule is Fairly Implemented

Source: Field Survey, 2022

Figure 4.9 found that all the employees constituting 85(100%) of the employees agreed that first come first serve priority rule is fairly and strictly implemented. This implies that most of the employees agreed that the first come first serve rule is fairly implemented.

Similarly, all the patients constituting 10(100%) agreed that the first come first serve priority rule is fairly and strictly implemented. This implies that most of the patients agreed that the first come first serve rule is fairly implemented.

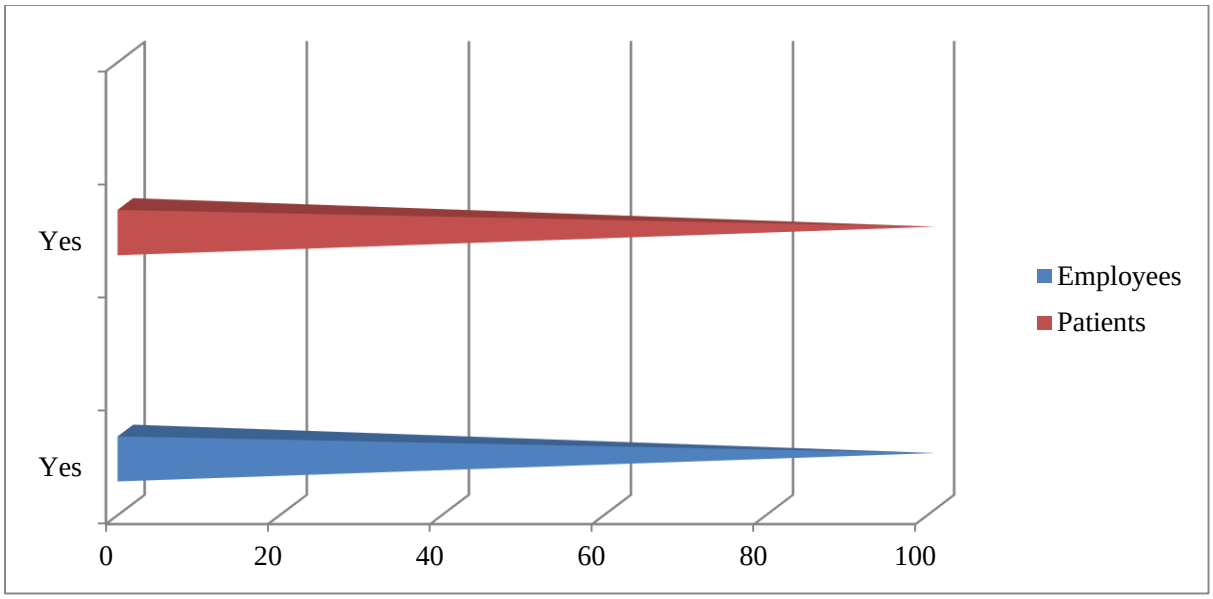


Figure 4.10: Patients Receive Full Health Care Delivery Service

Source: Field Survey, 2022

Figure 4.10 depicts that all the employees constituting 85(100%) agreed that patients receive full health care delivery service as soon as they are attended to. This means that patients receive their full health care services at the moment they are attended to in a queue

Again, 10(100%) representing all the patients agreed that they receive full health care services once they are service as soon as attended to. This implies that most of the patients agreed that the employees of the hospital provides full health care services once they are attended to in the queue.

Table 4.1: The Queuing Systems

Respondents were asked to indicate their extent of agreement or disagreement with the following statement by using Likert's scale of 1–5 where 1= Strongly Agree 2= Agree 3= Not sure 4= Disagree, 5= Strongly Disagree

Statement	**Strongly Agree**		**Agree**		**Not Sure**		**Disagree**		**Strongly Disagree**		**Total**	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Your department uses single-channel, single-phase, where the department has only one server to service patients	27	32.0	35	41.0	23	27.0	0	0.0	0	0.0	85	100.0
Your department uses a single-channel, multi-phase, where the department has one server and a multi-step servicing process for patient	35	41.0	50	59.0	0	0.0	0	0.0	0	0.0	85	100.0
Your department uses a multi-channel, single-phase, where the department has several servers and a one-step servicing process for patients	40	47.0	29	34.0	16	19.0	0	0.0	0	0.0	85	100.0
Your department uses multi-channel, multi-phase, where the department has several servers and a multi-step servicing process for patients.	60	71.0	25	29.0	0	0.0	0	0.0	0	0.0	85	100.0

Source: Field Survey, 2022

From table 4.1, it was established that majority of the respondents constituting 27(32%) strongly agreed to the notion that their department uses single-channel, single-phase, where the department has only one server to service patients, 35(41%) agreed whiles 23(27%) of the

respondents were not sure. Also, 35(41%) of the respondents strongly agreed that their department uses a multi-channel, single-phase, where the department has several servers and a one-step servicing process for patients whiles 50(59%) of the respondents agreed.

Table 4.1 depicts that 40(47%) of the respondents strongly agreed that their department uses a multi-channel, single-phase, where the department has several servers and a one-step servicing process for patients, 29(34%) of the respondents agreed whiles 16(19%) of the respondents were not sure. Similarly, the results show that majority of the respondents which constitute 60(71%) strongly agreed to the uses multi-channel, multi-phase, where the department has several servers and a multi-step servicing process for patients whereas 25(29%) of the respondents agreed.

The findings are in line with (Adeleye et al., 2018) who assets that the health sector uses four main types of queuing systems to deliver quality health care services to patients. These are Single-Channel, Single Phase; Multi-Channel, Single Phase; Single-Channel, Multiple Phases; and Multi-Channel, Multi-Phase.

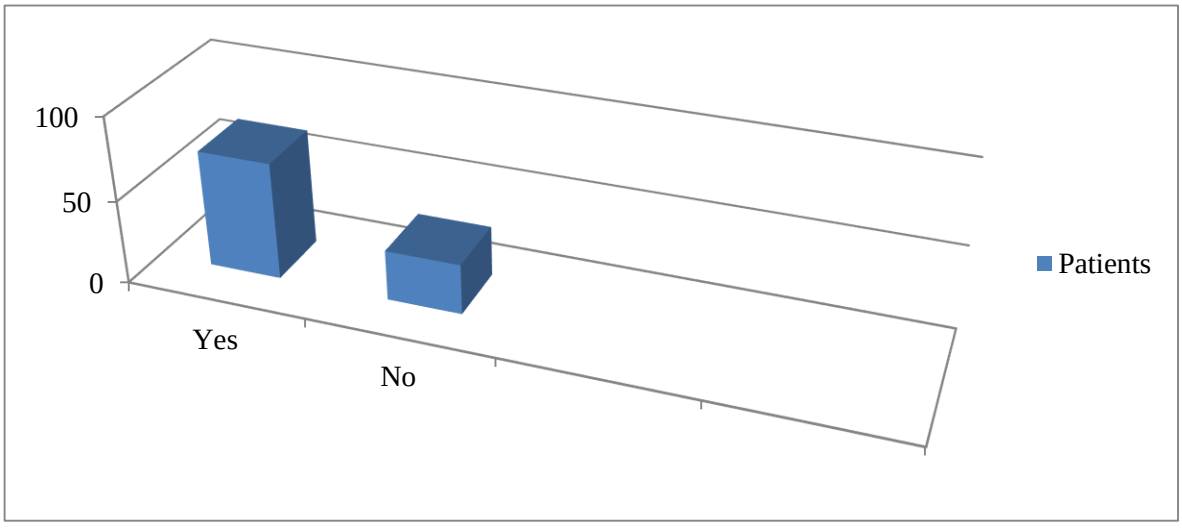


Figure 4.11: Satisfy with the Queuing System Use

Source: Field Survey, 2022

Figure 4.11 depicts that majority representing 7(70%) of the respondents were satisfy with the queuing system used to serve at the hospital whiles 3(30%) of the respondents were not satisfaction with the queuing system. This implies that most of the respondents were happy with the queuing system used at the hospital.

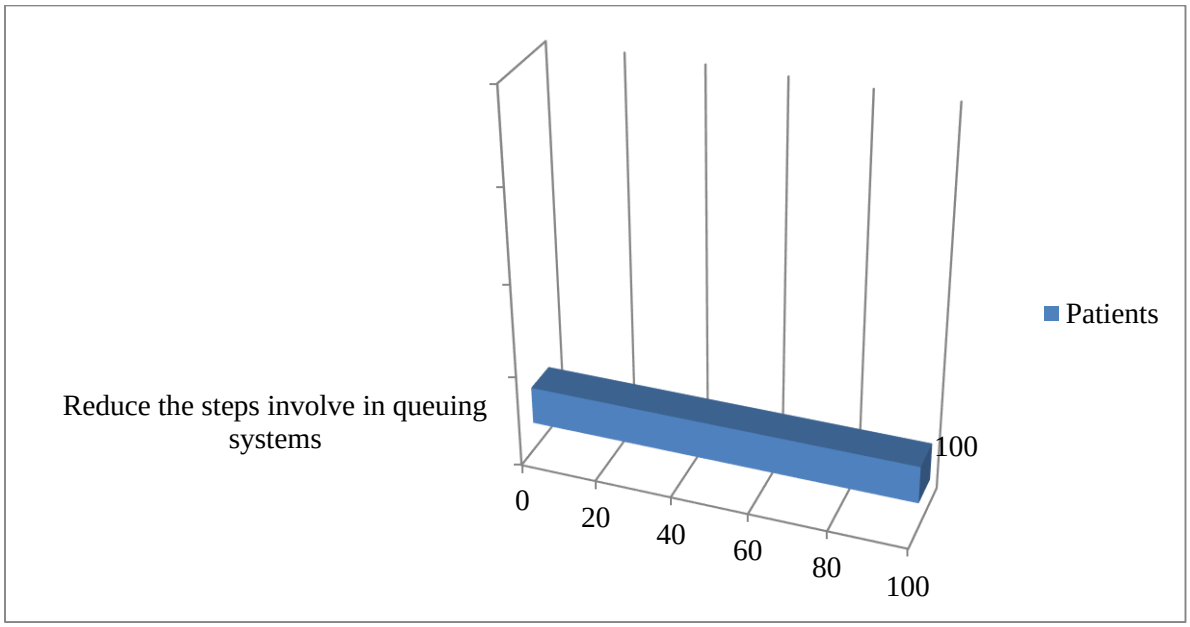


Figure 4.12: Improving on Patient Satisfaction

Source: Field Survey, 2022

Figure 4.12 shows that all the respondents representing 10(100%) agreed that reducing the steps involved in queuing systems will improve their satisfaction. This implies the hospital needs to reduce the steps involved in the queuing systems to improve patient satisfactions.

4.4 How Queuing Systems Help in Ensuring Health Care Delivery in Eastern Regional Hospital, Koforidua

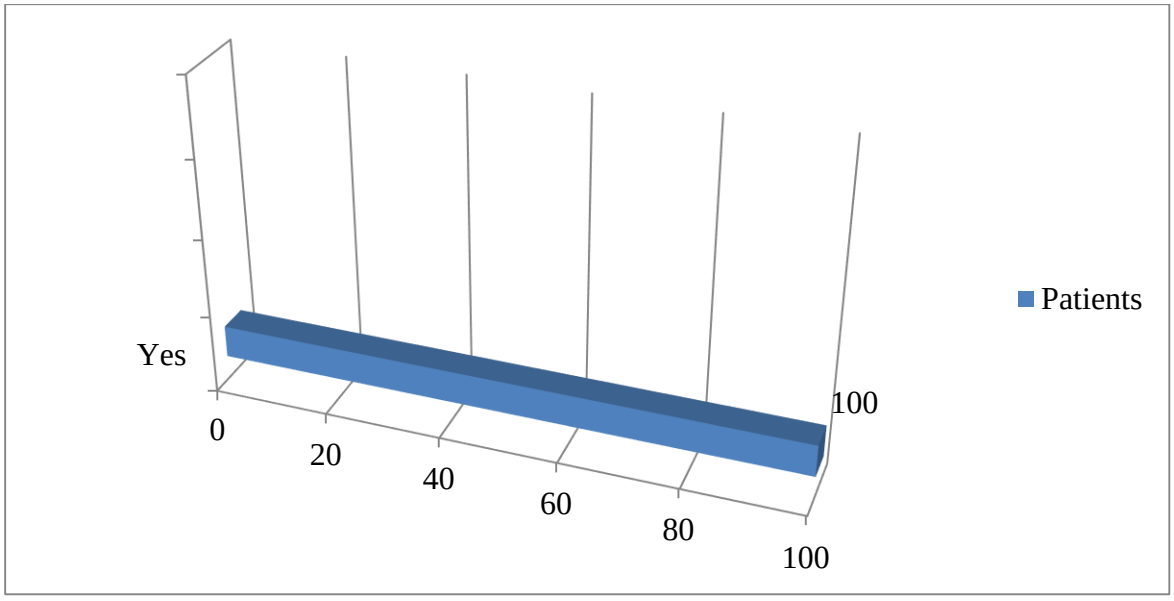


Figure 4.13: Queuing Systems Offer Quick Health Care Delivery

Source: Field Survey, 2022

Figure 4.13 shows that all the respondents representing 10(100%) agreed that queuing systems offer quick health care delivery. The implications are that the hospital delivers quick health care delivery to patients with the use of queuing systems.

The study findings reflect the view of (Fomundam & Herrmann, 2017) that queuing systems boost customer satisfaction through shortening lines and improving service delivery and offering quick health care delivery services,

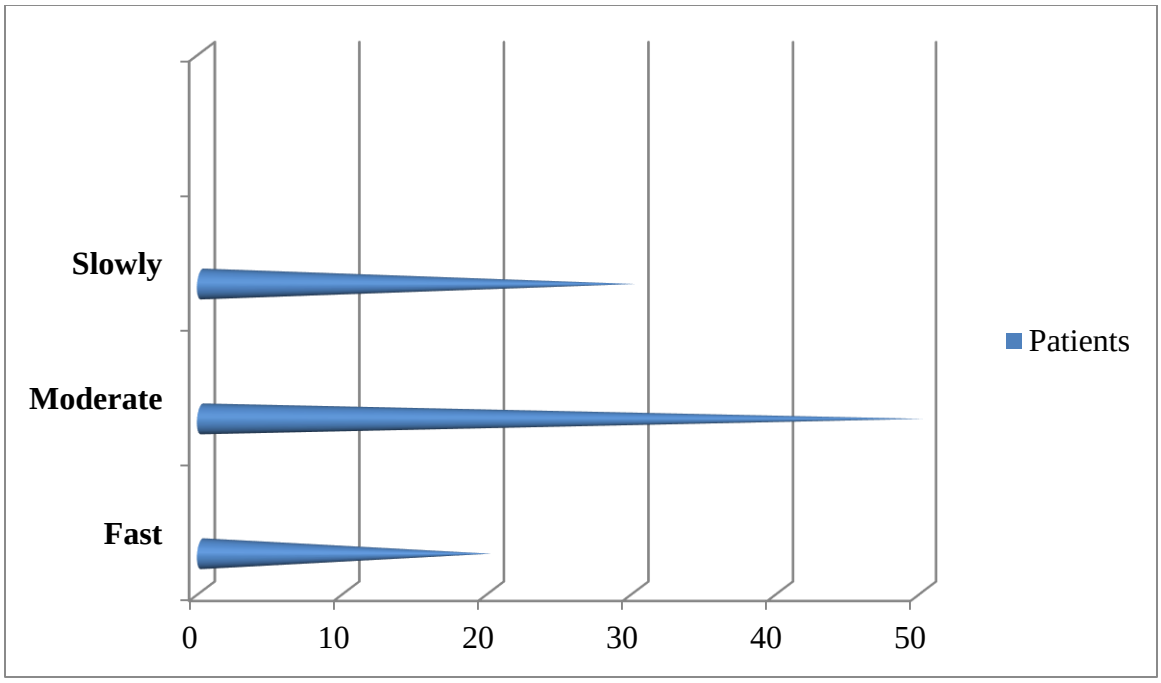


Figure 4.14: Rating the Queuing Systems

Source: Field Survey, 2022

Figure 4.14 found that majority of the respondents representing 5(50%) rated the queuing systems in the hospital moderate, minority representing 2(20%) rated queuing system being fast whiles 3(30%) of the respondents agreed the queuing systems being slow. The implications are that the hospital queuing systems is rated moderate.

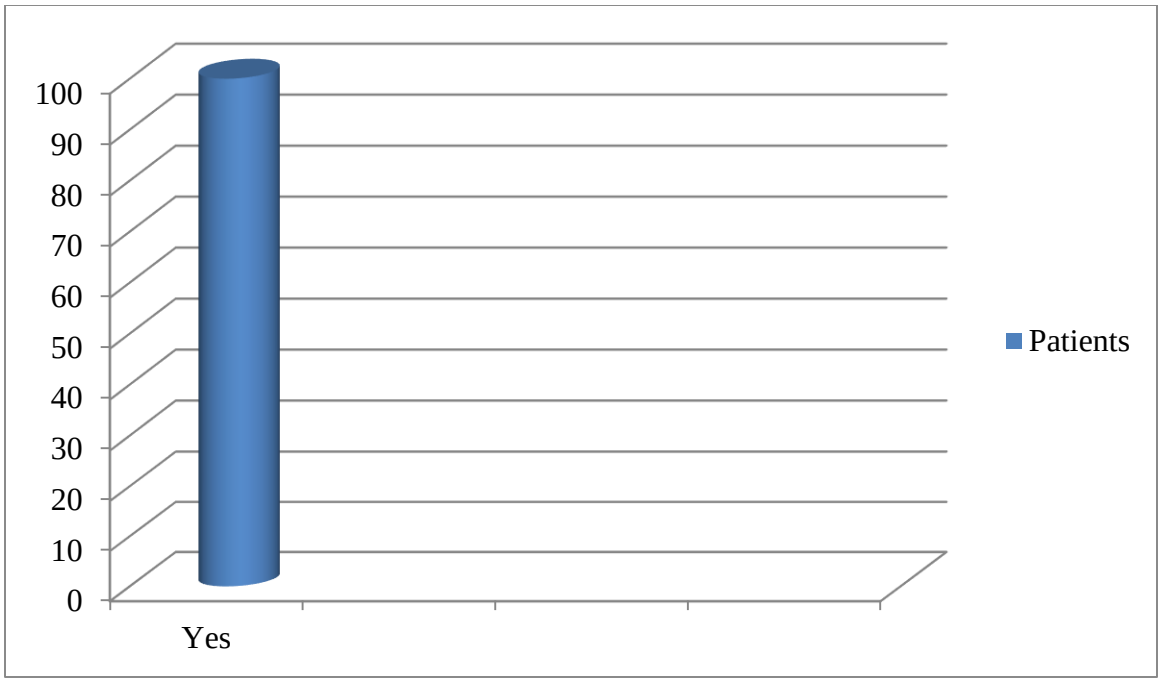


Figure 4.15: The Queuing Systems Enhance Health Care Delivery

Source: Field Survey, 2022

Figure 4.15 found that all of the respondents representing 10(100%) agreed that the queuing systems enhance health care delivery for patients. The study findings are in line with Green, (2018), who affirms that the adoption and implementation of queuing systems in the health sector ensures that health care delivery is enhanced to meet the patient satisfaction.

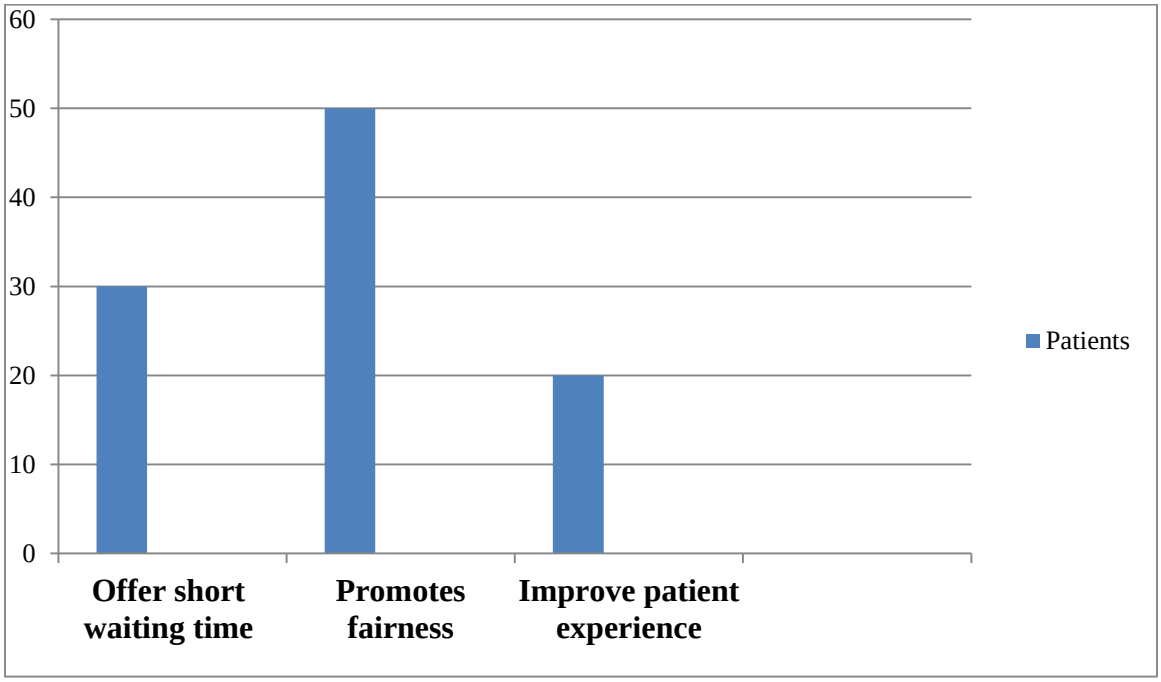


Figure 4.16: Queuing Systems Enhance the Quality of Health Care Received

Source: Field Survey, 2022

Figure 4.16 discovered that majority of the respondents representing 3(30%) agreed that the queuing systems in the hospital offer short waiting time, minority representing 2(20%) agreed to improvement experience whiles 5(40%) of the respondents agreed the queuing systems promotes fairness.

The study findings reflects with (Singh, 2017), who affirms that a queuing systems promotes fairness in order to provide equally opportunity to patients to receive medical care.

Table 4.2: How Queuing Systems Help in Ensuring Health Care Delivery

Respondents were asked to indicate their extent of agreement or disagreement with the following statement by using Likert's scale of 1–5 where 1= Strongly Agree 2= Agree 3= Not Sure 4= Disagree, 5= Strongly Disagree

Statements	**Strongly Agree**		**Agree**		**Not Sure**		**Strongly Agree**		**Strongly Disagree**		**Total**	
	(f)	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**
The hospital experience short queues/waiting time on regular basis.	56	66.0	29	34.0	0	0.0	0	0.0	0	0.0	85	100.0
The hospital experience quality customer satisfaction.	38	45.0	47	55.0	0	0.0	0	0.0	0	0.0	85	100.0
The queuing systems promote operational fairness and transparency in health care delivery	40	47.0	45	53.0	0	0.0	0	0.0	0	0.0	85	100.0
The queuing systems offer quick health care delivery for patients.	30	35.0	55	65.0	0	0.0	0	0.0	0	0.0	85	100.0
The queuing systems reduce customer frustration through good customer service.	51	60.0	34	40.0	0	0.0	0	0.0	0	0.0	85	100.0
The queuing systems improve the quality of health care delivery.	42	49.0	43	51.0	0	0.0	0	0.0	0	0.0	85	100.0
The queuing systems reduce	49	58.0	36	42.0	0	0.0	0	0.0	0	0.0	85	100.0

both direct and indirect costs in the hospital.												
The queuing systems enhance the hospital brand reputation	40	47.0	29	34.0	16	19.0	0	0.0	0	0.0	85	100.0
Generally, you are satisfied with how the queuing systems handle patients at the hospital while waiting for service	37	44.0	25	29.0	23	27.0	0	0.0	0	0.0	85	100.0

Source: Field Survey, 2022

From table 4.2, 56(66%) of the respondents strongly agreed to the notion that the hospital experience short queues/waiting time on regular basis while 29(34%) agreed. Again, 38(45%) of the respondents strongly agreed that the hospital experience quality customer satisfaction while 47(55%) agreed to the assertion. Also, it was discovered that 40(47%) of the respondents strongly agreed that the queuing systems promote operational fairness and transparency in health care delivery whiles 55(65%) agreed.

Moreover, 30(35%) strongly agreed that the queuing systems offer quick health care delivery for patients. whereas 55(65%) agreed to this assertion. Furthermore, 51(60%) of the respondents strongly agreed that the queuing systems reduce customer frustration through good customer service whiles 34(40%) of the respondents agreed.

In addition, majority of the respondents constituting 42(49%) strongly agreed that the queuing systems improve the quality of health care delivery whereas 43(51%) of the respondents agreed.

Nevertheless, 49(58%) of the respondents strongly agreed that the queuing systems reduce both direct and indirect costs in the hospital whiles 36(42%) agreed to this assertion.

Furthermore, Table 4.2 depicts that 40(47%) of the respondents strongly agreed that the queuing systems enhance the hospital brand reputation, 29(34%) of the respondents agreed whiles 16(19%) of the respondents were not sure. Finally, the results show that majority of the respondents which constitute 37(44%) strongly agreed that they are satisfied with the queuing systems that handle patients at the hospital whiles 25(29%) of the respondents agreed whiles 23(27%) of the respondents were not sure.

The study findings are consistent with the findings of (Adeleye, et al., 2018) that queuing systems reduce customer frustration through good customer service, which simultaneously decrease customer annoyance and enhance the hospital brand reputation. The author further added that queuing systems ensure operational transparency through the institution purposefully exposing its processes to customers to help them understand the work being done on their behalf.

4.5: Challenges Associated With the Queuing Systems in Eastern Regional Hospital, Koforidua

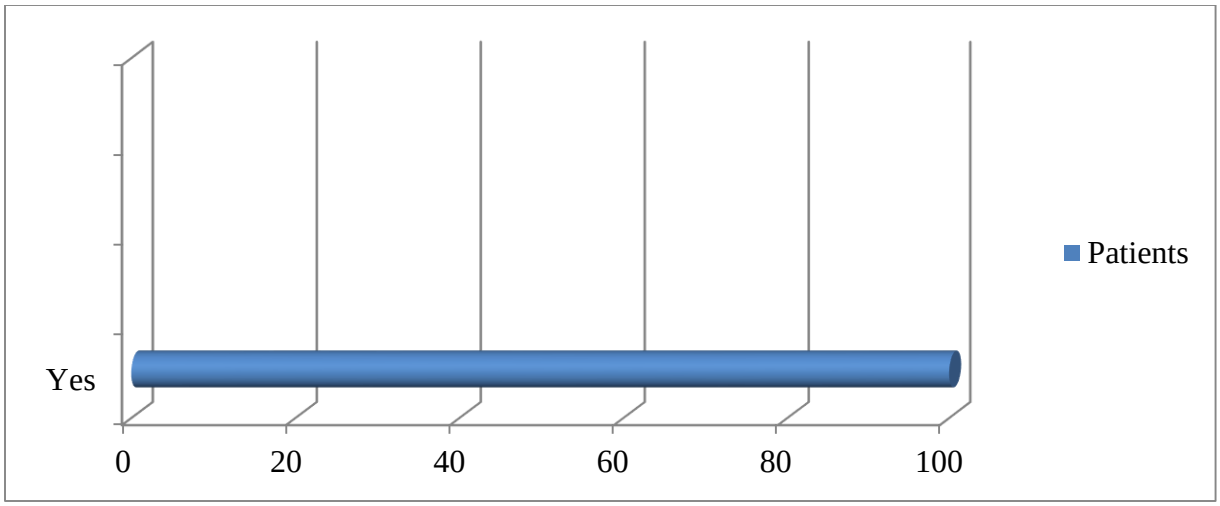


Figure 4.17: Face challenges with the use of queuing systems in the hospital

Source: Field Survey, 2022

From Figure 4.17, all the respondents constituting 10(100%) agreed that there are challenges facing the use of queuing systems in the hospital.

In similarly, majority of the respondents constituting 6(60%) agreed that poor design of queuing system is a challenge facing queuing systems which leads to long waiting whiles 4(40%) of the respondents agreed that queuing systems fail when there is no employee to guide customers, they may get confused.

The findings above concur with the study findings of (Gorney, 2020) who found out that queuing systems in the health sector fails to achieve it intended purpose as a result of poor design of queuing system which leads to long waiting and when there is no employee to guide customers, they may get confused.

Table 4.3: Challenges Associated with the Queuing Systems

Respondents were asked to indicate their extent of agreement or disagreement with the following statement by using Likert's scale of 1–5 where 1= Strongly Agree 2= Agree 3= Not sure 4= Disagree, 5= Strongly Disagree

Statement	**Strongly Agree**		**Agree**		**Disagree**		**Not sure**		**Strongly Disagree**		**Total**	
	(f)	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**
Lack of top management commitment	45	53.0	25	29.0	15	18.0	0	0.0	0	0.0	85	100.0
Lack of information systems	38	45.0	24	28.0	23	27.0	0	0.0	0	0.0	85	100.0
Technological issues	31	36.0	28	33.0	26	31.0	0	0.0	0	0.0	85	100.0
Weak organizational structures	34	40.0	26	31.0	25	29.0	0	0.0	0	0.0	85	100.0
Lack of finance	40	47.0	35	41.0	10	12.0	0	0.0	0	0.0	85	100.0
Lack of queuing system vision and trust	24	28.0	38	45.0	23	27.0	0	0.0	0	0.0	85	100.0

Source: Field Survey, 2022

Pertaining to the challenges associated with the queuing systems, 45(53%) of the respondents strongly agreed to lack of top management commitment, 25(29%) agreed whereas 15(18%) of the respondents disagreed. Also, 38(45%) of the respondents strongly agreed that lack of

information systems is a challenges associated with the queuing systems, 24(28%) agreed whereas 23(27%) disagreed. In addition, majority of the respondents constituting 31(36%) strongly agreed that the challenges associated with the queuing systems include technological issues whereas 28(33%) agreed whiles 26(31%) of the respondents disagreed.

Furthermore, it was discovered that the challenges associated with the queuing systems is weak organizational structures. The evident shows that 34(40%) of the respondents strongly agreed, 26(231%) agreed whereas 25(29%) disagreed. Similarly, concerning lack of finance as a challenges associated with the queuing systems, the results found 40(47%) of the respondents strongly agreed, 35(41%) agreed whereas 10(12%) of the respondents disagreed. Lastly, 24(28%) of the respondents strongly agreed to lack of queuing system vision and trust being a challenge to queuing systems, 38(45%) agreed whiles 23(27%) of the respondents were not sure.

The findings above concur with the study findings of (Akkermans et al., 2019) who affirms that weak organizational structure and culture of businesses, functional silos, short-term thinking, a history of local optimization, lack of top management awareness, partners' short-term focus, a lack of infrastructure, a lack of a shared goal and vision, and fear of being penalized for sharing open information all have an impact on queuing systems.

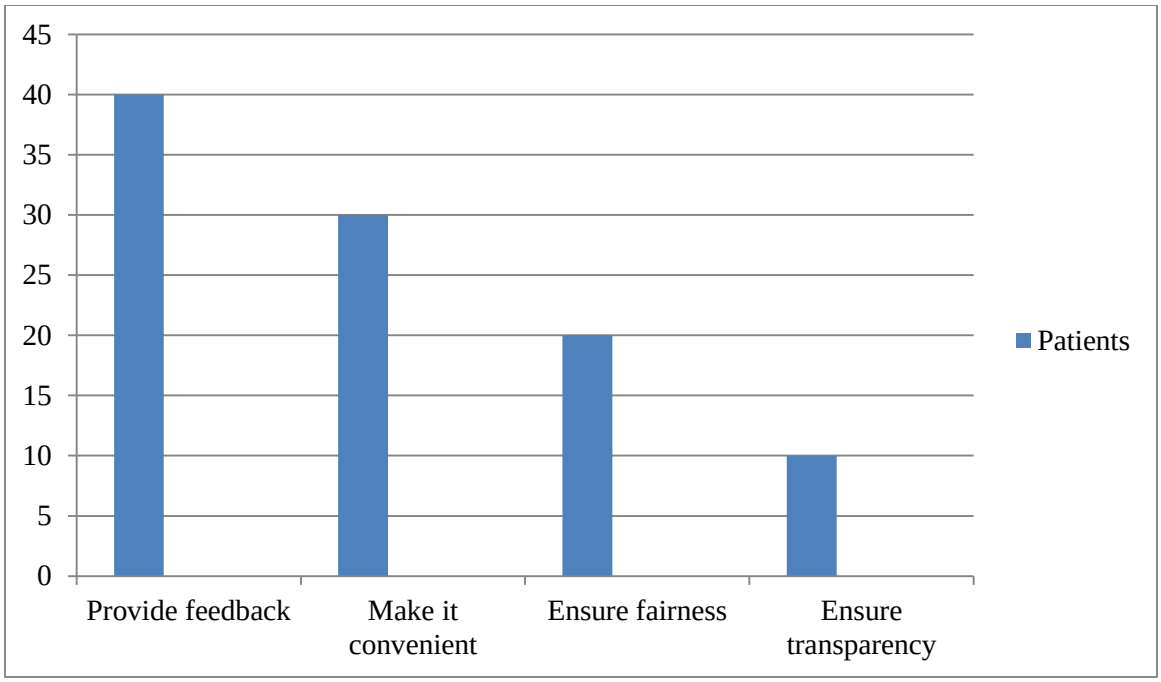


Figure 4.18: Improving on the existing queuing systems

Source: Field Survey, 2022

Figure 4.18 depict that 4(40%) of the respondents agreed that in order to improve on the existing systems, the hospital management must provide feedback to patients on the queuing systems whiles 3(30%) agreed to making the queuing system convenient. Again 2(20%) of the respondents agreed to ensuring fairness in the queuing systems whereas 1(10%) agreed to ensuring transparency.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter comprises the summary of the research findings, the conclusion and recommendations made from the work.

5.1 Summary of Major Findings

The major finding and the results of this study are presented according to the research objectives.

5.1.1 The Queuing Systems Used By Eastern Regional Hospital, Koforidua

The study deduced that employees and patients agreed that there is a queuing system at the hospital.

It was discovered that patients spend between 90-120 minutes in a queue receiving health care delivery and they suggested that the hospital needs to reduce the steps involved in the queuing systems to improve patient satisfactions.

The study discovered that both patients and employees agreed to first come first serve priority rule being fairly and strictly implemented and patients receive full health care services once they are attended to in a queue.

It was also found that the hospital mainly practices the multi-server system and rated the queuing system in the hospital as moderate.

5.1.2 How Queuing Systems Help in Ensuring Health Care Delivery in Eastern Regional Hospital, Koforidua

The study discovered that patients and employees agreed queuing systems enhance health care delivery, but most of the patients mentioned that queuing systems promote fairness in order to provide equal opportunities in receiving health care services whiles employees stated that queuing systems reduce waiting time on regular basis.

The study revealed that employees agreed queuing systems adopted by the various departments in the hospital reduce patient frustrations in the process of receiving health care services.

5.1.3 Challenges Associated With the Queuing Systems in Eastern Regional Hospital, Koforidua

The study found that patients agreed that there are challenges facing the use of queuing systems in the hospital and this challenge is poor design of queuing system which leads to long waiting time.

Further, the study found that employees stated lack of top management support, lack of finance and information support systems are the main challenges impeding the use of queuing systems to improve health care delivery.

5.2 Conclusion

In a period of major change in the healthcare environment, enhancing satisfaction is becoming increasingly important because satisfaction is recognized as a measure of quality. Knowledge of the use of queuing systems to determine system parameters is of value to healthcare providers

who seek to attract, keep and provide quality healthcare to patient in the ever-competitive “marketplace.

Studies on queuing systems and waiting lines are relevant especially in the health sector as it provides a very essential service for providing quality health care services and keeping people safe. Whiles this service is essential, patients cannot be made satisfied when they will have to wait to get this service from the hospital. Even though hospitals have made several attempts to deal with the problem of queueing in the health care delivery, the problems still exist. The study found that there is a relationship between queue systems and health care delivery. This implies that when queues systems are managed well, it can lead to quality health care delivery and vice versa.

5.4 Recommendation

Based on the findings, the following recommendations are suggested:

The hospital should enhance customers' perceptions of waiting time by providing patients moment-by-moment service information. This will help calm patients down in periods where there seem to be too much waiting in queues by patients.

Also, the hospital can inform patients how much each patients will have to wait. Moreover, hospital management will have to notify patients when the systems are down, there is a delay.

During rush hours it is desirable to use employees from other departments or the free skilled employees as during this time they should be very active to reduce waiting time and service time.

The study recommends management of the hospital to invest more in electronic booking facilities and make more liberal policies for electronic booking appointments to reduce the length of queue in the hospital.

In order to aid accurate capacity planning and assure quality and service, healthcare management should put place a proper record system that will capture all vital information about patient to facilitate easy queuing process.

REFERENCE

Adaora O. D., (2019) "Application of Queuing Models To Customers Management in the Banking System (A Case Study of United Bank for Africa, Okpara Avenue Branch Enugu)," Caritas University Enugu,

Adegoke C., Egbert B., Jaya C., Kwesi E., Tetteh G., and Dragana V. (2018), Ghana: PMI Assessment of the Supply Chain and Pharmaceutical Management for Antimalarials and ITNs. Arlington, Va.: USAID/DELIVER PROJECT, Task Order 3, and MSH/SPS Program

Adeleye A., Madawaki M.D.,Biradawa K.(2018), A Quantitative Business Technique .

Afzal, U and Yusuf, A., (2017)"The State of Health in Pakistan: An Overview," Lahore J. Econ., vol. 18, no. September, pp. 233–247.

Ahmad, N., (2020), "Health conditions: Analysis of patients 'social problems at public hospitals in southern region of Khyber Pakhtunkhwa," Gomal Univ. J. Res., vol. 2, no. 2, pp. 47–54

Ahmed M.K and Ali S. K (2021). Applications of Queuing Theory and Discrete Event Simulation in Health Care Units of Pakistan. International Journal of Science and Engineering Investigations vol. 10, issue 109.

Akkermans, H., Bogerd, P., & Vos, B. (2019). Virtuous and vicious cycles on the road towards international supply chain management.International Journal of Operations & Production Management, 19(5/6), 565-581

Armony, M., Israelit, S., Mandelbaum, A., Marmor, Y. N, Tseytlin, Y., and Yom-Tov, G.B (2020) “On patient flow in hospitals: a data-based queueing- science perspective,” Stoch. Syst., vol. 5, no. 1, pp. 146–194, doi: 10.1214/14-SSY153

Bakker, F., & Donk, D. P. Van, (2019), Health Operations Management: Patient Flow Logistics in Health Care, Routledge Health Management Services

Bastani, P. (2019) “A Queueing Model of Hospital Congestion,” Simon Praser University

Biju M. K.; Naeema K. and Faisal U. (2020), Application of Queuing Theory in Human Resource Management in Health Care. ICOQM-10:June 28-30

Bossert T., Bowser D., Amenyah J. and Copeland B., (2020). Ghana: Decentralization and Health Logistics Systems: Arlington, Va.: John Snow, Inc./DELIVER for USAID for the U.S. Agency for International Development. Available on: http://pdf.usaid.gov/pdf_docs/PNADM531.pdf (Accessed 6th May, 2022)

Burodo M.S., Suleiman S. and Shaba Y. (2019), Queuing Theory and ATM Service Optimization: Empirical Evidence from First Bank Plc, Kaura Namoda Branch, Zamfara State. American Journal of Operations Management and Information Systems. 4(3), 80-86. doi: 10.11648/j.ajomis.20190403.12

Burodo M.S., Suleiman S. and Yusuf G. (2021). An assessment of Queue management and Patient Satisfaction of Some Selected Hospitals in North-Western Nigeria, International Journal of Mathematics and Statistics Invention (IJMSI), 9(8), 14-24.

Callen, M., Gulzar, S., Hasanain, A., Khan A. Khan, R. Y and Mehmood, M. Z (2019) "Improving Public Health Delivery in Punjab, Pakistan: Issues and Opportunities," Lahore J. Econ., vol. 18, pp. 249–269.

Child, J., (2019) "Organizational structure, environment, and performance: the role of strategic Choice". Sociology

Christopher, M. L. (2017), Queues in Health. Health Care Management Science, 5, 283. 20

Cooper M. C., Lambert D. M., Janus DP. (2020), Focused Operations Management for Health Services Organizations. San Francisco, CA: Jossey-Bass.

Desta Al.Z. and Balete T.H.(2019). The Influence of Waiting Lines Management on Customer Satisfaction in Commercial Bank of Ethiopia, Financial Markets, Institutions and Risks, 3(3), 5 12

Dong, J., Yom-tov, E., and Yom-tov, G. B (2019) "The Impact of Delay Announcements on Hospital Network Coordination and Waiting Times.

Doshi, B. and Yao, D.D.(2017) Editorial Introduction, Special Issue on Telecommunications. Queueing Systems: Theory and Applications, 20, 1-6.

Dubihlela, J., & Omoruyi, O, (2018) "Barriers to Effective Supply Chain Management, Implementation, and Impact on Business Performance of SMEs in South Africa", the Journal of Applied Business Research, Vol. 30, pp. 1019–1030.

Ellinger A.E, (2020) "Improving Marketing/ Logistics Cross-Functional Collaboration in the Supply Chain", Industrial Marketing Management, Vol. 29, No. 1, pp. 85-96,

Fawcett, S. E. (2018). Strategic logistics in coordinated global manufacturing success. International Journal of Production Research, 30(5), 1081-2000

Fitzsimmons, J. A, Fitzsimmons, M. J. and Bordoli, S. (2018) Service management: operations, strategy, and information technology., 7th ed. NewYork: McGraw-Hill New York, NY

Fomundam, S and Herrmann, J., (2017) "A survey of queuing theory applications in healthcare, [Online]. Available: http://drum.lib.umd.edu/bitstream/handle/1903/7222/t.pdf.

Gorney, L., (2020),Queuing Theory:A Problem Solving Approach, New York: John Wiley, Second Edition,.

Green, L. V, (2018) "Queuing Analysis in Healthcare," in In Patient flow: Reducing Delay in Healthcare Delivery, Springer, Boston, MA, pp. 281–307

Green, L. V. (2019). How many Hospital Beds? Inquiry, 37(4), 400-412

Gunal, M. M (2019) "A guide for building hospital simulation models," Heal. Syst., vol. 1, no. 1, pp. 17–25, 2012, doi: 10.1057/hs.

Haghighinejad H. A. (2018), "Using Queuing Theory and Simulation Modelling to Reduce Waiting Times in An Iranian Emergency Department," IJCBNM January, vol. 44, no. 11, pp. 11–26, 2016

Hall, W., (2017)"Financial Management", 10th Edition. New Delhi: Vikas Publishing House Pvt.

Heizer, Jay & Barry Render. (2018). Operations Management. Jakarta: SalembaEmpat

Ikwunne T. A and Onyesolu, M. O (2020) “Optimality Test for Multi-Sever Queuing Model with Homogenous Server in the Out-Patient Department (OPD) of Nigeria Teaching Hospitals,” I.J. Mod. Educ. Comput. Sci., vol. 4, pp. 9–17, 2016, doi: 10.5815/ijmecs..04.02

Kalwar M. A. (2020) “Increasing Performance of Footwear Stitching Line by Installation of Auto-Trim Stitching Machines,” J. Appl. Res. Technol. Eng., vol. 1, no. 1, pp. 31–36.

Kalwar, M. A., Khaskheli, S. A., Khan, M. A. Siddiqui, A. A and Gopang, M. A (2018) “Comfortable Waiting Time of Patients at the OPD with Varying Demographics,” Ind. Eng. Lett., vol. 8, no. 2, pp. 20–27

Kandemir-Cavas, C. and Cavas, L., (2017) “An Application of Queueing Theory to the Relationship Between Insulin Level and Number of Insulin Receptors,” Turkish J. Biochem., vol. 32, no. 1, pp. 32–38

Kembe, M. M., Onah, E. S. and Iorkegh, S (2020) “A Study of Waiting And Service Costs of A Multi- Server Queuing Model In A Specialist Hospital,” Int. J. Sci. Technol. Res., vol. 1, no. 8, pp. 19–23.

Khamis K., and Njau, B., (2018) “Patients’ level of satisfaction on quality of health care at Mwananyamala hospital in Dar es Salaam, Tanzania.,” BMC Health Serv. Res., vol. 14, no. 400, pp. 1–8, doi: 10.1186/1472-6963-14-400.

Khaskheli S. A, Marri H. B., Nebhwani M., Khan M. A., and Ahmed M. (2020) “Compartive Study of Queuing Systems of Medical Out Patient Departments of Two Public Hospitals,” in Proceedings of the International Conference on Industrial

Koko M.A., Burodo M.S., Suleiman S. (2018). Queuing Theory and Its Application Analysis on Bus Services Using Single Server and Multiple Servers Model. American Journal of Operations Management and Information Systems. 3(4), 81-85. doi: 10.11648/j.ajomis.20180304.12

Krajewski, L., Ritzman, L. & Malhotra, M., (2018). Operations management: Processes and supply chains (9Ed.). New Jersey: Pearson Education, Inc

Levy Y and Yechiali, U., (2017) "An M/M/c queue with servers' vacations," INFOR, vol. 14, no. 2, pp. 153–163,.

Michelson, G. (2018)." A strategic choice–resource dependence analysis of union mergers in the British and Australian broadcasting and film industries". Journal of Management Studies, 35(5), 579-600

Mustafa, S. N. (2019) "A Comparison of Single Server and Multiple Server Queuing Models in Different Departments of Hospitals," vol. 47, no. 1, pp. 73–80.

Nkrumah S, Yeboah, F.B and Adiwokor, E.(2018) "Client Satisfaction with Service Delivery in the Health Sector: The Case of Agogo Presbyterian Hospital," Int. J. Bus. Adm., vol. 6, no. 4, pp. 64–78, doi:10.5430/ijba.v6n4p64.

Nor A.H.A and Binti N.S. H (2018) Application of Queuing Theory Model and Simulation to Patient Flow at the Outpatient Department. Proceedings of the International Conference on Industrial Engineering and Operations Management Bandung, Indonesia, March 6-8.

Nosek, A.R., Wislon , P. J., (2020), Queuing Theory and Customer Satisfaction: A Review of Terminology, Trends and Applications to Pharmacy Practice,Hospital Pharmacy, 36(3): 275-279,.

Obamiro John Kolade (2020), "Queuing Theory and Patient Satisfaction: An Overview of Terminology and Application in Ante-Natal Care Unit" Department Of Business Studies, College of Developmental Studies, Covenant University, Ogun State, Nigeria

Obulor R (2018) "Outpatient Queuing Model Development for Hospital Appointment System," Int. J. Sci. Eng. Appl. Sci., vol. 2, no. 4, pp. 15–22.

Rotich T. K (2016) Utility Analysis of an Emergency Medical Service Model Using Queuing Theory. British Journal of Mathematics & Computer Science 19(1): 1-18

Russell, R. and Taylor, B., (2020). Operations Management: International Student Version. 7th ed. New Jersey: John Wiley & Sons, Inc,

Segun M.O (2020) Performance Modelling of Health-care Service Delivery in Adekunle Ajasin University, Akungba-Akoko, Nigeria Using Queuing Theory. Journal of Advances in Mathematics and Computer Science, 35(3): 119-127

Shastrakar D.F and Pokley S (2017). Analysis of Different Parameters of Queuing Theory for the Waiting Time of patients in Hospital" International Conference onExaminations in Modern Engineering Science and Management, 5(3), 98-100.

Siciliani, L., Stanciole, A. and Jacobs, R. (2019). Do waiting times reduce hospital costs? Journal of Health Economics, 28 (4), 771-780.

Singh, V. (2017). Use of Queuing Models in Health Care, Working paper, University of Arkansas for Medical Sciences

Stewart W. J., (2020) Probability, Markov Chains, Queuing and Simulation: The Mathematical Basis of Performance Modeling, Princeton University Press, First Edition .

Suleiman S., Burodo M.S., and Ahmed Z. (2022). An Application of Single and Multi-server Exponential Queuing Model in Some Selected Hospitals of the North- Western Nigeria, Asian Journal of Probability and Statistics, 16(2): 1-9 DOI: 10.9734/AJPAS/2022/v16i230396

Sundarapandian, V. (2019). Queueing Theory: Probability, Statistics and Queueing Theory.

Surydana, L. (2017) "Service Quality , Customer Value and Patient Satisfaction on Public Hospital in Bandung District , Indonesia," Int. Rev. Manag. Mark. vol. 7, no. 2, pp. 187–192.

Uriarte, A. G, Zuniga, E. R. Moris, M. U and. Ng, A. H. C (2017) "System design and improvement of an emergency department using Simulation- Based Multi-Objective Optimization," J. Phys. Conf. Ser., vol. 616, no. 1, pp. 12–15, 2015, doi: 10.1088/1742-6596/616/1/01.

Varma, S. P (2017) "Waiting Time Reduction in a Local Health Care Centre Using Queueing Theory," IOSR J. Math., vol. 12, no. 1, pp. 95–100, doi: 10.9790/5728-121495100.

Wang, T. Guinet, A, Belaidi, A., and Besombes, B (2019) "Modelling and simulation of emergency services with ARIS and Arena. Case study: The emergency department of

Saint Joseph and Saint Luc hospital," Prod. Plan. Control, vol. 20, no. 6, pp. 484–495, 2009, doi: 10.1080/09537280902938605

Williamson, A., (2018) An Empirical Analysis of Corporate Survival and Growth: Evidence from Efficient Working Capital Management. International Journal of Scholarly Academic

Yeddula, V.R. (2019) "Healthcare Quality : Waiting Room Issues," University of Nebraska.

Young, J.P. (1962a), The Basic Models in a Queuing Theory Approach to the Control of Hospital Inpatient Census, John Hopkins University, Baltimore, 74-97. http/onlinelibrary. Wiley.com

APPENDIX A: QUESTIONNAIRES FOR EMPLOYEES

KOFORIDUA TECHNICAL UNIVERSITY

FACULTY OF BUSINESS AND MANAGEMENT STUDIES

DEPARTMENT OF PROCUREMENT AND SUPPLY SCIENCE

THE EFFECTS OF QUEUING AND WAITING TIME IN THE DELIVERY OF HEALTH CARE

(A CASE OF EASTERN REGIONAL HOSPITAL, KOFORIDUA)

We wish to have your assistance in completing this questionnaire which is designed to collect data on the above topic. Please tick [√] in the boxes provided for each question and give answers where due. All information given will be kept strictly confidential and will be used for academic purpose only.

SECTION A: BIO DATA

1. Gender: a) Male [ ] b) Female [ ]

2. Age: a) 18 --- 30 years [ ] b) 31 --- 40 years [ ] c) 41 – 50 years [ ] d) Above 51 years [ ]

3. Highest Educational level: a) Diploma [ ] b) HND [ ] c) 1st Degree [ ] d) 2nd Degree [ ]

e) PHD [ ] f) Others (Please Specify)……

4. How long have you worked with the institution?

a) Less than one year [ ] b) 1-5 years [ ] c) 6-10 years [ ] d) 11-15 years [ ] e) Over 15 years [ ]

5. Which department do you belong to? …….

SECTION B: THE QUEUING SYSTEMS USED BY EASTERN REGIONAL HOSPITAL, KOFORIDUA

7. Is there a queuing system seen at your department?

(a) Yes [ ] (b) No [ ]

8. How long do you attend to patients in a day?

(a) Below 4hrs [ ] (b) 4hrs [ ] (C) 6hrs [ ] (d) 8hrs [ ] (e) 8hrs and Above [ ]

9. Is the first come first serve priority rule fair and strictly implemented?

(a) Yes [ ] (b) No [ ]

10. If answered **NO in QUESTION 6**, what other queuing disciplines have you observed.

(a) LCFS (Last Come First Serve) [ ] (b) SIRO (Serve in Random Order) [ ]

(c) Priority queue [ ] (d) Others, please specify…….

11. Please tick (√) the appropriate number to indicate the queuing systems used at your department whiles treating patients at the hospital?

Statement	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
Your department uses single-channel, single-phase, where the department has only one server to service patients					
Your department uses a single-channel, multi-phase, where the department has one server and a multi-step servicing process for patient					
Your department uses a multi-channel, single-phase, where the department has several servers and a one-step servicing process for patients					
Your department uses multi-channel, multi-phase, where the department has several servers and a multi-step servicing process for patients.					

SECTION C: HOW QUEUING SYSTEMS HELP IN ENSURING HEALTH CARE DELIVERY IN EASTERN REGIONAL HOSPITAL, KOFORIDUA

12. Please tick (√) the appropriate number to indicate how queuing systems help in ensuring health care delivery in Eastern Regional Hospital, Koforidua. The item scales are five-point scales with **1 = Strongly Disagree 2 = Disagree 3 = Uncertain 4= Agree 5 = Strongly Agree.**

How Queuing Systems Help in Ensuring Health Care Delivery	**Strongly Agree**	**Agree**	**Not Sure**	**Disagree**	**Strongly Disagree**
The hospital experience short queues/waiting time on regular basis.					
The hospital experience quality customer satisfaction.					
The queuing systems promote operational fairness and transparency in health care delivery					
The queuing systems offer quick health care delivery for patients.					
The queuing systems reduce customer frustration through good customer service.					
The queuing systems improve the quality of health care delivery.					
The queuing systems reduce both direct and indirect costs in the hospital.					
The queuing systems enhance the hospital brand reputation					
Generally, you are satisfied with how the queuing systems handle patients at the hospital while waiting for service					

Others (Please specify

……..……

……..…

SECTION D: CHALLENGES ASSOCIATED WITH THE QUEUING SYSTEMS IN EASTERN REGIONAL HOSPITAL, KOFORIDUA

13. Please tick (√) the appropriate number to indicate challenges associated with the queuing systems in Eastern Regional Hospital, Koforidua. The item scales are five-point scales with

1 = Strongly Disagree 2 = Disagree 3 = Uncertain 4= Agree 5 = Strongly Agree.

Challenges Associated with the Queuing Systems	**Strongly Agree**	**Agree**	**Not Sure**	**Disagree**	**Strongly Disagree**
Lack of top management commitment					
Lack of information systems					
Technological issues					
Weak organizational structures					
Lack of finance					
Lack of queuing system vision and trust					

Others (Please specify)

……..……

……..

18. Please specify any ways you think queuing systems in the institution can be improved.

.....

APPENDIX A: QUESTIONNAIRES FOR EMPLOYEES

KOFORIDUA TECHNICAL UNIVERSITY

FACULTY OF BUSINESS AND MANAGEMENT STUDIES

DEPARTMENT OF PROCUREMENT AND SUPPLY SCIENCE

THE EFFECTS OF QUEUING AND WAITING TIME IN THE DELIVERY OF HEALTH CARE

(A CASE OF EASTERN REGIONAL HOSPITAL, KOFORIDUA)

We wish to have your assistance in completing this questionnaire which is designed to collect data on the above topic. Please tick [√] in the boxes provided for each question and give answers where due. All information given will be kept strictly confidential and will be used for academic purpose only.

SECTION A: BIO DATA

1. Gender: a) Male [ ] b) Female [ ]

2. Age: a) 18 --- 30 years [ ] b) 31 --- 40 years [ ] c) 41 – 50 years [ ] d) Above 51 years [ ]

3. Highest Educational level: a) Diploma [ ] b) HND [ ] c) 1st Degree [ ] d) 2nd Degree [ ]

e) PHD [ ] f) Others (Please Specify)……

4. How long have you worked with the institution?

a) Less than one year [ ] b) 1-5 years [ ] c) 6-10 years [ ] d) 11-15 years [ ] e) Over 15 years [ ]

5. Which department do you belong to? …….

SECTION B: THE QUEUING SYSTEMS USED BY EASTERN REGIONAL HOSPITAL, KOFORIDUA

6. Is there a queuing system seen at your department?

(a) Yes [ ] (b) No [ ]

7. How long do you attend to patients in a day?

(a) Below 4hrs [ ] (b) 4hrs [ ] (C) 6hrs [ ] (d) 8hrs [ ] (e) 8hrs and Above [ ]

8. Is the first come first serve priority rule fair and strictly implemented?

(a) Yes [ ] (b) No [ ]

9. If answered **NO in QUESTION 6**, what other queuing disciplines have you observed.

(a) LCFS (Last Come First Serve) [ ] (b) SIRO (Serve in Random Order) [ ]

(c) Priority queue [ ] (d) Others, please specify…….

10. Please tick (√) the appropriate number to indicate the queuing systems used at your department whiles treating patients at the hospital?

Statement	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
Your department uses single-channel, single-phase, where the department has only one server to service patients					
Your department uses a single-channel, multi-phase, where the department has one server and a multi-step servicing process for patient					
Your department uses a multi-channel, single-phase, where the department has several servers and a one-step servicing process for patients					
Your department uses multi-channel, multi-phase, where the department has several servers and a multi-step servicing process for patients.					

SECTION C: HOW QUEUING SYSTEMS HELP IN ENSURING HEALTH CARE DELIVERY IN EASTERN REGIONAL HOSPITAL, KOFORIDUA

11. Please tick (√) the appropriate number to indicate how queuing systems help in ensuring health care delivery in Eastern Regional Hospital, Koforidua. The item scales are five-point scales with **1 = Strongly Disagree 2 = Disagree 3 = Uncertain 4= Agree 5 = Strongly Agree.**

How Queuing Systems Help in Ensuring Health Care Delivery	**Strongly Agree**	**Agree**	**Not Sure**	**Disagree**	**Strongly Disagree**
The hospital experience short queues/waiting time on regular basis.					
The hospital experience quality customer satisfaction.					
The queuing systems promote operational fairness and transparency in health care delivery					
The queuing systems offer quick health care delivery for patients.					
The queuing systems reduce customer frustration through good customer service.					
The queuing systems improve the quality of health care delivery.					
The queuing systems reduce both direct and indirect costs in the hospital.					
The queuing systems enhance the hospital brand reputation					
Generally, you are satisfied with how the queuing systems handle patients at the hospital while waiting for service					

Others (Please specify

……..……

……

SECTION D: CHALLENGES ASSOCIATED WITH THE QUEUING SYSTEMS IN EASTERN REGIONAL HOSPITAL, KOFORIDUA

12. Please tick (√) the appropriate number to indicate challenges associated with the queuing systems in Eastern Regional Hospital, Koforidua. The item scales are five-point scales with

1 = Strongly Disagree 2 = Disagree 3 = Uncertain 4= Agree 5 = Strongly Agree.

Challenges Associated with the Queuing Systems	**Strongly Agree**	**Agree**	**Not Sure**	**Disagree**	**Strongly Disagree**
Lack of top management commitment					
Lack of information systems					
Technological issues					
Weak organizational structures					
Weak organizational culture					
Lack of finance					
Lack of queuing system vision and trust					

Others (Please specify)

……..……

……..

18. Please specify any ways you think queuing systems in the institution can be improved.

.....

APPENDIX B: QUESTIONNAIRES FOR PATIENTS

KOFORIDUA TECHNICAL UNIVERSITY

FACULTY OF BUSINESS AND MANAGEMENT STUDIES

DEPARTMENT OF PROCUREMENT AND SUPPLY SCIENCE

THE EFFECTS OF QUEUING AND WAITING TIME IN THE DELIVERY OF HEALTH CARE

(A CASE OF EASTERN REGIONAL HOSPITAL, KOFORIDUA)

We wish to have your assistance in completing this questionnaire which is designed to collect data on the above topic. Please tick [√] in the boxes provided for each question and give answers where due. All information given will be kept strictly confidential and will be used for academic purpose only.

SECTION A: BIO DATA

1. Gender: a) Male [ ] b) Female [ ]

2. Age: a) below 21 years ( ) (b) 21-30 years ( ) (c) 31-40 years ( ) (d) 41-above [ ]

SECTION B: THE QUEUING SYSTEMS USED BY EASTERN REGIONAL HOSPITAL, KOFORIDUA

3. Do you visit the hospital often?

(a) Yes [ ] (b) No [ ]

4. Is there a queuing system seen at the hospital?

(a) Yes [ ] (b) No [ ]

5. How long do you spend in the queue?

(a) Less than 30 minutes [ ] (b) 30 minutes to 60 minutes [ ] (c) 60 minutes to 90 minutes [ ]

(d) 90 min to 120 min [ ] (e) 120 minutes and above [ ]

6. Is the first come first serve priority rule fair and strictly implemented?

(a) Yes [ ] (b) No [ ]

7. If answered **NO in QUESTION 6**, what other queuing disciplines have you observed.

(a) LCFS (Last Come First Serve) [ ] (b) SIRO (Serve in Random Order) [ ]

(c) Priority queue [ ] (d) Others, please specify…….

8. Do you receive full health care delivery service as soon as you are attended to?

(a) Yes [ ] (b) No [ ]

9. If answered **NO in QUESTION 8**, how did you receive health care delivery.

(a) You join a single queue, but the service involves multiple phases [ ]

(b) You join multiple queues, which involve only one phase [ ]

(c) You join numerous queues with multiple phase services [ ]

(d) Others, please specify…….

10. Are you satisfy with the queuing system use to serve you at the hospital

(a) Yes [ ] (b) No [ ]

11. If answered **NO in QUESTION 10**, what should be done to improve on your satisfaction.

(a) Increase number of health care providers [ ] (b) Capacity building of health care providers [ ]

(c) Reduce the steps involve in queuing systems [ ] (d)Other (Specify)……

SECTION C: HOW QUEUING SYSTEMS HELP IN ENSURING HEALTH CARE DELIVERY IN EASTERN REGIONAL HOSPITAL, KOFORIDUA

12. Do the queuing systems offer quick health care delivery?

(a) Yes [ ] (b) No [ ]

13. How quick do the queuing systems operate?

(a) Very fast [ ] (b) Fast [ ] (c) Moderate [ ] (d) Slowly [ ] (e) Very slow [ ]

14. Do the queuing systems enhance health care delivery?

(a) Yes [ ] (b) No [ ]

15. If answered **YES in QUESTION 14**, how does the queuing systems enhance the quality of health care received?

(a) Offer short waiting time [ ] (b) Promote fairness [ ] (c) Improve the overall quality of support [ ] (d) Improve patient experience [ ] (e) Increase customer loyalty [ ]

(f) Others, please specify…….

SECTION D: CHALLENGES ASSOCIATED WITH THE QUEUING SYSTEMS IN EASTERN REGIONAL HOSPITAL, KOFORIDUA

16. Do you face challenges with the use of queuing systems in the hospital?

(a) Yes [ ] (b) No [ ]

17. If answered **YES in QUESTION 16**, what are some of the challenges associated with queuing systems in the hospital?

(a) Employees are required to assist patients to use queuing systems [ ] (b) Limited Space [ ]

(c) Some customers may take too long before they are served if they do not know how to use the queuing systems [ ] (d) When there is no employee to guide customers, they may get confused [ ] (e) Poor design of queuing system leads to long waiting time [ ]

(f) Others, please…….……..

18. If **NO in QUESTION 17**, what must be done to improve on the existing queuing systems?

(a) Ensure fairness [ ] (b) Provide feedback [ ] (c) Make it convenient [ ]

(d) Ensure transparency [ ] (e) Others, please……..…….