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Factors contributing to overcrowding at the emergency department of the St. Francis Community Hospital in Nairobi Kenya

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the thesis itself.

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ABSTRACT

Emergency department (ED) overcrowding is a major barrier to safe and efficient health services delivery across hospitals. This study sought to identify and assess factors contributing to overcrowding at the ED of the St. Francis Community Hospital in Nairobi. The objectives were to describe the patterns of association between patients' characteristics and overcrowding at the emergency department of the hospital, examine the institutional factors that contribute to overcrowding and determine the extent to which the hospital is complying with its own throughput target of four hours per client. A quantitative cross-sectional study was subsequently done with patients and staff over a two-week period. Data was collected using a questionnaire. Descriptive statistics were used to describe the association between patients' characteristics and overcrowding. Non-parametric tests (factor analysis) were used to describe institution factors that contribute to overcrowding, with Wilcoxon rank test being used to check whether patients took the four-hour ED timeframe specified in the hospital charter. The IBM-SPSS Statistics software was used for analysis. The study found that different patient characteristics contributed to overcrowding at the ED. Patient factors included age, mode of arrival, level of education and gender. Institutional factors contributing to overcrowding included nursing staff shortage, excessive time spent at the laboratory, poor coordination of workers, and an overall lack of inpatient beds, admissions rooms, and other resources. The hospital was found not to comply with the four-hour per-client throughput target specified on the charter. The study showed that overcrowding is a multifaceted challenge caused by a combination of patient, policy, and institutional factors. Study findings will inform policy and practitioners on areas to focus on in trying to reduce ED overcrowding and improving patient flow and experience through the health system.

Key words: patient characteristics, institutional factors, emergency department, overcrowding, throughput time.

Table of Contents

List of Figures

List of Tables

KEY DEFINITIONS

Overcrowding-Refers to the situation that impairs in the dispensation of acute care within the emergency department

Emergency Department-denotes medical facility or unit specializing in acute care patients or emergency department without prior appointment

Triage-Order or assignment for treatment to patients or casualties

Administrative Care Processes-Institutional or state regulatory procedures intended to maximize care delivery

Acuity-refers to nursing staff allocations

Patient Boarding Time-denotes time from the admission to the departure time from the emergency department

Re-Attendance- patients who revisit the hospital for treatment or those who come back after the first visit

LIST OF ABBREVIATIONS

ED -Emergency Department

IRB -Institutional Review Board

LOS - Length of Stay

SPSS -Statistical Package for the Social Sciences

HR - Human Resource

LB – Lack of Beds

EDD – Emergency Department Design

PF – Patient Factors

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DEDICATIONS

I dedicate this thesis to my fellow students and family who provided persistent support and assistance when I needed it. The students should use the findings of this research as the basis for seeking extra knowledge on the covered research area.

1 CHAPTER 1: INTRODUCTION

1.1 Background to the Study

Overcrowding in the emergency department (ED) is defined as situations where the patients exceed the treatment rooms or the staff required to meet the care needs (Erenler et al., 2014). Erenler and colleagues argued that high volumes of patients in EDs could lead to treatment crisis, particularly when the facility operates beyond its threshold capacity. Overcrowding has been described as a global concern that compromises access to emergency care by prolonging patient suffering, reducing the quality of care, and increasing fatalities (Pascasie and Mtshali, 2014).

Overcrowding in the ED can cause public health concerns and problems (Di Somma et al., 2014). Overpopulation in the hospitals is linked to diverse external and internal factors, which vary across institutions. ED overcrowding predisposes patients to increased morbidity, prolonged length of stay at the hospital, and increased mortality and morbidity (Di Somma et al, 2014). Although overcrowding may be an unpredictable occurrence in some instances, some argue that healthcare institutions should nonetheless institute measures to minimize the problem and promote efficiency (Rezaei, Yarmohammadian, Haghshenas, and Tavakoli, 2017).

With the problems such as overcrowding plaguing the Kenyan health system, more and more health facilities are recognizing the need to deal with such challenges that inhibit delivery of quality services (Wachira & Martin, 2011). The emergency care in Kenya has less sophistication than in developed countries, where the specialty is a fundamental aspect of public healthcare. Many Kenyan hospitals already operate with poorly developed emergency care departments, which worsen when overcrowding occurs (World Bank, 2011).

Overcrowding may result in misidentification, misplacement of patients in wrong wards, delays in the administration of critical care and decreased patient. Interventions are developed based on the administrative capacity to identify the contributing factors (Rezaei, Yarmohammadian, Haghshenas & Tavakoli, 2017). System-wide interventions may not work if institutions do not diagnose the factors contributing to overcrowding within the emergency department (Moe et al., 2015). The causes of the problem are interwoven within the hospital processes, but the ultimate problem is the

adverse effects on the patients. Different studies have tried to evaluate the overcrowding but few have addressed contributory factors.

St. Francis Community Hospital offers healthcare services as a Faith-Based Hospital. The hospital is located in Kasarani, Nairobi and run by the Little Sisters of St. Francis of Assisi (one of the formations within the Catholic sisterhood). The hospital, with a bed capacity of 100 serves a neighborhood of 400,000 persons, predominantly comprising of low-income earners (St Francis hospital.or.ke, 2017).

1.2 Problem Statement

An emergency department should be able to provide quality care within appropriate time frames because it handles time-sensitive patients. This has not been achieved at St. Francis Hospital. It has an overstretched ED that often operates beyond its capacity. This compromises the ED's ability to offer quality care within acceptable timelines, which may result in adverse outcomes. According to Pascasie and Mtshali (2014), emergency care requires timely and accurate intervention from the physicians.

Bernstein and Aronsky (2009) noted that delays in care could result in adverse outcomes for patients, including increased morbidity and mortality rates, and more suffering for clients with time-sensitive conditions. Additionally, patients may leave to seek care elsewhere, resulting in loss of credibility, trust, and income. Unlike other departments, the ED exposes a Hospital's inefficiencies easily, as it is easy to see a poor balance between supply and demand for the emergency services. Worse still, delays at the ED are likely to compromise the continuum of care.

Overcrowding in the ED leaves patients unattended for long hours, which causes crowding at the hospital corridors and the waiting bay (Moe et al., 2015). Further, downstream, health services providers are prone to making medical and administration errors as they deal with the pressure of trying to serve many patients within a limited period. The errors lead to poor outcomes, increased waiting time, staff frustration, and prolonged pain and suffering.

Anecdotal evidence suggests that the St. Francis Community Hospital, like most other facilities of its size, suffers from the problem of ED overcrowding. However, no sufficient studies have been done in this country to better define and understand the problem. The bulk of Studies on ED were done in high-income countries that have

health systems that differ considerably from ours. There was little local knowledge on how the processes of care were organized, and what points along the continuum of care can be strengthened to reduce overcrowding and improve outcomes.

1.3 Research Objectives

1.3.1 General Objective

i. To describe the factors contributing to overcrowding at the Emergency Department of the St Francis Community Hospital in Nairobi Kenya, and examine the impact on patient throughput time

1.3.2 Specific Objective

i. To describe the association between patient characteristics and overcrowding at the emergency department of the hospital
ii. To examine the predominant institutional factors that contribute to overcrowding at the emergency department of the hospital
iii. To assess the extent to which the hospital was complying with its own throughput target of four hours per client in the emergency department

1.4 Research Questions

1.4.1 Main Research Questions

i. What are the factors that contribute to overcrowding at St. Francis Community Hospital and the impact of throughput time.

The main research has been broken down into the following sub-questions;

1.4.2 Sub-Questions

i. What is the association between patients' characteristics and overcrowding?
ii. What are the predominant institutional factors that contribute to overcrowding?
iii. Is the throughput time of 4 hours being achieved?

1.5 The scope of the Study

The study focused on factors contributing to overcrowding in the ED of St. Francis community hospital. The study sought to extend existing knowledge on overcrowding within Kenyan hospitals. The research also sought to describe the nature of emergency care by looking at the overcrowding problem within one of the hospitals serving low-income earners in Kenya. The study limited the investigation to the ED by looking at

the personal characteristics of the patients, length of stay, and institutional factors contributing to overcrowding at the St. Francis Community Hospital.

1.6 Significance of the Study

This study sought to enhance understanding of the issues that inhibit delivery of efficient service at one of the most critical departments in a hospital. The knowledge will help the administration to come up or implement the mitigation factors. Study findings will also help ED specialists and healthcare administrators to develop a reliable process to facilitate easy admission and discharge of patients. The investigation seeks to show the importance of restructuring the ED and critical healthcare system to ensure effective functional processes. Recommending reduction of overcrowding and creating efficient processes in the throughput process will build public image and financial performance in hospitals. Dealing with overcrowding will ensure hospitals focus on deliver satisfactory service beyond the financial implications associated with the ED.

The patients will also be beneficiaries of this study because they will receive quality care within the acceptable time frame.

Findings will inform local administrative policy to increase efficiency in the emergency department translating to improved health outcomes for clients seeking care.

The regulations from the national government should provide the accreditation needed to raise the performance standards within the ED of hospitals. Additionally, the study enhances strict requirements for the accreditation for throughput processes to enhance patient and hospital related performance.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The following chapter contains a review of the literature, which has conceptualized contributing factors to overcrowding in the ED. The review begins with the definition of concepts. Additionally, an empirical review of literature addresses findings from published studies on the subject and a theoretical framework that includes systems theory and theory of constraints. A methodological review of literature helps to come up with a conceptual framework, which is primarily based on Asplin's acute care model.

2.2 Definition of Concepts

Different researchers have conceptualized the concept of overcrowding. Lo et al., (2014) defined overcrowding as the situation that impairs in the dispensation of acute care within the emergency department (ED). The researchers presented the definition from the perspective of a study that evaluated the effectiveness of the emergency medicine. According to Lo et al., (2014), overcrowding created demand for care services beyond the ability of the physicians and the nurses' to provide quality care. Qureshi et al. (2011) agreed with Lo et al. (2014) that the exceedingly high demand in the ED translates into poor health outcomes for the affected patients, dissatisfaction, and mortalities. Lo et al., (2014) developed the definition from the standpoint of the developed nation of Canada, but they affirmed the widespread and serious problem inhibiting quality healthcare.

Another concept relevant to the review entails emergency department services. According to Boyle, Beniuk, Higginson, and Atkinson (2012), the ED provides instant and timely care for emergency cases. The physicians and nurses must strike a balance that increases the capacity to provide quality care. Paul and Lin (2012) agreed that providing timely service amidst the high demand is an integral component of the emergency department service. The researchers associated the ED with complex operations that require physicians to adopt effective methodologies to maximize patient admissions or reduce the length of stay. Consequently, Paul and Lin (2012) described a situation where the patient throughput is high, and the length of stay is in accordance with the facilities as well as the abilities of the physicians or nurses.

Waiting times underline the overarching concept of overcrowding and have been conceptualized by different researchers. Holden (2011) viewed waiting times as concerns in the ED when they evaluated problems within the department and application of lean thinking in U.S, Canada, and Australia. Holden (2011) determined that the improvement of patient safety and care depends, on how the ED deals with the urgent care cases and execution of methodological frameworks in place. Jennings, Clifford, Fox, O'Connell, and Gardner (2015) extended the view of Holden (2011) by opening that waiting time is a product of proper practitioner service, which underlines the quality of care as well as patient satisfaction. The definition showed that the timely healthcare delivery in ED is critical for the achievement of the projected patient outcomes.

Patient or ED boarding is an integral element in the discussion of overcrowding. Singer, Thode Jr, Viccellio, and Pines (2011) established that prolonged boarding had negative patient outcomes, higher inpatient dissatisfaction, and increased mortality rates. The study depended on the analysis of observation of 90,000 visits in undisclosed hospital settings. Another study by Pines, Batt, Hilton, and Terwiesch (2011) found that reducing boarding within the ED would maximize the patient outcomes and financial results while ensuring effectiveness in the admission of the patients. The analysis by Pines, Batt, Hilton, and Terwiesch (2011) inclined towards bed management capacity through reduction of boarding times within the EDs. Although Pines, Batt, Hilton, and Terwiesch (2011) focused on financial outcomes, they emphasized the essence of sustained demand for quality care within the EDs by preventing situations that lead to the excessive occupation on borrowed beds.

This study adopts the following definition of overcrowding, A situation that occurs when the demand for care exceeds the supply due to human factors, patient factors, and the hospital policies.

2.3 Theoretical Literature Review

2.3.1 Systems Theory

General systems theory and theory of constraints are the main theoretical frameworks for the study. According to Smith (2010), the general systems theory perceives the world through relationships and factors between each element of the whole system. Institutions or individuals must consider and evaluate each system but as an interdependent aspect of a total system .Systems theory further views a system as an integrated whole to the extent of becoming impossible to reduce it to small units (Smith, 2010).

Consequently, a systems approach emphasizes the principles of the organization rather than evaluating a system using basic building blocks. An organized system entails identification of diverse factors and their relationship to each other, which can affect the whole system. For example, the layout or organization of the ED can have a significant influence on the throughput processes of all patients under evaluation and treatment. It follows, therefore that physicians' capability of identifying the interaction of factors could determine the outcomes of critically ill patients.

Guided by the systems theory described by Smith (2010), an ED is a system structured to provide care for patients with emergent life-threatening conditions. The input, throughput, and output components make up the ED system. The factors can be classified based on how they affect the ED processes. Alteration of the factors can result in delays, which could change the entire system. Healthcare managers could implement processes changes after they identify factors that contribute to delays in the throughput processes.

This theory was used in the study to help the hospital understand that it is good to focus on all the dimensions and factors that are associated with overcrowding so as to make an impact on solving it. If one factor is addressed and others are left out overcrowding will still exist. These factors comprise of patient characteristics and institutional factors.

2.3.2 Theory of Constraints

The Theory of Constraints focuses more directly on bottlenecks in processes. Goldratt emphasized the value of identifying the most important limiting factor or constraint that prevents the achievement of a goal (Lighter, 2011). The theory argues that by setting up measures to remove the constraints, improvement would be achieved. Bisogno,

Calabrese, Ghiron, and Pacifici (2017) observed that the theory encompasses the inefficiencies and bottlenecks within the ED, which limit the achievement of quality care or required a length of stay. When applied to healthcare processes, the theory can have value in establishing practices where patients get quality care without having to deal with waiting times or inadequate facilities (Story, 2016). For this study, identifying system constraints can be seen as a form of operations research done to identify factors that contribute to overcrowding at the ED of St. Francis Community Hospital.

Escobar, Vega, and Zamora (2016) pointed out that identifying constraint helps to create value by promoting patient-flow and maximizing doctor-patient interaction. The Theory of Constraints would provide normative guidance on identifying bottlenecks and proposing measures to mitigate their impact on hospital care (Bisogno, Calabrese, Ghiron & Pacifici, 2017). Dynamic systems in the hospitals require proactive measures to prevent situations that frustrate the delivery of healthcare (Story, 2016). The theory of constraints and system theory have a wider system of focus as opposed to Asplin's model which is most suitable because it is specific to overcrowding.

2.4 Empirical Review Of Literature

The following section outlines the findings from different authors about the causes of overcrowding at the ED.

2.1.1. Causes of Overcrowding

Different researchers have acknowledged overcrowding as a primary concern in the ED. Studies found diverse causes including organizational and patients factors i.e. demographic factors, prolonged length of stay (LOS), consultancy delay, insufficient patient beds and delayed imaging and testing (Erenler et al., 2014). According to Erenler et al. (2014) overcrowding has become a global problem, which limits the capacity of EDs to discharge relevant duties to the patients.

2.4.1.1 Patients Characteristics in the ED

2.4.1.1.1 Age

Knapman and Bonner (2010) found a link between aged patients and overcrowding within a medium-volume EDs. The research examined the triage level, waiting times, and physicians for 185 patients. The multiple linear regression analysis established that attending to patients aged over 65 years takes longer waiting times and assessments, which Erenler et al. (2014) associated with overcrowding. A comparative study by Bekmezian et al. (2011) determined the similar effect on overcrowding following the

assessment of LOS for children patients in the ED. The prolonged ED LOS showed that pediatric EDs register at least 8hours due to the sensitivity of children cases. However, the studies could not address the policy interventions needed for the population of young adults seeking treatment.

2.4.1.1.2 Acuity

Nagree et al. (2013) sought to quantify the effect of low-acuity patients in EDs and proportion of general practice. The estimation occurred in three tertiary hospitals in Perth, Western Australia and utilized data from Emergency Department Information Systems. According to Nagree et al. (2013), the low-acuity patients only accounted for 5% of LOS in the EDs, which showed that overcrowding could not, happen with low acuity patient attendances. Ekwall (2013) argued that knowledge of perceptions of medical needs may determine the assessment and triage decisions, but the severity of the medical conditions could lead to prolonged LOS. The cross-sectional survey used a small sample of 72 patients but it affirmed at acuity determines the assessment level, which leads to overcrowding when prolonged.

2.4.1.1.3 Non-urgent Cases

Examination of non-urgent patients in the EDs did not have a clear indication of how they could cause overcrowding. However, a systematic review by Durand et al. (2011) emphasized the non-urgent visits remains a controversial issue, which could translate into crowding and costs in the EDs. Analysis of 34 categories of non-urgent visits showed considerable variation (4.8-90%), which showed the current studies could not determine the link between non-urgent visits and overcrowding with utter reliability. Although Kubicek et al. (2012) profiled cases from EDs in the urban pediatric hospital; at least 43% affirmed their inability to receive treatment due to excessive patient volume.

2.4.1.1.4 Patient Volume

Another study by Saghafian, Hopp, Van Oyen, Desmond, & Kronick (2012) determined that patient volumes in the EDs are the primary cause of crisis-level overcrowding in the United States Hospitals. Although the hospital under investigation had sought to use different patient-flow designs, the responsiveness could not match the number of patients requiring emergency attention. Saghafian, Hopp, Van Oyen, Desmond, & Kronick (2012) argued that a high percentage of admitted patients and boarding time could create a bed-block, which translates to overcrowding. Even though the research

was based on a case study from a developed economy perspective, it would be important to determine whether similar findings would hold in resource-constrained settings like Kenya.

2.4.1.1.5 Patient Boarding Time

In a study involving patient boarding, Rabin et al. (2012) determined that the solutions to ED boarding and subsequent overcrowding problem have not been instituted well. Although some hospitals and countries across the United States have come up with interventions and legislation, the study found hospital leaders who are reluctant to focus on ED department that focused on the hours or days of stays, which could contribute to the risks facing patients. Despite identifying gaps in the institution of interventions to mitigate boarding discrepancies, Rabin et al. (2012) did not provide solutions for making meaningful change within the department. The research only managed to view hours or days of stay as a compelling concern in ED crowding and subsequent mortality and morbidity.

Another study by Powell et al. (2012) was more explicit than Rabin et al. (2012) were because they focused on the association between inpatient discharge and ED boarding to affirm their effect on crowding. Examination of 28 ED patients and timing of the discharging process helped to determine the effect on boarding demand in the ED. Powell et al. (2012) established that timing of inpatient discharges was imperative for ED boarding but without stating how it could contribute to prolonged stays or bungled admissions. According to White et al. (2013), boarding discrepancies increased the length of stay of patients, which could lead to overcrowding.

Other factors that were found in the literature to be associated with overcrowding included a sudden surge in patient presentation especially after an accident or disease outbreak like cholera as well as contextual factors such as time of the day and day of the week.

2.4.1.2 Institutional Factors

2.4.1.2.1 Prolonged LOS

A retrospective study by Nicks and Manthey (2012) focused on the adverse effects of resource utilization and throughput processes between January 2007-08. The examination took place in an inpatient ward for psychiatric patients. Comparative analysis of1438 psychiatric and non-psychiatric adult admissions showed a significant increase in the LOS in the ED due to inefficient reimbursement process. Nicks and

Manthey (2012) found that the LOS within the inpatient wards prevented bed turnover required to accommodate extra patients. Similar findings emerged from a study by Forero, McCarthy, and Hillman (2011) but viewed LOS as an access block element causing overcrowding in the ED in Canada and U.S. The overcrowding problem is getting worse despite the initiative to mitigate LOS or access block to maximize quality patient outcomes (Crawford et al., 2014; Affleck, Parks, Drummond, Rowe & Ovens, 2013).

2.4.1.2.2 Insufficient inpatient beds

Zhou et al. (2012) carried out a multivariate logistic regression analysis that traced the overcrowding problem to insufficient patient beds in California hospital. Examination of daily hospital occupancy in the ED for 24 hours and 20,276 emergency admissions showed a significant discrepancy in boarding. At least 14% of the urgent patient cases could not be accommodated due to increased incidences of serious complications but without bed capacity. The resultant effect was overcrowding, which predisposes patients to poor treatment and mortality within the ED (Sun et al., 2013; Erenler et al., 2014). Stowell et al. (2013) discovered that the saturation of wards led to outlying of patients, which exacerbates the overcrowding problem although the research was done in high-income country some of the outcomes of the findings can still apply to low resource settings in Kenya.

2.4.1.2.3 Delayed Testing and Treatment

Rooney and Schilling (2014) viewed overcrowding as an impediment when they sought to evaluate its relationship with point-of-care testing in the ED. The prolonged testing time emerged as a contributory factor to overcrowding despite the study failing to associate with any particular hospital. Kocher, Meurer, Desmond, and Nallamothu (2012) found that delayed testing and treatment led to overcrowding due to increase LOS. The researchers analyzed data from a National Ambulatory Medical Care survey between 2006 and 2008. The analysis showed LOS for an ultrasound, treatment, or performance of urgent procedures exceeds 20minutes, which translated into increased time. The treatment and testing costs in the ED increase overcrowding when hospitals fail to use computerized processes or embracing faster decision-making (Spalding, Mayer, Ginde, Lowenstein & Yaron, 2011; Qureshi et al., 2011).

2.2.1.0.4. Delay of consultations

Brick et al. (2013) identified the delayed consultations as causes of prolonged LOS, which in turn led to overcrowding for EDs admitting patients with dementia. The study examined consultations for 1180 patients who were undergoing urgent procedures at two Canadian EDs. The prospective cohort study found varying times for consultation decision time, which accounted for 333-55% of LOS. Consequently, delayed decision-making among ED consultants increases to ED LOS (Horng et al., 2013; Soong, High, Morgan & Ovens, 2013). Overcrowding occurred when ED throughput increased as determined by Brick et al. (2013) in the Canadian EDs. However, the research explained overcrowding from a developed country rather than present generalizable findings for EDs in low-income countries. On the other hand, current literature traces diverse effects of overcrowding within the ED.

2.4.1.3 Administrative Care Processes

Qureshi et al. (2011) associated decision-making process in the ED with possible overcrowding in the ED. The research focused on the impact on the management of acute care emergency surgical services to determine the primary outcome of the administrative focus on timely surgical decision-making. Qureshi et al. (2011) found out that the administrative capacity to implement and respond to the timely request as well as consultation could expedite admissions at the ED. Proper surgical decision-making was associated with increased admissions and reduction of time required to treat the surgical patients requiring emergency services.

Another study by Konrad et al. (2013) agreed with Qureshi et al. (2011) that decision-making was an imperative element in the administration of ED following their computer-simulated study. However, Qureshi et al. (2011) opined that the implementation of split-flow processes for the patient management was imperative for the hospital seeking to reduce congestion and waiting. Konrad et al. (2013) further found that the split-flow process could be effective in reducing overcrowding because it responds to dissatisfaction, staff morale issues, and unsafe conditions. Analysis of the post-implementation metrics such as hospital data before the execution of split flow operation showed significant improvement, which affirmed that overcrowding in ED could be an administrative lapse.

The study of triage liaison physicians within the ED by Rowe et al. (2011) expanded assertions of Konrad et al. (2013) on concerns that determine operational efficiency.

Although the research was prone to subjectivity for using a systematic review, examining the effectiveness of the triage liaison physicians established an imperative administrative element within the ED Rowe et al. (2011) review of different articles questioned the effectiveness of triage liaison physicians but without providing succinct directions on solving overcrowding. The study inclined towards possible human and financial resources contributing to overcrowding within the ED.

Another study by Affleck et al. (2013) viewed overcrowding at the ED as a problem of administration but could not determine the contributory factors to the severity level in a Canadian Hospital. The assessment of care processes such as patient transfer, initial physician assessment helped to create a multifaceted perspective on the factors that led to overcrowding. Affleck et al. (2013) provided a general overview of the minimization of processes that delay securing beds for patients in the ED. The study showed that seeking solutions and interventions at the ED level was imperative for a healthcare system seeking to prevent the consequences of overcrowding. Conversely, current authors and researchers have diverse views about patterns of patient characteristics within the realm of overcrowding in ED.

2.4.1.3.1 Bottlenecks within the ED

Researchers have established several bottlenecks that may occur during the patient flow process in the ED. The following figure summarizes typical patients flow process at the ED of most hospitals. Bottlenecks may be encountered at any of the service points indicated below.

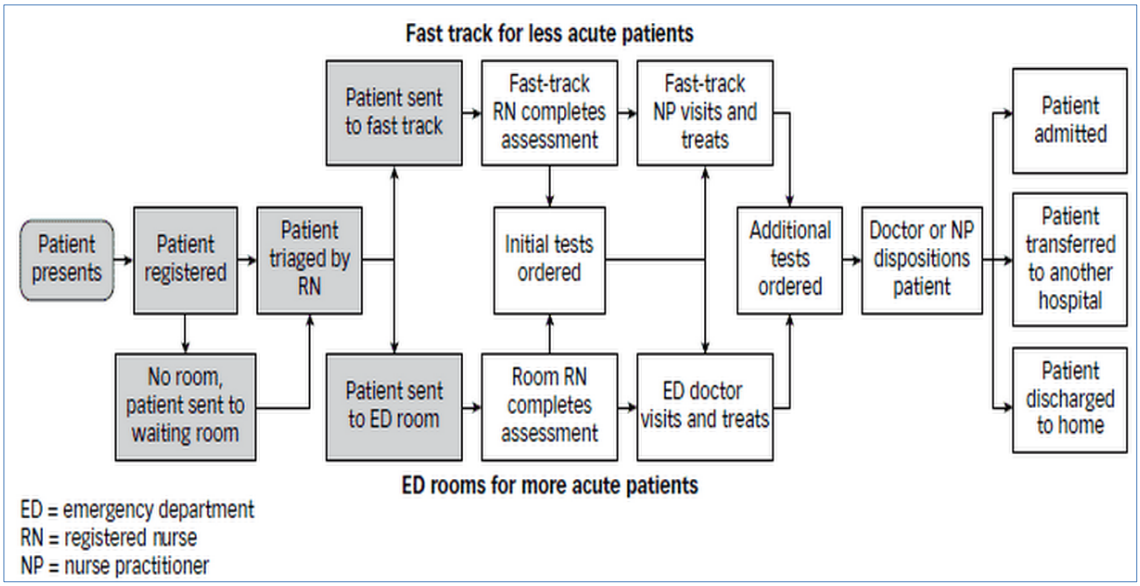

FIGURE 2.1: PATIENT FLOW MAP IN THE ED

2.4.1.3.2 Registration Inefficiencies

An investigative project by Smith (2009) identified diverse bottlenecks within the ED, which contribute to overcrowding. The study determined that the delays in the throughput process in the ED lead to crowding. The existence of manual registration, boarding time, and volume of patients were found to have a significant contribution to inefficient patient flow with the ED.

2.4.1.3.3 Prolonged Triage

Arora (2009) agreed with Smith (2009) that any influence or impediment on the parallel patient flow could increase the LOS in the ED and consequently lead to overcrowding. According to Rowe et al. (2011), the effectiveness of triage determines the efficiency of the throughput process. Although triage nurse order could reduce overcrowding in the ED, it could lead to delay and bungled patient flow if physicians fail to create an effective framework. The study identified the need to reduce the LOS, medical errors and create interventions that increase patient satisfaction. The literature provided an internal based perspective of the bottlenecks that contribute to crowding.

2.4.1.3.4 Limited Beds

Chang et al. (2012) focused on identifying bottlenecks within the ED but from the standpoint of the psychiatric clinician. The prospective cohort study found that the rate-limiting steps such as staff unavailability, limited beds after discharge, and clinical instability were some of the administrative obstacles to the achievement of required

efficiency and patient flow in the ED. Despite the findings by Chang et al. (2012) limiting their generalizations to ED in psychiatric institutions, it provided a perspective of ED where the internal issues within a hospital could contribute to overcrowding significantly. Resultantly, increase in the ED waiting time increased crowding and incapacitated physicians from conducting a necessary assessment as well as treatment.

2.4.2 Meeting Throughput Requirement

Analysis of literature on ED throughput by Sun (2009) aimed to determine the factors that could alter the ED's throughput time. The search for literature and report writing were subjective for lack of empirical analysis. However, the research identified issues such as low inpatient census, the point of care testing, urgent care areas, and in-room registration as possible source challenges in the process of complying with the throughput requirement. The study did not identify the explicit time needed for each patient in the ED.

Fulbrook, Jessup, and Kinnear (2017) viewed the achievement of the throughput in the ED as the sole responsibility of the navigator. The study utilized 20,000 presentations to determine the extent the navigator role could optimize the throughput time, and reduce the waiting times in the ED. The study used a compliance scheme of National Emergency Access Target, which is different from the policies set in a middle-income country. Fulbrook, Jessup, and Kinnear (2017) found significant time and cost-effectiveness following the assumption of the roles of nurses in the ED.

However, bed management is antecedent of high or low compliance with the throughput time as per the view of Howell, Bessman, Marshall, and Wright (2010). Although the settings of the study was a hospital in a developed economy, the findings found efficient throughput when proper bed management was undertaken in the ICU admission and ED. Correspondingly, Hillier et al. (2009) found high hospital occupancy has a negative effect on the throughput in the ED. The study did not enumerate the exact time needed for admission or discharge to create efficient patient flow.

2.4.3 Effects of Overcrowding

2.4.3.1 Patient Outcomes

A review of overcrowding in the EDs by McCarthy (2011) established adverse outcomes of the urgent and non-urgent patients. The study reported overcrowding as the contributor to the deteriorating patient dissatisfaction in many countries across the world. Although a study by Johnson and Winkelman (2011) was a review of literature of 276 journal articles, it presented overcrowding as the primary cause of poor satisfaction among patients and delay in treatment. The study might have errors due to the subjectivity of the researchers' reviews, but it affirmed adverse outcomes in the EDs when physicians cannot achieve the requisite operational rates. Similarly, Sun et al. (2013) understood overcrowding as the cause of inpatient deaths, delayed treatment, and overall cost implications for the patients during a cohort study in 187 hospitals.

2.4.3.2 Mortalities in the ED

A cohort study Guttmann, Schull, Vermeulen, and Stukel (2011) found an association between overcrowding and the short-term mortalities in the ED in Ontario, Canada. The study further attributed the departure of the patients to increased waiting time due to inability to accommodate the demand of patients. The effect of overcrowding on increased mortalities was the main highlight of another study by Geelhoed and de Klerk (2012). Geelhoed and de Klerk (2012) found that the EDs in Western Australia registered high-mortality rate between 2007 and 2010 despite the introduction of 4-hour rule to reduce access block and subsequent overcrowding in the EDs. The study confirmed the relationship between mortalities and overcrowding in EDs but limited to healthcare institutions from highly developed economies. However, current studies have suggested solutions to overcrowding but without addressing the problem from the standpoint of the low-income country like Kenya.

2.4.4 Solutions to Overcrowding in the ED

Despite identifying significant causes of overcrowding including prolonged LOS and insufficient patient beds, Erenler et al. (2014) recommended solutions to the problem. Understandably, experiences from education and research hospitals showed the need to increase collaboration between ED physicians and consultants to address overcrowding. The main contributory factor was increased LOS, which impedes the provision of sufficient healthcare to the patients in the ED. Additionally, Erenler et al.

(2014) recommended a systematic approach to the ambulatory systems in the ED to optimize the centers.

Another study by Hoot and Aronsky (2008) found that solutions within the EDs could translate into low mortality rates and patient satisfaction. The systematic review of 40 articles suggested diverse solutions including non-urgent referrals, expanding hospital bed access, additional personnel and crowding measures. However, the study only addressed perspectives of reducing overcrowding without associating it with a particular healthcare institution. Correspondingly, Olshaker and Rathlev (2006) argued that the ambulance diverse was one of the effective methods for solving the overcrowding crisis in the EDs.

2.5 **Summary of Gaps**

The current studies have addressed overcrowding but limiting the focus on hospitals in the developed economies such as Canada, UK, United States, and Australia. Studies done in these countries may not apply to our practice locally because of the difference in patient-provider ratio, the proficiency levels, availability of resources, disease pattern, and context, and the cultural background. The conceptualization of overcrowding within the EDs remains scarcely documented in low-income countries like Kenya. Therefore, a research to establish the contributing factors to the problem of overcrowding from the standpoint of ED in St. Francis Community Hospital is appropriate. Guided by the gap identified in the current studies, the following objectives were developed to guide the research process:

i. To describe the association between patient characteristics and overcrowding at the emergency department of the hospital. The objective aligns with the input factors identified in the conceptual framework, which include gender, sex, and type of illness, time of the day, the day of the week, non-urgent patients, and acuity of patients. The studies show the need to identify clients' characteristics contributing to overcrowding in the ED of St. Francis Community Hospital.
ii. To examine the predominant institutional factors, that contribute to overcrowding in the ED. Close-ended questionnaire to outpatient nurses and clinical officers at the emergency department were prepared.
iii. To determine whether the throughput time of four hours as the hospital charter is being achieved. One sample Wilcoxon rank test was used to determine if patients were indeed taking 4 hours in the ED.

2.6 Conceptual Framework

2.6.1 Asplin's Model of Acute Care

One popular framework used to study overcrowding is based on Asplin's Model of Acute Care. The model presents overcrowding as a problem caused by multiple factors. The framework presents overcrowding across three measurable points: input, throughput, and output. The model is based on the realization that overcrowding is a systemic problem across healthcare systems globally.

2.6.2 Input Factors

According to Asplin, Inputs factors are the ones related to patients presenting to the Emergency Department for care. These factors include the age group, sex, arrival mode, triage, tests and procedures, consults, diagnosis. The study will use these factors as the independent variables.

2.6.3 Throughput factors

Throughput factors in Asplin's model include ED activities that impede patient flow. The theory views EDs as complex systems that are susceptible to overcrowding when essential activities are mishandled. Poor ED design, inadequate physical space, number of medical and nursing staff may lead to crowding and payment process. Moreover, the time spent in the ED increases workload and waiting time as well as hindering proper patient flow in the hospital.

The throughput measures include ED occupancy rate, patients' total length of stay in the ED. The occupancy rate determines the number or volume of patients designated to treatment spaces within the ED. Asplin argued that overcrowding occurs when the occupancy rate exceeds 100%. The total length of stay and time taken to see a patient lead to overcrowding when the waiting is longer than 30 minutes. On the other hand, output measures lead to consideration of through measures by the framework of overcrowding.

2.6.4 Output Measures

These include ED boarding time, which underlines the admission decision by the physician. The number of patients boarding in emergency department designates the occupancy rate or capacity of the ED. Asplin's Model also identifies output factors such as lack of inpatient beds and inadequate critical care beds as contributors to overcrowding in the ED. Although hospitals focus on increasing the inpatient bed

capacity, issues such as quality standards, longer stays, and patient transfers reduce their capacity to control crowding.

The framework further views the prioritization of lucrative elective work as opposed to emergency admissions to drive crowding. The study prefers to get ideas from Asplin's framework when developing her own based on literature review because it encompasses specific issues that occur within the ED department. The framework will be applied in the inquiry to understand the contributing factors to overcrowding in the ED of St. Francis Community Hospital. A conceptual framework has been developed based on the propositions in Asplin's Model of Acute Care

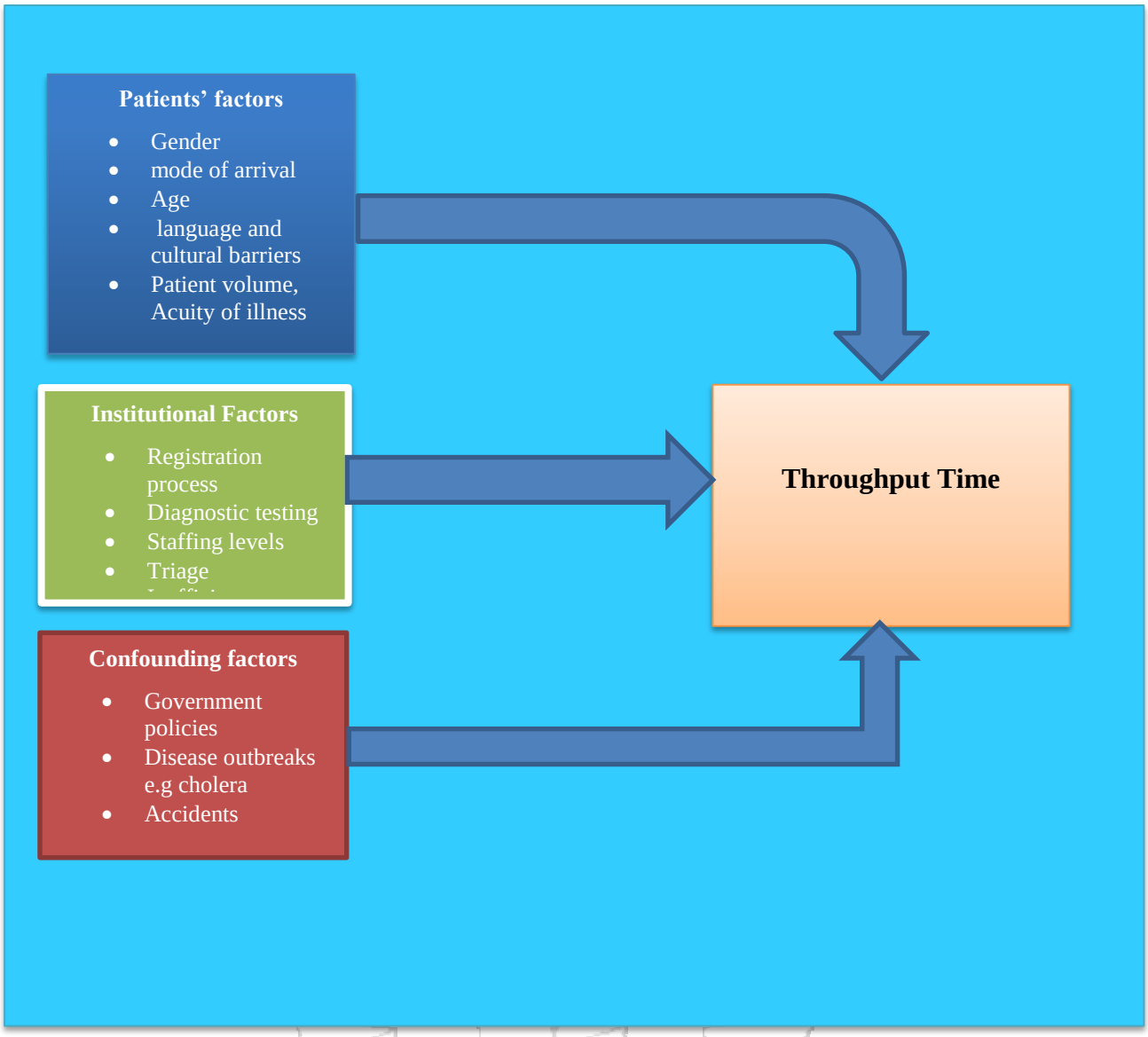

FIGURE 2.2: CONCEPTUAL FRAMEWORK

2.7 Study Variables

The following variables were used in the study:

TABLE 2.1: STUDY VARIABLES

Variables
▪ **Gender-** respondents were either male or female ▪ **Age-** patient charts will provide the correct ages of the patients ▪ **Level of education.** ▪ **Mode of arrival.** ▪ **Payment mode.** ▪ **Time of visit-** It represented the time the respondent will approach the help desk to express desire for ED services ▪ **Department.** ▪ **Diagnosis-** The study will group the subjects into specialties such as surgical, general medicine, and pediatrics. ▪ **Throughput time** the time between admission and discharge or time from arrival to the final disposition at the hospital ▪ **Human resource factors** ▪ **Number of beds** ▪ **ED design**

3 CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology used in the study. The section describes, the study design, study settings and population, sampling, and data collection methods and analysis. Ethical considerations are also discussed in the chapter.

3.2 Research Design

The study used quantitative cross-sectional design. Data was collected to examine factors that contribute to overcrowding at the ED. Cross-sectional studies provide a snapshot of the situation at a point in time (Le May & Holmes, 2012), which in this case was overcrowding in the ED. The cross-sectional view of the ED overcrowding situation will provide empirical and measurable evidence as necessitated by the doctrine of positivism (Le May & Holmes, 2012). The philosophy informs a research inquiry that enables provision of explanations and prediction to establish necessary and sufficient conditions under which overcrowding occurs in the ED. Making judgment based on logic reduced subjectivity or bias. The design was preferred as the most practical approach given time and resource considerations.

3.3 Study Setting

The study took place at the St. Francis Community Hospital in Kasarani, Nairobi, Kenya. This is a faith-based hospital serving a catchment population of at least 400,000 people and has an inpatient bed capacity of 100. The Hospital offers outpatient and inpatient services. The outpatient department sees an average of 300 patients per day. This number is composed of patient coming for various clinics, for example, well woman clinic, ENT, Orthopedics and the emergency patients. The average number of re-attendance or return patients to the emergency department is 30 per day.

3.4 Population and Sample Design

3.4.1 Target Population

The study population included staff and patients who were visiting the ED of the St. Francis Hospital but had been there before (re-attendants). There are 16 nurses and 13 clinicians working at the ED. The patients were chosen because they were the consumers of the ED service. The overcrowding problem affects the patients directly or indirectly. The staffs were selected because they have information on the processes and factors that may contribute to overcrowding since they have been working in the department.

3.4.2Sample Design

The hospital information system provided information about the number of outpatients seen at the facility as well as the number of staff working in each station. It also relayed basic information about the patients and number of staffs at a given time and the hospital occupancy rate. The sample was picked from patients who were seen in the emergency department for a period of one week.

A non-probability convenience sampling method was used to select the patients for the study. This was the most appropriate method given the nature of the emergency department, and also patients coming at different intervals and time of the day.

For the staffs nonprobability restrictive judgment sampling (purposive sampling) was used as the questions were targeting the nurses and clinical officers because they come into contact with the patient on a daily basis and have a wide range of perspective on the study topic. Informed consent procedures were sought before collecting any information on the samples.

3.4.1.1 Sample Size and Sampling Technique

The average number of attendance/return patients to the emergency department is 30 per day. The total number of patient per week was 210.

Therefore, the population size was 210 for the study period

*(30*7) = 210*

The sample size was calculated using the Yamane (1967:886) formula for proportions.

$$n = \frac{N}{1 + N(e)^2} \qquad \text{Therefore:} \qquad \frac{210}{1 + 210\,(0.05)\text{^}2}$$

$$n = 138$$

Where n is the sample size,

N is the population size

e is the level of precision

0.05 will be the margin of error.

For the staff, a universe of all the nurses and clinical officers was included in the study, as they were only 29 in total.

3.5 Inclusion and Exclusion Criteria

The following is the inclusion and exclusion criteria, which guided the enrollment of participants in the study.

3.5.1 Inclusion Criteria

- Patients returning for ED services at the St. Francis Community Hospital at the period of study
- Patients who have given their consent
- Subjects should be at least 18 years and above.
- Children below 18 years whose caregivers provide consent
- Staffs working at E/D who interact with the patients on a daily basis

3.5.2 Exclusion Criteria

- Patients from other departments other than ED
- Unstable patients in the ED
- Patients/Caregivers who decline to provide consent.
- Staff not working in the ED
- Staff working in ED but not interacting with the patient
- Patient visiting the ED for the first time

3.6 Data Collection Methods

Based on review of the literature and previous studies, a questionnaire was developed to guide data collection from patients and staff. Questionnaire items sought to collect information on the hospital/organization and patient factors that were associated with overcrowding at the ED. Informed consent was sought before administering the questionnaire. The questionnaire was divided into two broad parts;

Part 1: Questions on the socio-demographic characteristics

Part 2: Questions aimed at describing hospital factors that may be associated with overcrowding. For part two, five sets of items were investigated, namely, human resource shortages, lack of sufficient beds, the physical design of the ED, patient factors, and finally, other factors that may contribute to overcrowding based on staff views.

3.7 Data Analysis

Descriptive statistics was used to describe the patient's characteristics associated with overcrowding and a Pearson chi-square test was run to check for significance in objective one. A non-parametric test (factor analysis) was used for analysis of objective two touching on institutional factors that contribute to overcrowding in the ED. One sample Wilcoxon rank test was used to assess the extent to which the Hospital was

meeting the four-hour throughput time per patient at the ED, as outlined in the charter. The IBM-SPSS tool was used for analysis.

3.8 Dissemination and Utilization of Results

A report on the final research findings will be presented to the department for part fulfillment of the master's degree. Should an opportunity arise, a poster presentation will be made, highlighting the main findings from the study. At St Francis Hospital, a results dissemination meeting will be organized to share the key findings. This has already been agreed with the Hospital Management.

3.9 Research Quality

3.9.1 Quality

The questionnaire was pre-tested through a pilot study with 10 respondents to eliminate ambiguity and ensure proper flow. Le May and Holmes (2012) argued that the respondents should provide a consistent pattern so that the findings can achieve repeatability. Each observable measure throughout the patient flow process in the ED received the same approach, including time and resources.

3.9.2 Reliability

Reliability is the extent to which the research instrument will produce similar results in different circumstances and by different raters (Bolanirwa, 2015). Cronbach's alpha analysis was conducted to check the reliability of the instrument. The instrument is said to be reliable if it has alpha coefficient value above or equal to 0.6 (Hair et al., 2006; Lai and Chen, 2011; Malhotra, 2007). In research, a reliability coefficient alpha of at least 0.7is considered acceptable. In order to avoid a test-retest effect, each patient participant filled only one instrument during the study. To protect the integrity of the study, the patients who participated in the study were asked not to discuss their responses on the instrument with one another.

TABLE 3.1 CRONBACH'S ALPHA

	Reliability Statistics	
Organizational Factors	Cronbach's Alpha	N of Items
Human Resource	.767	5
Lack of beds	.564	5
Emergency Department Design	.021	4
Patient factors	.852	8

Table 2 shows that all the variables were reliable except emergency department design which could be attributed to few questions addressing it.

3.9.3 Validity

Content validity is the degree to which the instrument fully measures what it is presupposed to measure (Bolanirwa, 2015). This was achieved through an extensive review of the literature to ensure that the test items on the questionnaire fully captured the dimensions of the study topic.

3.10 Ethical Issues in Research

3.10.1 IRB Ethical Clearance

An ethical clearance from the ethical review board was sought. According to Smith and Parker (2013), an ethical clearance is required when human subjects are involved in the conduct of research. The ERB issued an approval upon determining the researcher's capacity to meet the honesty, accuracy, and sufficient protection of human subjects.

3.10.2 Seeking Consent from St. Francis Community Hospital

The researcher sought consent from the hospital by sending a letter of introduction and intent. The letter outlined the aims and objectives of the study as well as the benefits of the findings to the improvement of ED services at St. Francis Community Hospital. A leaflet of information was distributed to the staff and patients about the study to optimize participation.

3.10.3 Privacy and Confidentiality

The study provided a guarantee of privacy and confidentiality of information. The research did not ask or observe private treatment or consultation services.

4 CHAPTER 4: PRESENTATION OF RESEARCH FINDINGS

This chapter presents the outcomes of the study based on the questionnaires issued out. It portrays the rate of response and the way data was analyzed using IBM-SPSS software. This chapter presents the findings of the study as analysis and discussion in every finding. The study was guided by the specific objectives.

TABLE 4.1: RESPONSE RATE

Sampled Population		Sample Size	Respondents	Response rate
ED staff		29	29	100%
Patients		138	138	100%

The researcher issued out seventy 29 questionnaires for ED staffs and 138 to patients who were revisiting the ED. Surprisingly all the questionnaires issued were returned fully filled representing 100% response rate as shown in table 2.

4.1 Descriptive characteristics of patients.

Figure 3, 4, and 5 describe demographic characteristics of patients included in the study.

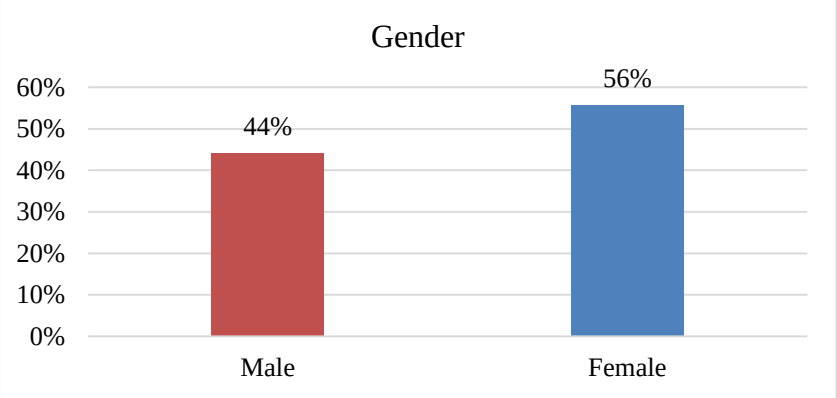

FIGURE 4.1: A BAR GRAPH SHOWING THE GENDER OF THE RESPONDENTS

Figure 3 shows there were more males than females sampled into the study.

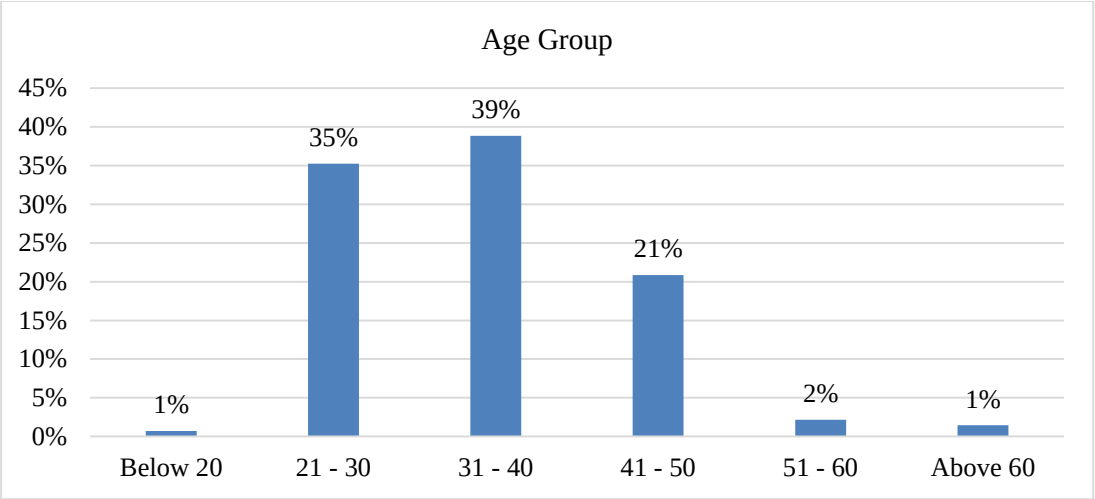

FIGURE 4.2: A BAR GRAPH SHOWING RESPONDENTS' AGE GROUP

The respondents belonged to different age groups; most were of ages 21 to 50 years as per figure 4. The study utilized a large youthful population.

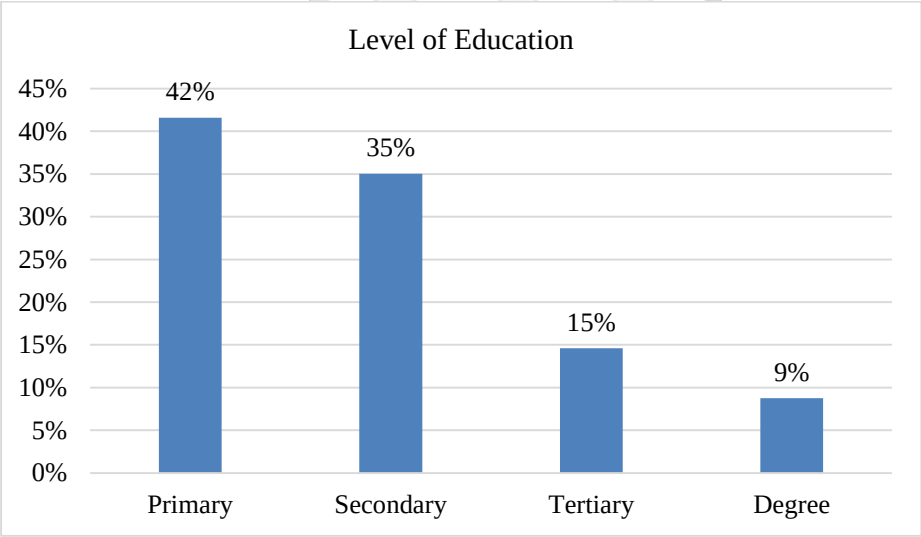

FIGURE 4.3: RESPONDENTS LEVEL OF EDUCATION

As shown in Figure 5, the majority of the respondents seeking ED services had only attained primary level of education. The population comprised of patients with secondary, tertiary, and degree level of education.

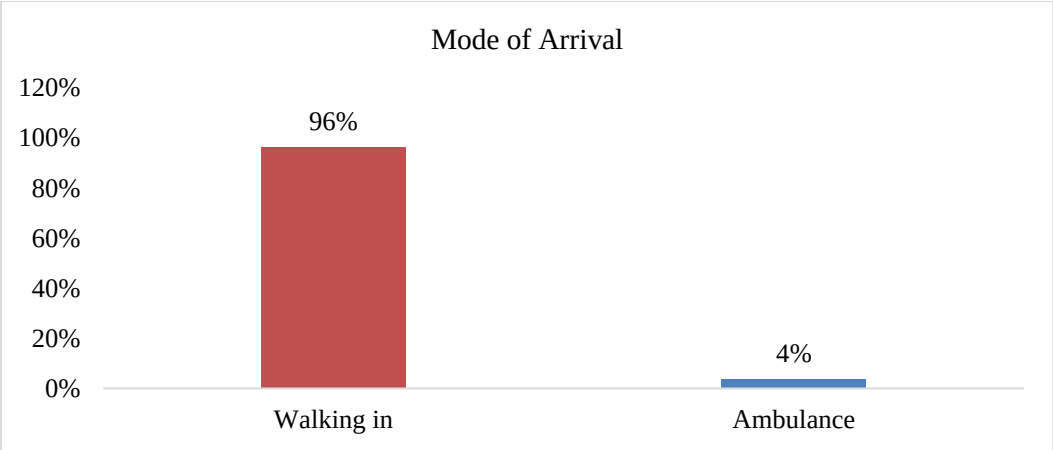

FIGURE 4.4: DIFFERENT MODES OF ARRIVAL AT ED

Figure 6 shows that most of the respondents were walk-in patients while only 4% arrived using ambulance services.

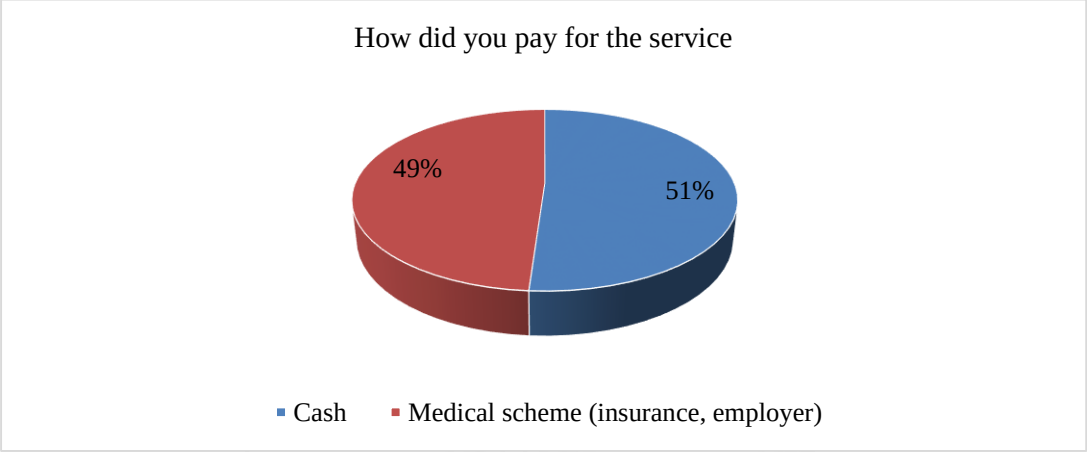

FIGURE 4.5: PIE CHART ON PAYMENT METHODS

As per Figure 7, the majority of the patients (51%) used cash to pay for the ED services while 49% medical schemes including employer and insurance cover options.

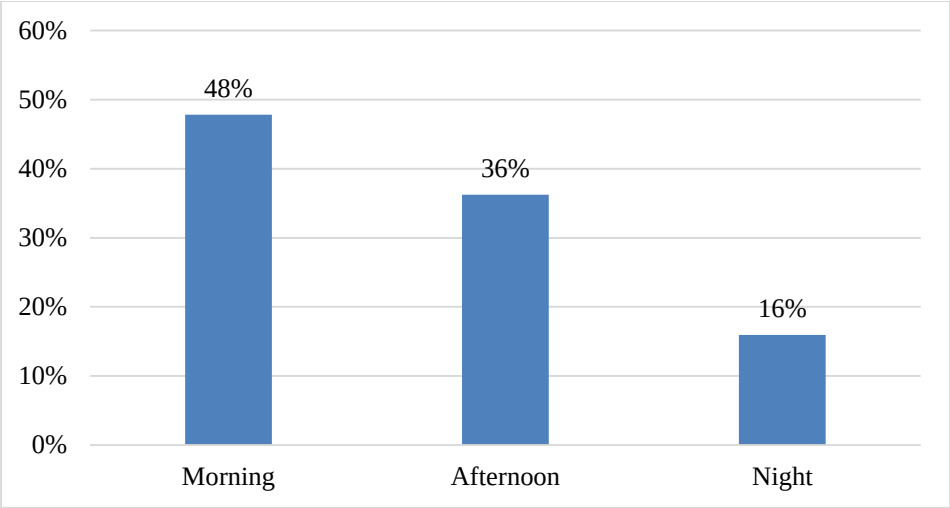

FIGURE 4.6: TIME OF THE LAST VISIT

Figure 8 shows the time of last time visit at the ED of St. Francis Community Hospital. Many respondents were recorded to have attended the hospital in the morning hours as compared to afternoon and night.

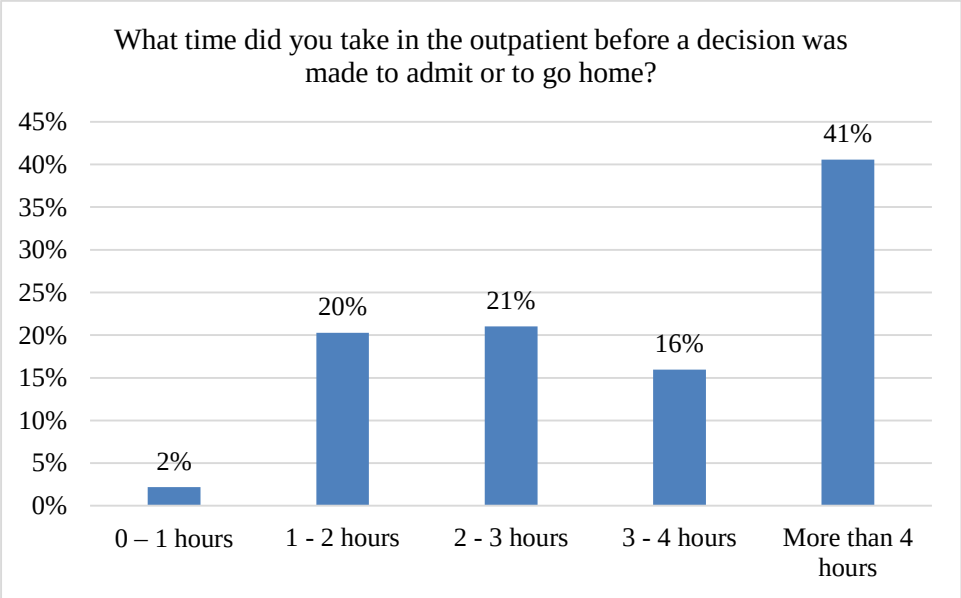

FIGURE 4.7: BAR GRAPH ON THE TIME TAKEN IN THE OUTPATIENT BEFORE ADMISSION OR GOING HOME AFTER DECISIONS WERE MADE

Majority of the patients (41%) took more than four hours for the physicians to make decisions for admission or going home as per Figure 9.

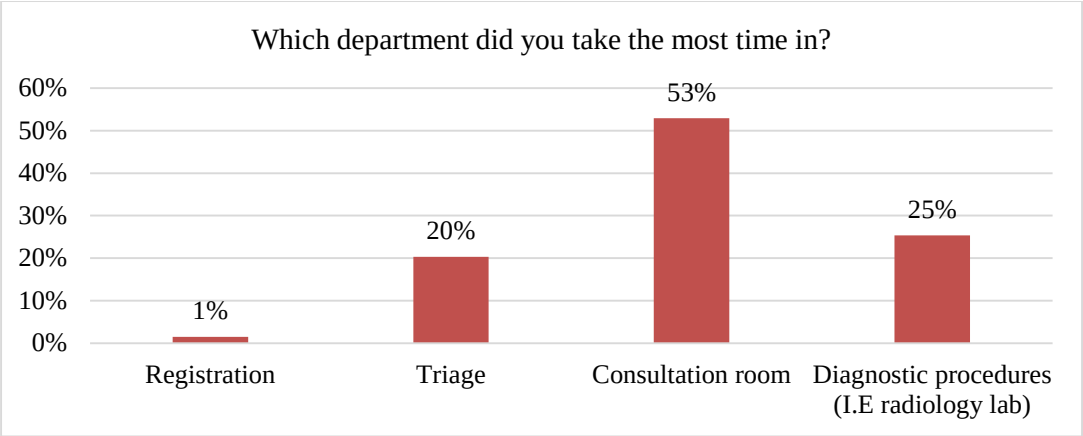

FIGURE 4.8: DIFFERENT DEPARTMENTS ATTACHED TO THE ED

The patient reported having taken more time in consultation when compared to other flow stations as shown in the bar graph in Figure 10. Time spent in the triage and diagnostic procedures had a close effect on the time. Registration was done relatively faster than other procedures.

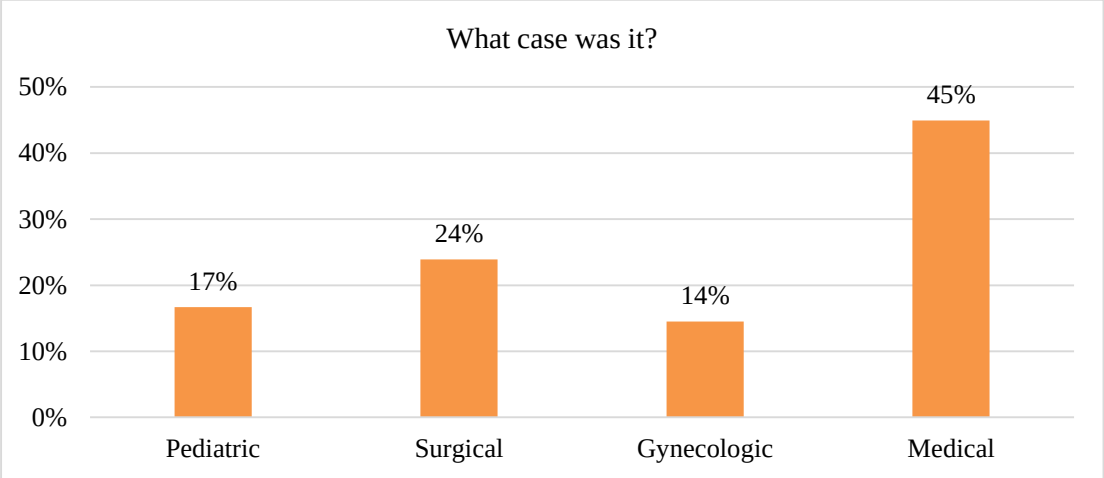

FIGURE 4.9: CASES HANDLE IN THE ED

4.2 Analysis of objective one

4.2.1 Cross Tabulation of patient characteristics and throughput time.

Different cases were handled in the ED as per Figure 11, most of them were medical cases (45%) followed by surgical at 24%).

1. GENDER VERSUS THROUGHPUT TIME

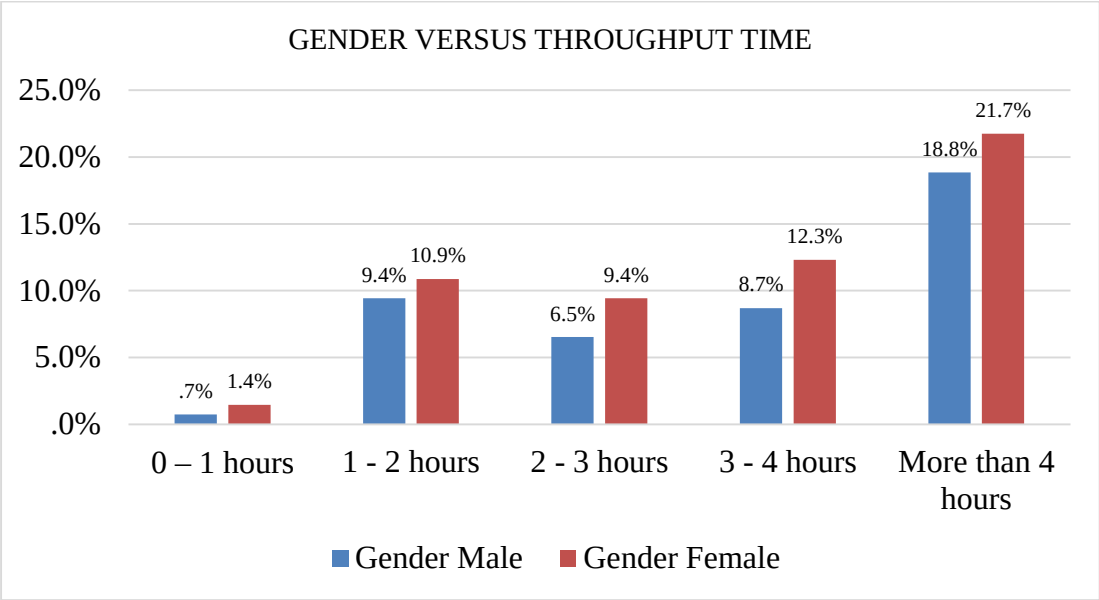

FIGURE 4.10: BAR GRAPH SHOWING THE TIME TAKEN BY EACH GENDER

Example: From figure 12 it is evident that 40.5% of the total respondents took more than four hours before a decision was made. More females took more than four hours as compared to males.

2. AGE GROUP VERSUS THROUGHPUT TIME

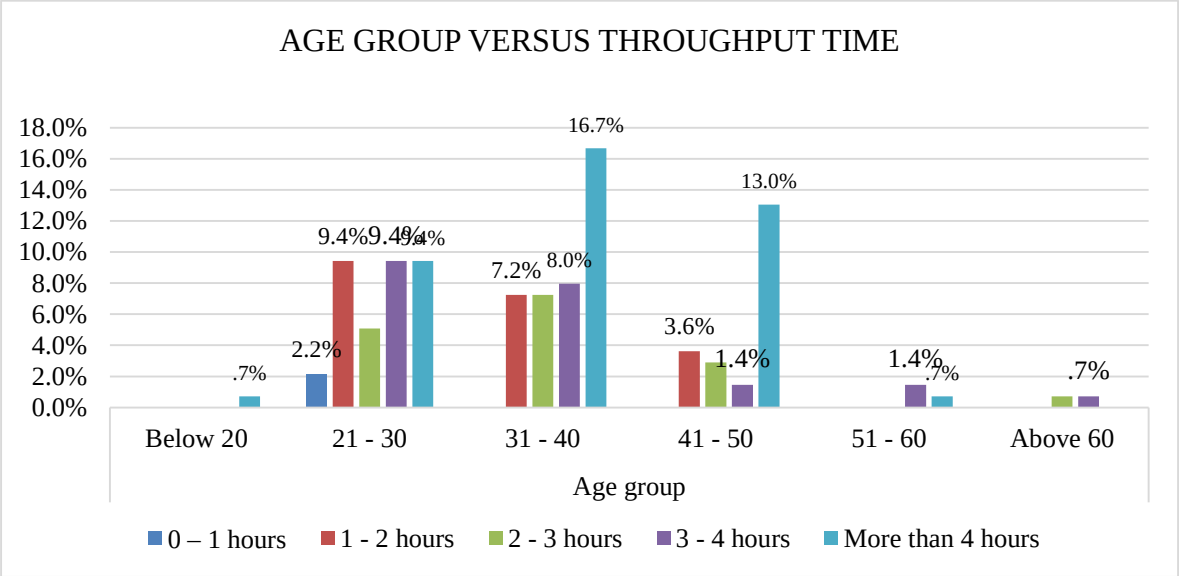

FIGURE 4.11: BAR GRAPH SHOWING THE TIME TAKEN BY EACH AGE GROUP

Figure 13 shows that 40.5% of all the respondents spent more than four hours before a decision was made to admit or discharge them. Among these, 16.7% were aged 31 –

40, 13.0% were aged 41 – 50, and the rest 10.3% were distributed in the remaining age brackets.

3. MODE OF ARRIVAL VERSUS THROUGHPUT TIME

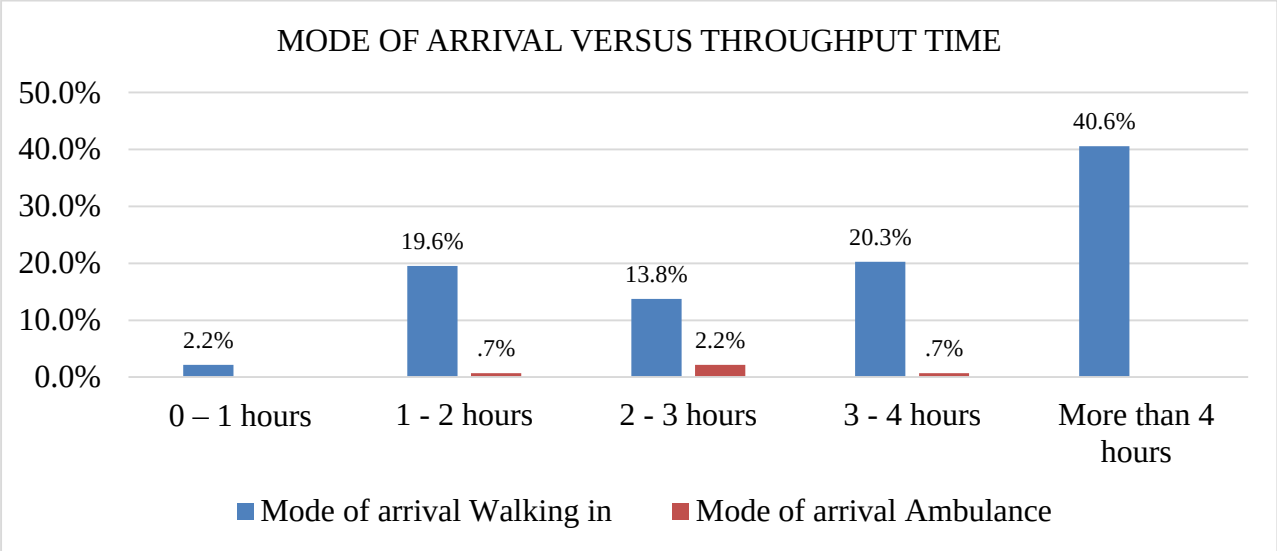

FIGURE 4.12: MODE OF ARRIVAL VERSUS THROUGHPUT TIME

Figure 14 shows that patients who took more time were walk-in or non-urgent clients as compared to those who came with the ambulance

4. LEVEL OF EDUCATION VERSUS THROUGHPUT TIME

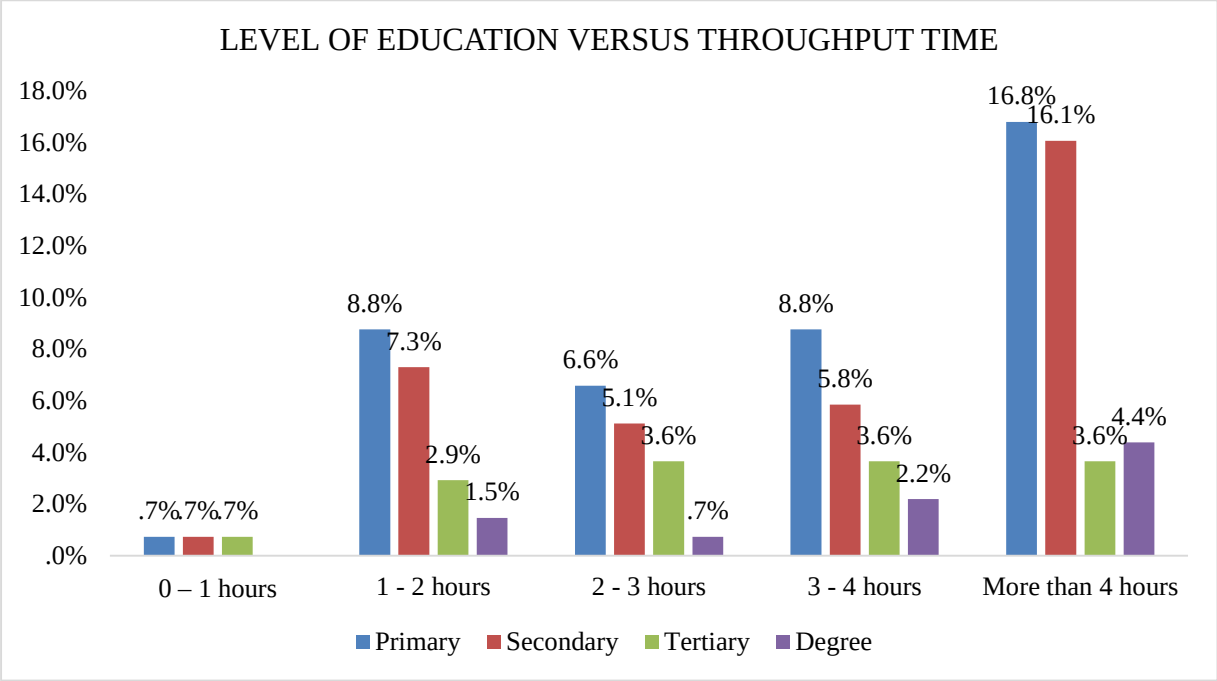

FIGURE 4.13: A BAR GRAPH SHOWING THE DISTRIBUTION OF TIME BY EDUCATIONAL LEVEL

Figure 15 shows that majority of those who spent more than four hours in the ED before a decision was made had attained primary and secondary education.

5. TIME OF THE LAST VISIT VERSUS THROUGHPUT TIME

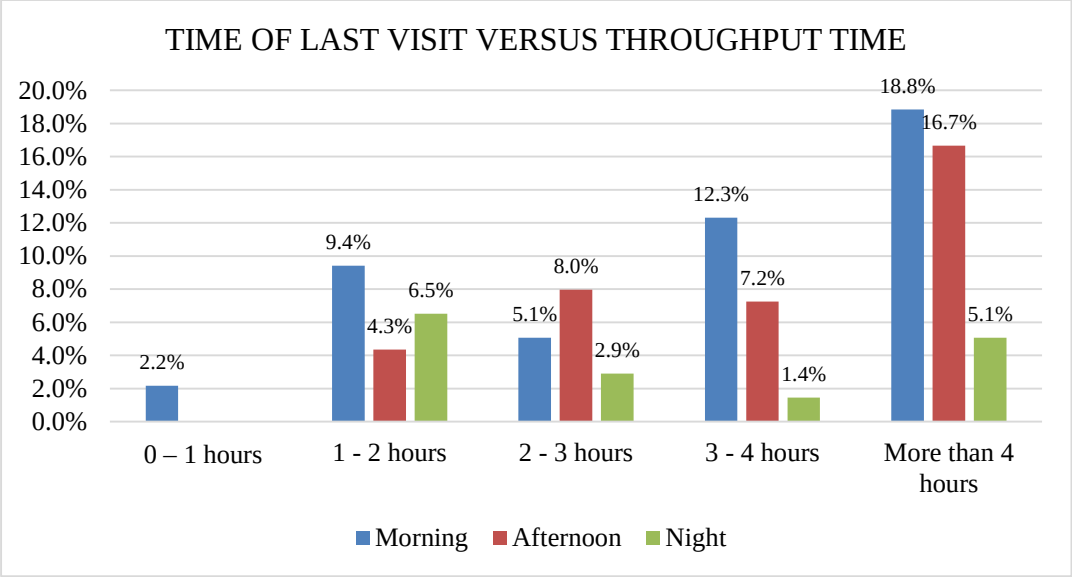

FIGURE 4.14: BAR GRAPH ON THE COMPARISON OF THE TIME OF THE LAST VISIT VERSUS THROUGHPUT TIME

Figure 16 shows that most of the patients that took more than four hours visited in the morning and afternoon.

6. DEPARTMENTS VERSUS THROUGHPUT TIME

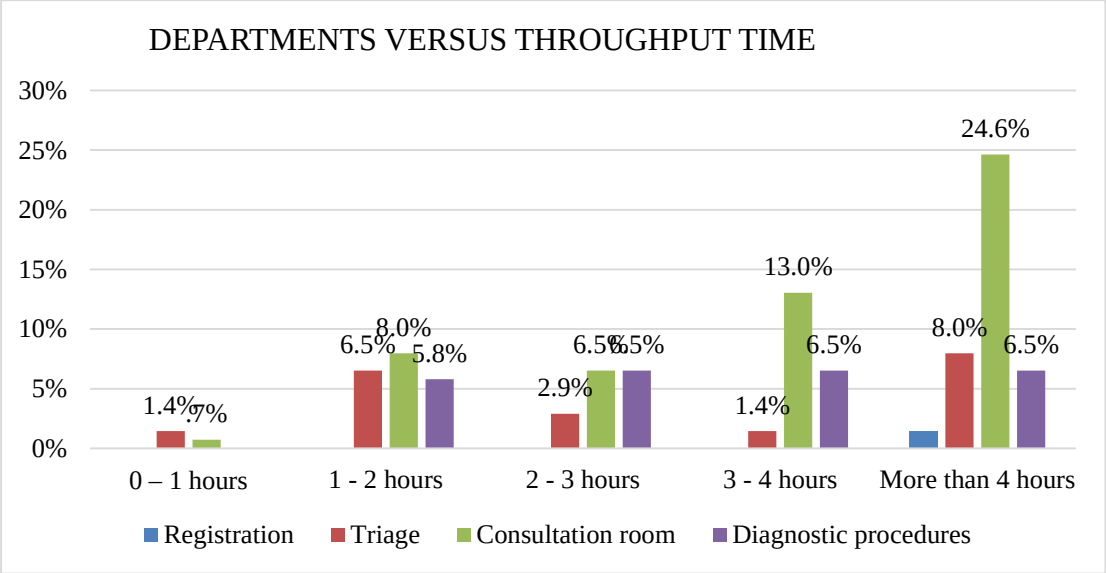

FIGURE 4.15: DIFFERENT DEPARTMENTS OF THE ED VERSUS THROUGHPUT TIME

Figure 17 shows that most patients (24.6%) took more than four hours in the consultation room.

7. DIAGNOSIS VERSUS THROUGHPUT TIME

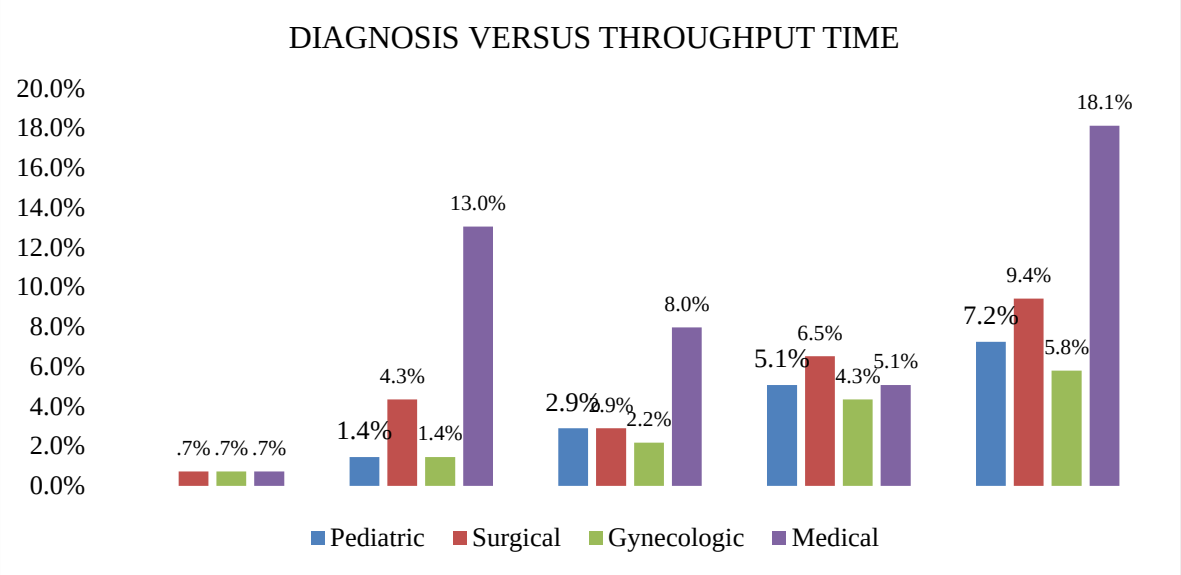

FIGURE 4.16: DIAGNOSIS VERSUS THROUGHPUT TIME

Medical cases took more time as compared to other cases this may be because most of the patients seen at the department are classified as medical cases as shown in Figure 18.

4.2.2 Pearson Chi-Square

TABLE 4.2: PEARSON CHI-SQUARE

Tests of Association			
	Pearson Chi-square		
	Statistic	df	p-value
Gender	.503[a]	4	.973
Age group	25.223[a]	20	.193
Mode of arrival	8.538[a]	4	.074
Level of education	5.085[a]	12	.955
Time of last visit	15.007[a]	8	.059
Which department did you take the most time in?	18.820[a]	12	.093
what case was it	12.087[a]	12	.439

The Pearson Chi-square was run after the descriptive cross-tabulations to check for the statistical significance of the independent variables (patient characteristics) in explaining throughput time. Table 4 shows that only mode of arrival and times of the last visit were significant at 0.1% level of significance. This may be attributed to a small sample size, which led to no major differences among groups e.g. the proportion for gender and level of education (primary and secondary) were almost equal in number.

4.3 Analysis of Objective Two

To identify the institutional factors that contribute to overcrowding in the ED

In this objective, factor analysis was deployed to identify the main determinants of overcrowding in the emergency department.

Factor analysis is a data reduction technique, which is carried out using a correlation matrix of variables of interest. A set of variables are combined to a new smaller set of variables called factors. These factors represent a weighted mean of the original data, which are latent variables (variables that cannot be observed). Factor analysis, which uses the principal component analysis and Varimax rotation, was used to extract factors subject to KMO, Barlett tests and an Eigenvalue cut-off of 1.0.

4.3.1 Sampling Adequacy Test (KMO and Bartlett's Test)

Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was used to determine whether factor analysis should be appropriate to yield distinct and reliable factors or determine important variables. The interpretation of results is defined as follows:

0.0 – 0.49 unacceptable
0.5 – 0.59 miserable
0.6 – 0.69 mediocre
0.7 – 0.79 middling
0.8 – 0.89 meritorious
0.9 – 1.00 marvelous

The table below presents coefficients of KMO.

TABLE 4.3: KAISER-MEYER-OLKIN MEASURE OF SAMPLING ADEQUACY

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	
Human Resource	.710
Lack of beds	.523
Emergency Department Design	.569
Patient factors	.467

The table shows that coefficient of KMO is greater than 0.5 hence the sample is adequate to proceed with factor analysis except for patient factors which were less than 0.5 which is unacceptable. Although the patient factors are not significant it is an important factor in our research hence we did not eliminate.

The Bartlett's Test of Sphericity is the test for the null hypothesis that the correlation matrix has an identity matrix. My interest is to determine some relationship between variables hence we should reject the null hypothesis for us to conclude that the correlation matrix is not identity matrix if the p-value of Bartlett's test of Sphericity is less than 0.05.

TABLE 4.4: BARTLETT'S TEST OF SPHERICITY FOR INSTITUTIONAL FACTORS

Bartlett's Test of Sphericity	Approx. Chi-Square	P values
Human Resource	48.864	.000
Lack of beds	43.173	.000
Emergency Department Design	39.782	.000
Patient factors	73.137	.000

Table 6 shows the p values are all less than 0.001, meaning the null hypothesis is rejected. It then follows that the Bartlett test of Sphericity is highly significant, and that factor analysis should be carried out.

4.3.2 Human Resource- Organizational Factor

4.3.2.1 ***Data Screening***

The first step in factor analysis is to determine the inter-correlation between variables of interest. The variables should have a strong correlation, but not too strong, such that they suffer multi co-linearity effects. Variables that do have a very weak correlation coefficient which is not significant at 5% level of significance should be removed and variables with a correlation coefficient of greater than 90% are eliminated.

A correlation matrix was run for the five set of questions relating to human resource. The five questions were defined as shown in the table below:

TABLE 4.5: FIVE HR QUESTIONS USE FOR CORRELATION

HR1	1. There is a shortage of medical staff specialized in emergency medicine.
HR2	2. Shortage of nursing staff specialized in emergency.
HR3	3. Long time consumed in laboratory, radiology and other procedures.
HR4	4. Lack of coordination between workers in the emergency department may lead to overcrowding
HR5	5. The physician documentation process is tedious leading to patients spending more time.

The table below represents a correlation matrix, which shows correlation coefficient in the first row and their significance in the second row for each variable.

TABLE 4.6: CORRELATION MATRIX OF HUMAN RESOURCE FACTORS

Correlation						
		HR1	HR2	HR3	HR4	HR5
HR1	Correlation Coefficient	1.000	.150	.270	.033	.000
	Sig. (2-tailed)		.438	.165	.866	.998
HR2	Correlation Coefficient	.150	1.000	.661**	.469*	.565**
	Sig. (2-tailed)	.438		.000	.010	.002
HR3	Correlation Coefficient	.270	.661**	1.000	.450*	.423*
	Sig. (2-tailed)	.165	.000		.016	.028
HR4	Correlation Coefficient	.033	.469*	.450*	1.000	.627**
	Sig. (2-tailed)	.866	.010	.016		.000
HR5	Correlation Coefficient	.000	.565**	.423*	.627**	1.000
	Sig. (2-tailed)	.998	.002	.028	.000	

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Determinant =0 .125

From the table above, there is a relationship between the five variables. The relationship is statistically significant except for HR1 and HR2, HR1and HR3, and HR1and HR4, which had p-values (highlighted in yellow) of greater than 0.05. There is no multicollinearity effect since the correlation coefficients are below 0.9. The determinant coefficient of 0.125 > 0.0001 which confirms the multicollinearity effect is not statistically significant. Although the first variable HR1 is not statistically significant in the correlation table, it was not eliminated since it is an important variable in this research.

4.3.2.2 ***Factors Extraction***

Principal component analysis will be used to identify variables that account for more variability and extract new factors based on the total variance explained as shown in the table below.

TABLE 4.7: FACTOR EXTRACTION OF HUMAN RESOURCE VARIABLES

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.801	56.019	56.019	2.801	56.019	56.019
2	1.105	22.104	78.123	1.105	22.104	78.123
3	.510	10.195	88.318			
4	.370	7.399	95.717			
5	.214	4.283	100.000			

Extraction Method: Principal Component Analysis

From the table 9 above the components in the first column are the numbers of the variables used in the Factor Analysis. The initial Eigenvalues are the variances of the factors to be extracted. The total column contains the Eigenvalue. The first factor will always account for the most variance and hence have the highest Eigenvalues. The next

factor will account for as much of the leftover variance as it can and the same will continue until the last factor. The percentage of variance represents the percent of total variance accounted by each factor and the cumulative percentage gives the cumulative percentage of variance account by the present.

This table shows you the actual factors that were extracted. If you look at the section labeled "Rotation Sums of Squared Loadings," it shows you only those factors that met cut-off criterion (extraction method). In this case, there were two factors with eigenvalues greater than 1. Factor 1 accounts for 55.858% of the variability in all 5 variables, and Factor 2 accounts for 22% of the variability. These two factors explain 78.123% of the total variability. The scree plot below also confirms the number of factors to be extracted when the curves starts to level off. In this case, the curve started to level off or becoming less steep after the second component hence, only two factors were extracted.

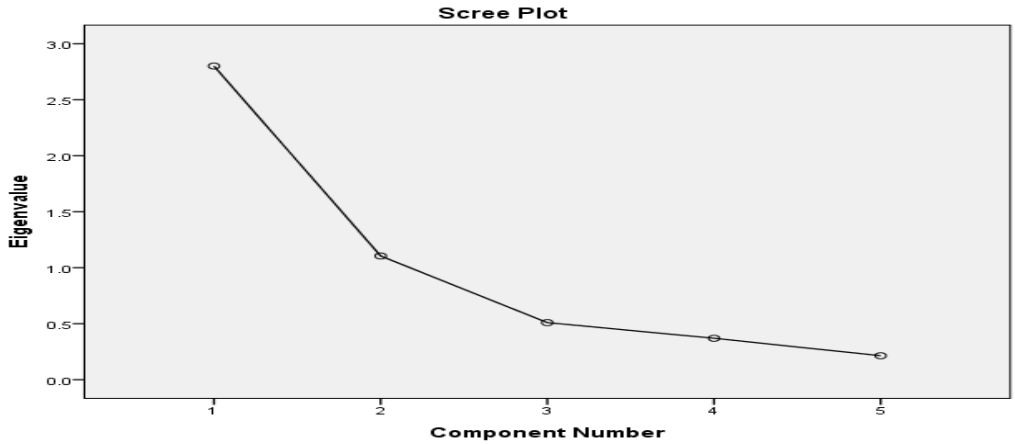

FIGURE 19: SCREE PLOT CONFIRM OF FACTOR EXTRACTION

4.3.2.3 Factor Rotation

After extraction of factors, the variables were subjected to varimax rotation. The Rotated Component Matrix represents the rotated factor loadings, which are the correlations between the variables and the factors. The factor column represents the rotated factors that have been extracted out of the total factor.

TABLE 4.8: FACTOR ROTATION OF INSTITUTIONAL FACTORS

Rotated Component Matrix[a]

	Component	
	1	2
HR1	.010	.957
HR2	.794	.318
HR3	.864	.161
HR4	.847	-.253
HR5	.836	-.083

Extraction Method: Principal Component Analysis

Rotation Method: Varimax with Kaiser Normalization

The above matrix gives the correlation of the variables with each of the extracted factors. Usually, each of the variables is highly loaded in one factor and less loaded towards the other factors. To identify the variables, included in each factor, the variable with the value maximum in each row is selected to be part of the respective factor. The values have been highlighted in each of the rows to group the 5 variables into 2 core factors. Thus, after rotation, Factor 1 accounts for 55.858% of the variance and Factor 2 accounts for 22% of the variance. The two factors explain 77.858% of the human resource factors contributing to overcrowding in the emergency department (ED). Now the pattern is much clearer.

Hence, it can be concluded that factor one under human resource, contributes more to overcrowding in the emergency department (ED) of St. Francis than does factor two. Factors one comprises of long time consumed in laboratory, radiology and other procedures, lack of coordination between workers in the emergency department, and the tedious physician documentation process and a shortage of nursing staff specialized in emergency care. Factor Two has one factor which is there is a shortage of medical staff specialized in emergency medicine.

4.3.3 Lack of Beds - Organizational Factor

4.3.3.1 Data Screening

A correlation matrix was run for the five set of questions relating to lack of beds. The table below gives a summary of the variables.

TABLE 4.9: ORGANIZATIONAL FACTOR

LB1	Lack of beds for patients admitted to the ED
LB2	Small numbers of patient admission rooms in the ED
LB3	Number of beds in the ED is not enough for patients' hospitalized in the ED
LB4	Presence of patients in the ED waiting for free beds
LB5	Lack of material resources needed to increase the number of beds in the ED.

The table below represents a correlation matrix and their significance.

TABLE 4.10: CORRELATION MATRIX FOR LACK OF BEDS

Correlations

		LB1	LB2	LB3	LB4	LB5
LB1	Correlation Coefficient	1.000	.640**	.337	.218	-.365
	Sig. (2-tailed)		.000	.074	.257	.052
LB2	Correlation Coefficient	.640**	1.000	.578**	.539**	.064
	Sig. (2-tailed)	.000		.001	.003	.743
LB3	Correlation Coefficient	.337	.578**	1.000	.278	.316
	Sig. (2-tailed)	.074	.001		.144	.095
LB4	Correlation Coefficient	.218	.539**	.278	1.000	.268
	Sig. (2-tailed)	.257	.003	.144		.159
LB5	Correlation Coefficient	-.365	.064	.316	.268	1.000
	Sig. (2-tailed)	.052	.743	.095	.159	

**. Correlation is significant at the 0.01 level (2-tailed).

Determinant =0.184

From the table above, there is a relationship between the five variables. The relationship is statistically significant except for LB3 and LB1, LB4 and LB1 and LB2 and LB5, which had p-values (Highlighted in yellow) of greater than 0.05. There is no multicollinearity effect since the correlation coefficients are below 0.9. The determinant coefficient of 0.184 > 0.0001 which confirms the multicollinearity effect is not statistically significant. Although the LB3 and LB1, LB4 and LB1 and LB2 and LB5 are not statistically significant in the correlation table, they were not eliminated since they are important variables in this research.

4.3.3.2 Factors Extraction

The principal component analysis will be used to identify variables that account for more variability and extract new factors based on the total variance explained as shown in the table below.

TABLE 4.11: FACTOR EXTRACTION FOR LACK OF BEDS

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.140	42.808	42.808	2.140	42.808	42.808
2	1.550	31.004	73.812	1.550	31.004	73.812
3	.742	14.838	88.649			
4	.360	7.197	95.847			
5	.208	4.153	100.000			

Extraction Method: Principal Component Analysis

This table shows you the actual factors that were extracted. If you look at the section labeled "Rotation Sums of Squared Loadings," it shows you only those factors that met cut-off criterion (extraction method). In this case, there were two factors with eigenvalues greater than 1. Factor 1 accounts for 42.713% of the variability in all 5 variables, and Factor 2 accounts for 31.099% of the variability. These two factors explains 73.812% of the total variability. The scree plot below also confirms the number of factors to be extracted when the curves starts to level off. In this case, the curve started to level off or becoming less steep after the second component hence only two factors were extracted.

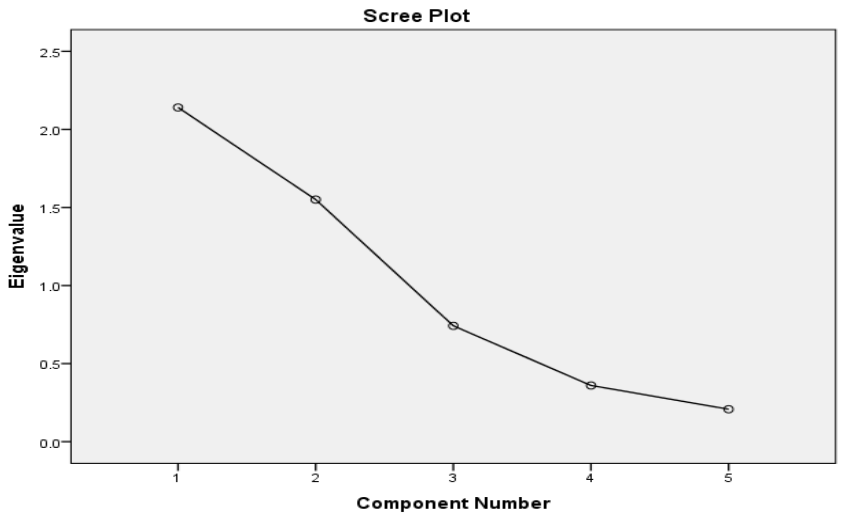

FIGURE 20: SCREE PLOT FOR LACK OF BEDS

4.3.3.3 Factor Rotation

TABLE 4.12: FACTOR ROTATION OF ORGANIZATIONAL FACTORS

Rotated Component Matrix[a]

	Component	
	1	2
LB1	.912	-.111
LB2	.688	.072
LB3	.647	.513
LB4	.087	.923
LB5	.636	-.650

Extraction Method: Principal Component Analysis

Rotation Method: Varimax with Kaiser Normalization

The matrix gives the correlation of the variables with each of the extracted factors. Usually, each of the variables is highly loaded in one factor and less loaded towards the other factors. To identify the variables included in each factor, the variable with the value maximum in each row is selected to be part of the respective factor. The values have been highlighted in each of the rows to group the five variables into two core factors. Thus, after rotation, Factor 1 accounts for 42.713% of the variance and Factor 2 accounts for 31.099% of the variance. The two factors explain 73% of the lack of beds factors contributing to overcrowding in the emergency department (ED).

Hence, it can be concluded that factor one contributes more to overcrowding in the emergency department of St. Francis Community Hospital than factor 2. Factor one

includes the following: Lack of beds for patients admitted to the ED, Small number of patient admission rooms in the ED, Number of beds in the ED is not enough for patients hospitalized in the ED. Factor two has two component; Presence of patients in the ED waiting for free beds and lack of material resources needed to increase the number of beds in the ED.

4.3.4 Emergency Department Design - Organizational factor

4.3.4.1 Data screening

A correlation matrix was run for the four set of questions relating to **Emergency Department Design**. The five questions were defined as shown in the table below

TABLE 4.13: HYPOTHESIS FOR ED DESIGN ANALYSIS

EDD1	There is an easy movement of people within the ED.
EDD2	The places allocated for patients to wait is adequate
EDD3	There is an ineffective use of the resources available
EDD4	Lack of space allocated to ED under the continuous increase in the number of patients

TABLE 4.14: CORRELATION MATRIX FOR EMERGENCY DESIGN

Correlations

		EDD1	EDD2	EDD3	EDD4
EDD1	Correlation Coefficient	1.000	.650**	.066	-.408*
	Sig. (2-tailed)		.000	.740	.028
EDD2	Correlation Coefficient	.650**	1.000	.227	-.382*
	Sig. (2-tailed)	.000		.254	.045
EDD3	Correlation Coefficient	.066	.227	1.000	.203
	Sig. (2-tailed)	.740	.254		.299
EDD4	Correlation Coefficient	-.408*	-.382*	.203	1.000
	Sig. (2-tailed)	.028	.045	.299	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Determinant=0.188

From the table above, there is a relationship between the five variables. The relationship is statistically significant except for EDD1 and EDD3, EDD2 and EDD3 and EDD3

and EDD4, which had p-values of greater than 0.05. There is no multicollinearity effect since the correlation coefficients are below 0.9. The determinant coefficient of 0.188 > 0.0001 which confirms the multicollinearity effect is not statistically significant. Although the EDD1 and EDD3, EDD2 and EDD3 and EDD3 and EDD4 are not statistically significant in the correlation table, they were not eliminated since they are important variables in this research.

4.3.4.2 Factors Extraction

The principal component analysis was used to identify variables that account for more variability and extract new factors based on the total variance explained as shown in the table below.

TABLE 4.15: VARIANCE OF ORGANIZATIONAL FACTORS

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.192	54.799	54.799	2.192	54.799	54.799
2	1.084	27.110	81.909	1.084	27.110	81.909
3	.589	14.728	96.636			
4	.135	3.364	100.000			

This table shows the actual factors that were extracted. The section labeled "Rotation Sums of Squared Loadings" shows factors that met cut-off criterion (extraction method). In this case, there were two factors with eigenvalues greater than 1. Factor 1 accounts for 54.017% of the variability in all 5 variables, and Factor 2 accounts for 27.891% of the variability. These two factors explain 81.909% of the total variability. The scree plot below also confirms the number of factors to be extracted when the curves starts to level off. In this case, the curve started to level off or becoming less steep after the second component hence only two factors were extracted.

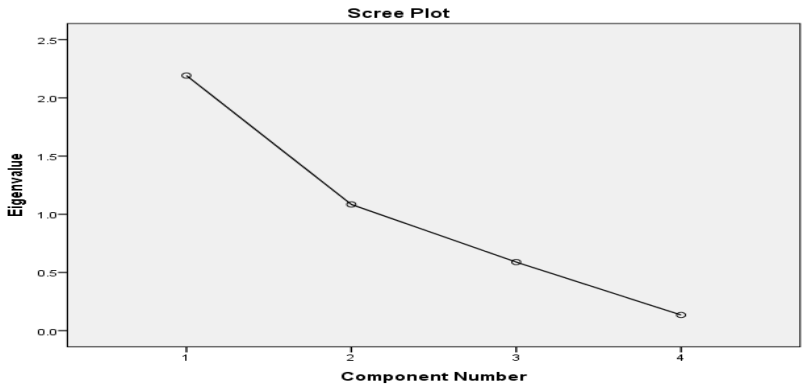

FIGURE 21: SCREE PLOT OF THE FACTORS

4.3.4.3 Factor Rotation

TABLE 4.16: FACTOR ROTATION FOR ED DESIGN

Rotated Component Matrix[a]

	Component	
	1	2
EDD1	.934	-.038
EDD2	.940	.113
EDD3	.032	.949
EDD4	-.635	.448

Extraction Method: Principal Component Analysis

Rotation Method: Varimax with Kaiser Normalization

The above matrix gives the correlation of the variables with each of the extracted factors. Usually, each of the variables is highly loaded in one factor and less loaded towards the other factors. To identify the variables, included in each factor, the variable with the value maximum in each row is selected to be part of the respective factor. The values have been highlighted in each of the rows to group the 5 variables into 2 core factors. Thus, after rotation, Factor 1 accounts for 54.017% of the variance and Factor 2 accounts for 27.891% of the variance. The two factors explain 81.909% of the Emergency Department Design factors contributing to overcrowding in the emergency department (ED).

It can be concluded that factor one under Emergency Department Design**,** which are; Easy movement of people within the ED, the places allocated for patients to wait is

adequate and Lack of space allocated to ED under continuous increase in number of patients contributes more to overcrowding in the Emergency Department (ED) of St. Francis Community Hospital than factor 2, which has only one factor which is there is ineffective use of the resources available .

4.3.5 Patient Factors - Organizational Factor

4.3.5.1 Data Screening

A correlation matrix was run for the eight set of questions relating to patient factors. The eight questions were defined as shown in the table below

TABLE 4.17: QUESTIONS FOR PATIENT FACTORS USED IN THE CORRELATION

PF1	1. Patients who come to the ED and are not considered emergency cases
PF2	2. Majority of the patients come in the ED in the evening
PF3	3. Some patients interfere with the work of the doctor and request for treatments that may not be needed.
PF4	4. Patient paying through insurance spends much time as compared to cash paying patients.
PF5	5. Escalating number of patients due to traffic accidents
PF6	6. Increase in percentage of diseases associated with heart attack, neurology, & atherosclerosis.
PF7	7. Elderly patients take more time as compared to young ones.

The table 20 below represents a correlation matrix and their significance.

TABLE 4.18: CORRELATION MATRIX OF PATIENT FACTORS

Correlations									
		PF1	PF2	PF3	PF4	PF5	PF6	PF7	PF8
PF1	Correlation Coefficient	1.000	.235	.198	.532**	.673**	.339	.485**	.223
	Sig. (2-tailed)		.219	.304	.003	.000	.078	.008	.535
PF2	Correlation Coefficient	.235	1.000	.191	-.035	.086	.062	.170	.049
	Sig. (2-tailed)	.219		.321	.857	.663	.753	.378	.894
PF3	Correlation Coefficient	.198	.191	1.000	.618**	.275	.204	-.024	.474
	Sig. (2-tailed)	.304	.321		.000	.149	.289	.898	.166
PF4	Correlation Coefficient	.532**	-.035	.618**	1.000	.433*	.556**	.281	.626
	Sig. (2-tailed)	.003	.857	.000		.019	.002	.132	.053
PF5	Correlation Coefficient	.673**	.086	.275	.433*	1.000	.054	.541**	.682*
	Sig. (2-tailed)	.000	.663	.149	.019		.786	.002	.030
PF6	Correlation Coefficient	.339	.062	.204	.556**	.054	1.000	.398*	-.044
	Sig. (2-tailed)	.078	.753	.289	.002	.786		.032	.911
PF7	Correlation Coefficient	.485**	.170	-.024	.281	.541**	.398*	1.000	.746*
	Sig. (2-tailed)	.008	.378	.898	.132	.002	.032		.013
**. Correlation is significant at the 0.01 level (2-tailed).									
*. Correlation is significant at the 0.05 level (2-tailed).									

Determinant=0.041

From the table above, there is a relationship between the seven variables. The relationship is statistically significant except for PF2, PF7 and all other variables which had p-values of greater than 0.05. There is no multicollinearity effect since the correlation coefficients are below 0.9. The determinant coefficient of 0.041 > 0.0001 which confirms the multicollinearity effect is not statistically significant. Although PF2, Pf7, and all other variables are not statistically significant in the correlation table, they were not eliminated since they are important variables in this research.

4.3.5.2 Factors Extraction

The principal component analysis will be used to identify variables that account for more variability and extract new factors based on the total variance explained as shown in the table below.

TABLE 4.19: FACTOR EXTRACTION FOR PATIENT FACTORS

Total Variance Explained						
	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.210	52.626	52.626	4.210	52.626	52.626
2	1.437	17.961	70.586	1.437	17.961	70.586
3	1.245	15.563	86.149	1.245	15.563	86.149
4	.789	9.863	96.012			
5	.230	2.870	98.881			
6	.068	.854	99.735			
7	.021	.265	100.000			
Extraction Method: Principal Component Analysis						

Table 20 shows the actual factors that were extracted. If you look at the section labeled "Rotation Sums of Squared Loadings," it shows you only those factors that met cut-off criterion (extraction method). In this case, there were three factors with eigenvalues greater than 1. Factor 1 accounts for 52.626% of the variability in all 7 variables, Factor 2 accounts for 24.23% of the variability and Factor 3 accounts for 17.938%. These three factors explain 86.149% of the total variability. The scree plot below also confirms the

number of factors to be extracted when the curves starts to level off. In this case, the curve started to level off or becoming less steep after the third component hence, only three factors were extracted.

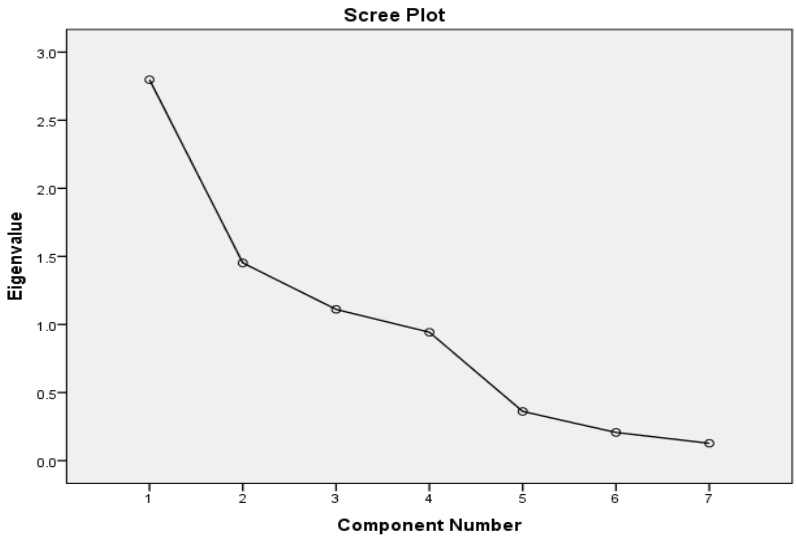

FIGURE 22: SCREE PLOT OF THE FACTORS

4.3.5.3 Factor Rotation

TABLE 4.20: FACTOR ROTATION FOR PATIENT FACTORS

Rotated Component Matrix[a]			
	Component		
	1	2	3
PF1	.880	.355	.095
PF2	.854	.031	.490
PF3	.832	.322	.284
PF4	.805	-.182	-.238
PF5	.733	.370	-.027
PF6	.365	.893	-.116
PF7	.003	.856	.240
Extraction Method: Principal Component Analysis Rotation Method: Varimax with Kaiser Normalization			

The above matrix gives the correlation of the variables with each of the extracted factors. Usually, each of the variables is highly loaded in one factor and less loaded

towards the other factors. To identify the variables, included in each factor, the variable with the value maximum in each row is selected to be part of the respective factor. The values have been highlighted in each of the rows to group the 7 variables into 3 core factors. Thus, after rotation, factor 1 accounts for 52.626% of the variance and factor 2 accounts for 17.961% of the variance. The two factors explain 70.586% of the Emergency Department Design factors contributing to overcrowding in the emergency department (ED).

Factor one includes the following:

- Patients who come to the ED and are not considered emergency cases
- Majority of the patients come in the ED in the morning
- Some patients interfere with the work of the doctor and request for treatments that may not be needed
- Patient paying through insurance spends much time as compared to cash paying patients
- Escalating number of patients due to traffic accidents contributes more to overcrowding in the Emergency Department (ED) of St. Francis Community Hospital.

Factor 2 includes:

- Increase in percentage of diseases associated with heart attack, neurology, & atherosclerosis
- Elderly patients take more time as compared to young ones and factor

4.4 **Analysis by Objective Three**

Objective three sought to assess the extent to which the Hospital is complying with its own throughput target of four hours per client in the outpatient department as stipulated in the hospital charter. To achieve this objective, frequency tabulations were used to assess the percentage of the respondent who spent more than four hours in the outpatient before a decision was made to admit or discharge to go home.

TABLE 4.21: TIME TAKEN BY THE RESPONDENTS IN THE OUTPATIENT

How much time did you take in the outpatient before a decision was made to admit or to go home?

		Frequency	Percent
Valid	0 – 1 hours	3	2.2
	1 - 2 hours	28	20.3
	2 - 3 hours	22	15.9
	3 - 4 hours	29	21.0
	More than 4 hours	56	40.6
	Total	138	100.0

From the table above, 2% of the respondent spent 0 to 1 hour in the outpatient before a decision was made to admit or to go home, 20.3% spent 1-2 hours, 15.9% spent 2-3 hours, 21% spent 3-4 hours and 40.6 % spent more than 4 hours in the outpatient before a decision was made to admit or to go home.

In order to make inference about the hospital overcrowding a one-sample Wilcoxon rank test was run to determine whether the median time in the outpatient before a decision was made to admit or to go home was greater than four.

TABLE 4.22: ONE SAMPLE WILCOXON SAMPLE TEST FOR COMPLIANCE WITH THROUGHPUT REQUIREMENTS

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The median of what time did you take in the outpatient before a decision was made to admit or to go home? equals 4.00.	One-Sample Wilcoxon Signed Rank Test	.013	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

From the table above at 5% level of significance, the p-value = 0.013 < 0.05 hence we reject the null hypothesis and conclude that the median time in the outpatient before a

decision was made to admit or to go home was greater than 4 which does not conform to the throughput requirement of the hospital.

5 CHAPTER 5: DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

The chapter discusses key findings in light of broader literature from other studies. The chapter offers a discussion guided by the objectives of the study.

5.1 Summary of Key Findings

5.1.1 Patient Characteristics Associated with Overcrowding

A large proportion of patients spent at least four hours at the outpatient, with a slightly higher proportion of women experiencing overcrowding than men. Selected patient characteristics were associated with ED overcrowding. No studies were identified locally that have examined this relationship at the emergency department.

Conversely, the 40.6% of patients who experienced overcrowding were spread across different age groups. In addition to this, differences were noted across age groups. Those aged between 31 and 40 years waited more than other age groups. Other studies have found different patterns. For instance, a study done by Knapman and colleagues found that patients aged 65 years and above registered longer triage, waiting times, and assessment times (Knapman and Bonner, 2010). Children register longer waiting times in the triage of the EDs due to the sensitivity of their diseases (Bekmezian et al., 2011).

Majority of the patients who sought services at the outpatient section were walk-in clients. A large proportion of the walk-in patients spent more than four hours as compared to those who came by ambulance who didn't experience overcrowding. Clearly, walk-in mode of arrival leads more to overcrowding than ambulatory services as they are not considered urgent. The findings align with results of another study by Affleck et al. (2013) who established the mode of arrival at the ED could contribute to overcrowding without proper administration of admission processes. A high number of low-acuity patients and unavailable ambulatory diversions could increase the severity of overcrowding at the ED (Lin, Kao & Huang, 2015).

The time taken by patients with different level of education to receive services varied. While patients with primary level education appeared to take longer in the ED, those with higher education took a shorter time. Previous studies have not demonstrated a clear link between the level of education and time spent in an outpatient setting. However, Konrad et al. (2013) reported an association between patient knowledge and

the efficiency with which they progressed through the system. No studies were identified that examined the relationship between process efficiency and implementation of improvement measures in the ED (Arora, 2009; Smith 2009).

The results show that patients who came in the morning took more time (greater than 4 hours) to get services as compared to those who came in the afternoon and night. Morning hours contribute to high inpatient admissions, which could exceed the bed capacity and transfers in the ED admission rooms (Thijssen et al., 2013; Rathlev et al., 2012). The results showed a decrease in the time spent in the triage or assessment rooms because there was high patient flow as well as low patient volume. However, patient flow depends on the size of the hospital, bed capacity, and staff availability (Khanna, Boyle, Good & Lind, 2012). The patient volume and flow could reduce, but lack of the right bed capacity increases ED congestion (Wong et al., 2010).

A chi-square was run to check for the an association between the variables and the independent variables; only two variables were found to be significant at 0.1 level of significance (mode of arrival and time of arrival). The rest (gender, age-group, level of education, department, and diagnosis) did not have a significant p-value. However, this did not mean they are unimportant, as this may have been caused by other factors like a small sample size making observed groups to have minimal differences. Powell et al. (2012) found varying results as they focused on the association between inpatient discharge and ED boarding to affirm their effect on crowding. Examination of 28 ED patients and timing of the discharging process helped to determine the effect on boarding demand in the ED. Powell et al. (2012) established that timing of inpatient discharges was imperative for ED boarding but without stating how it could contribute to prolonged stays or bungled admissions.

5.1.2 Institutional Factors that Contribute to Overcrowding

As expected, the first factor in the results was marked by high loadings than the second and consequent factors. In conclusion, all variables as measured by the questionnaire load to two main factors.

The results showed that from the five human resource questions asked; factor one accounts for 56.019% of the variability in overcrowding while factor two explains 22.104%. Factor one comprises of long time consumed in laboratory, radiology and other procedures, lack of coordination between workers in the emergency department, and the tedious physician documentation process and a shortage of nursing staff while

factor two comprise of a shortage of medical doctors specialized in emergency medicine. The total variance explained by both factors was 78.123%. Similar findings were made in the study by Nicks and Manthey (2012) when they studied resource utilization and throughout processes in January 2007-2008 but in the ED of a psychiatric ward. Other studies that identified similar findings but from the perspective of hospitals in developed countries of US and Canada include (Crawford et al., 2014Affleck; Parks, Drummond, Rowe & Ovens, 2013). The studies emphasized the need to install resources that would create an enabling environment for admissions.

Another organizational factor was the lack of beds, which also had factor one explaining overcrowding more at 42.808% while factor two was at 31.004%. Factor One framework included elements such as lack of patient beds in the ED and a small number of patient admission rooms in the ED. Factor One further included a number of beds in the ED are not enough for patients hospitalized in the ED. Factor two had two components, and Presence of patients in the ED waiting for free beds and lack of material resources needed to increase the number of beds in the ED. The total variance explained by both factors was 73.812%.

Similar results emerged from a study by Zhou et al. (2012) despite addressing the insufficient patient beds from the standpoint of a Californian hospital. Insufficient inpatients beds for ED admissions were noted in other studies (Stowell et al., 2013; Sun et al., 2013; Erenler et al., 2014) to have contributed to a significant overcrowding problem.

ED design emerged as a contributing factor to overcrowding with factor one accounting for 54.799% of the variability while factor two is at 27.110%. Factor one comprised of easy movement of people within the ED, the places allocated for patients to wait is adequate and Lack of space allocated to ED under the continuous increase in a number of patients. Factor two had only one factor which was an ineffective use of the resources available. The total variance explained by both factors was 81.909%.

ED design has a significant influence on the way it accommodates the patients for admission. Howell (2008) did not address the design of ED per se in his study but discovered that a crowded ED features poor bed management. The findings of the study established poor floor management and limited room for the admission of patients from the ED.

The findings showed three major patient factors that contributed to overcrowding in the ED. Factor one includes the following:

Patients who come to the ED and are not considered emergency cases, Majority of the patients come in the ED in the evening, Some patients interfered with the work of the doctor and request for treatments that was not necessary, Patient paying through insurance spend more time as compared to cash paying patients and escalating number of patients due to traffic accidents contributes more to overcrowding in the Emergency Department (ED) of St. Francis Community Hospital

Factor 2 comprised of, Increase in percentage of diseases associated with heart attack, neurology, & atherosclerosis and elderly patients took more time as compared to young ones. It was established that factor one explained for 52.626% of the variability and factor two 17.961%, together they accounted for 70.586% of the variance. A systematic review by Durand et al. (2011) on analysis of 34 categories of non- urgent visits showed considerable variation (4.8%-90%) which showed the current study could not determine the link between non-urgent visits and overcrowding.

The results affirm the failure by the ED of St. Francis Hospital to align its processes with the emergency clinical work. Although the study by Nugus and Forero (2011) did not study address organizational factors explicitly, they found organizational and interdepartmental work to have a significant impact on the medical activities in the ED but based on the context of overcrowding of an Australian hospital. The failure to provide sufficient resources including nursing staff can cause burnout and fatigue, which reduces nursing capacity to perform (Hunsaker, Chen, Maughan & Heaston, 2015). Hence, the LOS in the ED increases. High LOS exacerbates the overcrowding problem by increasing high expenditures and inefficiencies that derail patient safety (Bashkin et al., 2015).

5.1.3 Compliance with the Throughput Requirement

The findings showed that the median time spent by the patients in the outpatient was more than four hours. The time exceeds the throughput requirement set for the ED department. Hence, throughput time is a contributing factor to overcrowding in the ED of St. Francis Hospital. The ED does not comply with the maximum requirement of four hours per client in the outpatient department. Failure to meet the throughput requirement in the ED creates overcrowding because it increases the LOS and reduces

the admission capacity. Additionally, other studies have associated high throughput time with increased patient boarding and delayed treatment of ED patients hence compromising the quality of patient care (Baker & Esbenshade, 2015; Qureshi et al., 2011; Konrad et al., 2013).

5.2 Conclusion

The study aimed to achieve three objectives. The first objective aimed to determine the patient characteristics associated with overcrowding in the ED of St. Francis Community Hospital. The study established a link between educational level, gender, age, mode of arrival, time of the day and overcrowding.

The study sought to determine the institutional factors that contributed to overcrowding in the ED of St. Francis Community Hospital. Human factors, shortage of beds and ED design contribute to overcrowding in the ED. Conversely, it was determined that the ED of St. Francis Community Hospital does not comply with the throughput requirement of four hours per client.

5.3 Limitations of the Study

Generalization of the study to other EDs might be limited considering the context of the ED services varies from one hospital to another. Further, it focused on the problem of overcrowding from the perspective of a faith-based hospital which could restrict the generalizability of the findings to the public or private hospitals facing similar concerns. The sample proportion (one hospital) was also too small to make an inference on the whole population. The organizational-specific findings could limit the implementation of findings to similar institutions in Kenya or a middle-income country. Assigning sufficient time for the study was a challenge.

5.4 Practical Recommendations for St. Francis Community Hospital

In regards to the study results, the researcher recommends the following:

1. The hospital management should match the right number of staff to patient volume, which will ease flow within the ED, especially in the morning hours when the influx of patients is experienced.
2. The hospital administration should be deliberate on increasing the number of medical staffs in the ED within what matches the huge increase of patients.

3. The hospital administration should be working on the provision of extra space and beds for the ED due to the huge increase in patients' numbers and the narrow space of the ED
4. The hospital administration should ensure that the four-hour rule is adhered to by mitigating the factors hindering its implementation.
5. Redesigning the floor plan of the admission rooms in the ED should be a priority so that it improves the patient flow process. The organizational procedures will improve service delivery and meet the quality expectations of the patients.
6. Ensure that all the processes are automated to reduce the tedious documentation process experienced by the physicians.
7. The results showed the time taken for the physicians to make decisions for admissions or discharge is high. Hence, the hospital could adopt lean principles to streamline the triage and registration procedures at the ED.
8. Routine investigations should be carried out to determine the most important bottlenecks to drive short-term impact while creating an efficient channel for eliminating overcrowding.
9. Seeking funding from donors and managing available resources will resolve the shortage of resources i.e. beds, human resource.

5.5 Suggestions for Further Research

The study found institutional factors contributing to overcrowding at the ED of St. Francis Community Hospital. The research could not evaluate the factors in-depth as it was trying to establish a myriad of contributing factors to overcrowding. Hence, future research should concentrate on one or all-organizational factors. The research could attempt to undertake a comparative analysis with another faith-based community hospital or a public healthcare institution to identify similarity and differences to the bottlenecks in the ED department.

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Appendices

Appendix A: Work Plan

Activity	**Sept 2017**	**Oct 2017**	**No 2017**	**Dec 2017**	**Jan 2018**	**Feb 2018**	**March 2018**
Area of interest identified	x						
Topic refined to develop study proposal	x						
Write, submit and defend Proposal		x	x				
Collection of data and information				x	x		
Analysis and interpretation of collected data/information						x	
Final draft prepared— submission of the study report							X

Appendix B: Introduction Letter

Strathmore Business School

Thursday, 16 November 2017

St. Francis Community Hospital-Nairobi
P.o Box 62676,
Nairobi.

Dear Sir/Madam

INTRODUCTION – NJOGU, MARY WANJIRU

This is to introduce **Mary**, admission number **MBA HCM/ 93054/16** who is an MBA HCM student at Strathmore Business School. As part of our SBS MBA HCM Master's Program, Mary is expected to do applied research and to undertake a project. This is in partial fulfilment of the requirements of the Master of Business Administration. She would like to request for appropriate data from your organization to help her finalize her research.

Mary is undertaking a research project on **"Factors Contributing to Overcrowding at The Emergency Department of the St. Francis Community Hospital in Nairobi."**. The research project shall be undertaken at the St. Francis Community Hospital in Nairobi. The information obtained from your organization shall be treated confidentially and shall be used for academic purposes only.

Our MBA seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct usefulness to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest, if not of practical value to your organization.

We very much appreciate your support and we shall be willing to provide any further information if required.

Yours sincerely,

Prof. Gilbert Kokwaro

Director, Institute of Healthcare Management and
Academic Director, MBA in Healthcare Management

Strathmore UNIVERSITY
Ole Sangale Road, Madaraka Estate
P.O. Box 59857 00200 Nairobi, Kenya
Cell: +254 703 034 414/6/7
Email: info@sbs.ac.ke or visit www.sbs.strathmore.edu
Twitter: @SBSKenya

Appendix C: Ethical Approval

Strathmore UNIVERSITY

SU-IRB 0157/18

26th February 2018

To

Mary Wanjiru Njogu

Email: mnjogu99@gmail.com

Dear Ms Njogu,

REF **Student ID:** MBA-HCM/09742 **Protocol ID:** SU-IRB 0157/18
FACTORS CONTRIBUTING TO OVERCROWDING AT THE EMERGENCY DEPARTMENT OF THE ST. FRANCIS COMMUNITY HOSPITAL IN NAIROBI KENYA

We acknowledge receipt of your application documents to the Strathmore University Institutional Ethics Review Committee (SU-IERC) which includes:

1. Research Proposal dated 25th February 2018
2. Participant Information and consent form English and Swahili version 25th February 2018
3. Study Questionnaire
4. CV

The committee has reviewed your application, and your study *"Factors Contributing to Overcrowding at the Emergency Department of The St. Francis Community Hospital in Nairobi, Kenya."* has been granted **Approval**.

This approval is valid for one year beginning **26th February 2018** until **25th February 2019.**

In case the study extends beyond one year, you are required to seek an extension of the Ethics approval prior to its expiry. You are required to submit any proposed changes to this proposal to SU-IERC for review and approval prior to implementation of any change.

SU-IERC should be notified when your study is complete.

Thank you

Sincerely,

Amina Salim

STRATHMORE UNIVERSITY APPROVED BOARD

Appendix D: Research Participant Information Sheet (Patients)

STUDY TITLE:

FACTORS CONTRIBUTING TO OVERCROWDING AT THE EMERGENCY DEPARTMENT OF ST FRANCIS HOSPITAL

LOCALITY: NAIROBI **ETHICS COMMITTEE REF**.:

LEAD INVESTIGATOR: MARY WANJIRU NJOGU Contact phone number: 0723482665

INSTRUCTIONS

You are invited to take part in a study on factors contributing to overcrowding in the emergency department of St Francis Hospital whether or not you take part is your choice. If you do not want to take part, you do not have to give a reason, and it will not affect the care you receive. If you do want to take part now, but change your mind later, you can pull out of the study at any time.

This Participant Information Sheet will help you decide if you would like to take part. It sets out why we are doing the study, what your participation would involve, what the benefits and risks to you might be, and what would happen after the study ends. We will go through this information with you and answer any questions you may have.

If you agree to take part in this study, you will be asked to sign the Consent Form on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

Please make sure you have read and understood all the pages.

PURPOSE OF THE STUDY

The purpose if this study is to understand the factors contributing to overcrowding at the emergency department of this hospital and recommend possible solutions to reduce overcrowding.

The study has been approved by the school board and passed by the ethics committee.

This study is to be carried out in partial fulfillment of masters in MBA Healthcare management

WHAT WILL THE STUDY INVOLVE

You will be asked few questions in line with the study questionnaire about the previous visit experience in terms of time taken, the data collected will be analyzed and used to clearly understand the factors contributing to overcrowding in the emergency department, and measures will be taken to reduce or solve this problem.

WHO PAYS FOR THE STUDY

You will not incur any costs to participate in this study

WHAT ARE MY RIGHTS

You have a right to decline participation or withdraw from the research at any time during the study.

Your name and the information you provide will remain in private and it will be coded for discretion and confidentiality.

HOW WILL THE STUDY HELP ME

After identifying the factors leading to overcrowding, the researcher will recommend possible ways of solving the problem and thus this will eventually lead to less waiting time for you and your families in future.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS

If you have any questions, concerns or complaints about the study please contact:

Name: Mary Wanjiru Njogu

Telephone Number: 0723482665

Email: mnjogu99@gmail.com

Consent

Your signature below indicates that you have decided to volunteer as a research participant for this study and that you have read and understood the information provided above.

Subject's Name: _____

Subject's Signature: _____ Date: _____

Investigator's signature: _____ Date: _____

KICHWA CHA UTAFITI:

SABABU ZINAZOFANYA HOSPITALI KUJAA SANA NAWAGONJWA KUCHUKUWA MUDA MREFU KABLA YA KUHUDUMIWA

KIONGOZI WA UCHUNGUZI: MARY WANJIRU NJOGU

Umealikwa kushiriki katika utafiti na uchunguzi wa sababu zinazofanya wagonjwa kukaa kwa muda mrefu hospitalini kabla ya kuhudumiwa. Kushiriki kwako katika utafiti huu ni chaguo lako. Kama hutaweza kushiriki katika utafiti, haitaathiri huduma utakayopokea.

Hii Karatasi ina maelezo jinsi wewe kama mshiriki utanufaishwa na utafiti huu.. Tutapitia taarifa hii na wewe na kujibu maswali yote utakayo uliza.

Ukikubali kushiriki katika utafiti huu, itakulazimu kuweka sahihi yako katika ukurasa wa mwisho wa waraka huu kama idhini ya makubaliano. Utapewa nakala ya karatasi hii kama Mshiriki na Fomu ya idhini ya kudhibitisha kua wewe ni mshiriki. Tafadhali hakikisha umesoma na kuelewa kurasa zote.

MADHUMUNI YA UTAFITI

Lengo la utafiti huu ni kuelewa vizuri sababu zinazowafanya wagonjwa kukaa muda mrefu kabla kuhudumiwa ambapo inafanya hospitali kujaa sana.

Utafiti huu umekubaliwa na bodi ya shule na kupitishwa na kamati ya maadili. Utafiti huu utamuezesha anayahitimu shahada ya MBA katika usimamizi wa Afya.

KUSHIRIKI KUTAHUSISHA NINI?

Utaulizwa maswali kuhusu ile wakati wa mwisho uliokuwa hapa hospitalini kwa mujibu wa utafiti, dodoso litajazwa na majibu itakayokusanywa kuchambuliwa na kutumika kutoa maoni na suruhu .

HAKI ZANGU

Una haki ya kukataa kushiriki au kujitoa katika utafiti huu wakati wowote.

UTAFITI HUU UTANISAIDIA KIVIPI?

Sababu za kuchelewa au kutohudhuriwa wakati unofaa zikijulikana zitakuwa za muhimu kwako na hospitali.mfano wewe na jamii yako hamtangojaa kwa muda

mrefu hospitalini pia kutoka hospitalini bila kuonekana.Tutapatia hospitali majibu ili waweze kurekebisha.

Kama una maswali yoyote, wasiwasi au malalamiko kuhusu utafiti tafadhali wasiliana na:

Jina: MARY WANJIRU NJOGU

Nambari ya Simu: 0723482665

Barua pepe: mnjogu99@gmail.com

IDHINI

Sahihi yako hapa chini yamaanisha umekubali kuwa mhusika katika utafiti huu. Na kwamba umesoma na kuelewa kabisa inavyotakikana.

JINA LAKO _____

SAHIHI _____ TAREHE: _____

Appendix D: Research Participant Information Sheet (Nurses and Doctors)

TITLE OF STUDY

FACTORS CONTRIBUTING TO OVERCROWDING IN ST. FRANCIS COMMUNITY HOSPITAL

Investigator: MARY WANJIRU NJOGU **Phone:** 0723482665

My name is Mary Wanjiru Njogu. I am a Masters student in Health management at Strathmore University. Currently, I am carrying out a research on ***"Factors affecting overcrowding in the emergency department of St. Francis Community Hospital"*** I am in the process of gathering relevant data for this study. You have been identified as one of the possible participants in this because you work in the ED of the St. Francis Community hospital and you will be of help in gathering relevant information. Staffs who do not work within the ED will not be eligible to participate. I am requesting that you read this form and ask any questions that you may have before agreeing to be in the study. The purpose of the study will be to identify the factors that contribute to overcrowding at the emergency department of the ED of St. Francis Community hospital. Ultimately, this research will be published and presented as a book to the hospital management and at Strathmore to aid in completion of my studies.

If you agree to be in the study, you will be requested to answer some questions regarding your demographic information and on the factors contributing to crowding at the emergency department. There are no expected risks of being in this study.

The benefits of this study is that once we identify the factors contributing to overcrowding will recommend the possible solutions in solving the matter and this will revert the negative effects of overcrowding for example patients leaving without being seen, increased mortalities at the waiting area, reduced patients complains due to long waiting time, reduced work overload good reputation of the hospital which will eventually lead to influx of patients. Thus, you will be part of a workstation with exemplary services. The records of this study will be kept strictly confidential. I will not include any information in any report I may publish that would make it possible to identify you.

There will be no any form of payment to participants in this study.

The decision to participate in this study is entirely up to you. You may refuse to take part in the study at any time without affecting your relationship with the investigators of this study. Your decision will not result in any loss or benefits to which you are otherwise entitled. You have the right not to answer any single question, as well as to withdraw completely from the interview at any point during the process; additionally, you have the right to request that the interviewer not use any of your interview material.

You have the right to ask questions about this research study and to have those questions answered by me before, during, or after the research. If you have any further questions about the study, at any time feel free to contact me, [Mary Wanjiru Njogu] at [mnjogu99@gmail.com] or by telephone at [*0723482665*]. If you like, a summary of the results of the study will be sent to you.

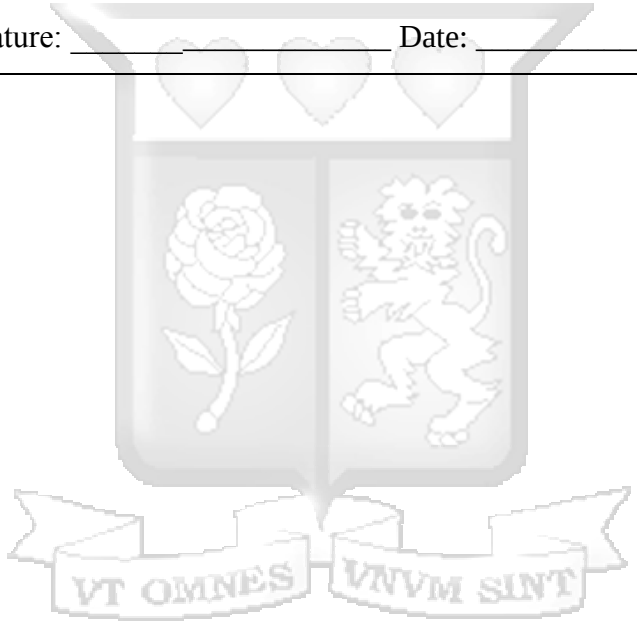
Consent

Your signature below indicates that you have decided to volunteer as a research participant for this study, and that you have read and understood the information provided above.

Subject's Name: _____

Subject's Signature: _____ Date: _____

Investigator's signature: _____ Date: _____



Appendix E: Patients Questionnaire

The patient is asked to fill the questionnaire below. The information requested is to help in the carrying out of a research. In case of any difficulties with filling in the questionnaire, a research assistant is available to offer guidance.

PATIENTS FACTORS.

DATE:_____ **QUESTIONNAIRE CODE:_____**	
Tick the **most** appropriate option. Tick only one.	
Gender	[ ] Male [ ] Female
Age group	[ ] Below 20 [ ] 21 – 30 [ ] 31 – 40 [ ] 41 – 50 [ ] 51 – 60 [ ] Above 60
Mode of arrival	[ ] Walking in [ ] Ambulance
Level of education	[ ] primary [ ] secondary [ ] Tertiary [ ] Graduate
How did you pay for the service?	[ ]Cash [ ]Medical scheme (insurance, employer)
Time of last visit	[ ] Morning [ ] Afternoon

	[ ] Night
On average, what time did you take in the outpatient before a decision was made to admit or to go home?	[ ] 0 – 1 hours [ ] 1 – 2 hours [ ] 2 – 3 hours [ ] 3 – 4 hours [ ] More than 4 hours
Which department did you take the most time in?	[ ] Registration [ ] Triage [ ] Consultation room [ ] Diagnostic procedures (I.E radiology lab)
What case was it?	[ ] Pediatric [ ] Surgical [ ] Gynecologic [ ] Medical

Appendix F: Study Questionnaire for ED Staff

DATE:_____ **QUESTIONNAIRE CODE:_____**	
STAFF DEMOGRAPHIC PROFILE Tick the **most** appropriate option. Tick only one.	
Gender	[ ] Male [ ] Female
Age group	[ ] Below 20 [ ] 21 – 30 [ ] 31 – 40 [ ] 41 – 50 [ ] 51 – 60 [ ] Above 60
Education	[ ] Secondary School level [ ] Mid-level College Graduate University Degree [ ] Graduate [ ] Post-graduate
Job Title:	[ ] Clinical officer [ ] Nurse
Years of experience:	[ ] 0-2 [ ] 3-5 [ ] 5-10 [ ] >10

Organizational Factors **On a scale of 1-5 how would you rate the following factors in regard to contributing to overcrowding in the Emergency Department (ED)of St. Francis Community Hospital:** **1. STRONGLY DISAGREE 2.DISAGREE 3. AGREE 4. STRONGLY AGREE 5. NOT SURE**					
Human Resource					
1. There is shortage of medical staff specialized in emergency medicine.	1	2	3	4	5
2. Shortage of nursing staff specialized in emergency.	1	2	3	4	5
3. Long time consumed in laboratory, radiology and other procedures.	1	2	3	4	5
4. Lack of coordination between workers in emergency department may lead to overcrowding	1	2	3	4	5
5. The physician documentation process is tedious leading to patients spending more time.	1	2	3	4	5
Lack of beds					
1. Lack of beds for patients admitted to the ED	1	2	3	4	5
2. Small number of patient admission rooms in the ED	1	2	3	4	5
3. Number of beds in the ED are not enough for patients' hospitalization in the ED	1	2	3	4	5
4. Presence of patients in the ED waiting for free beds	1	2	3	4	5
5. Lack of material resources needed to increase the number of beds in the ED.	1	2	3	4	5
Emergency Department Design					
1. There is easy movement of people within the ED.	1	2	3	4	5
2. The places allocated for patients to wait is adequate	1	2	3	4	5
3. There is effective use of the resources available	1	2	3	4	5
4. Lack of space allocated to ED under continuous increase in number of patients	1	2	3	4	5
Patient factors					
1. Patients who come to the ED and are not considered emergency cases	1	2	3	4	5
2. Majority of the patients come in the ED in the evening	1	2	3	4	5
3. Some patients interfere with the work of the doctor and request for treatments that may not be needed.	1	2	3	4	5

4. Patient paying through insurance spends much time as compared to cash paying patients.	1	2	3	4	5
5. Escalating number of patients due to traffic accidents	1	2	3	4	5
6. Increase in percentage of diseases associated with heart attack, neurology, & atherosclerosis.	1	2	3	4	5
7. Elderly patients take more time as compared to young ones.	1	2	3	4	5

GENERAL QUESTION

Do you think there are other factors that contribute to overcrowding in the ED that have not been mentioned? Yes[ ] No [ ]

If Yes Name two: 1. _____

2. _____

THANK YOU FOR YOUR TIME AND COOPERATION

Appendix G: Test for Normality

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Gender	.371	136	.000	.631	136	.000
Age group	.219	136	.000	.852	136	.000
Mode of arrival	.540	136	.000	.184	136	.000
Level of education	.234	136	.000	.871	136	.000
How did you pay for the service	.344	136	.000	.636	136	.000
Time of last visit	.297	136	.000	.769	136	.000
What time did you take in the outpatient before a decision was made to admit or to go home?	.244	136	.000	.827	136	.000
Which department did you take the most time in?	.267	136	.000	.827	136	.000
What case was it	.278	136	.000	.800	136	.000

Appendix H: Budget

Activities	Amount (KSH)
Developing Research Proposal	5,000
Research Instruments - Questionnaires	3,000
Data Analysis - Research Assistant	10,000
Printing Write-Up	2,500
Travel Expenses	3,000
Total Expenses	23, 500