**UNIVERSITY OF GHANA**

**COLLEGE OF HEALTH SCIENCES**

**SCHOOL OF NURSING AND MIDWIFERY**

# FACTORS INFLUENCING LENGTH OF STAY OF ADULT IN-PATIENTS WITH DIABETES MELLITUS: A STUDY AT 37 MILITARY HOSPITAL

**PRESENTED BY**

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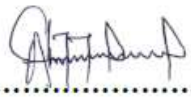
## DECLARATION

I, James Abina Ofori, declare that this thesis is my original work and has not been presented for a degree award at any other institution. All materials used have been duly acknowledged.



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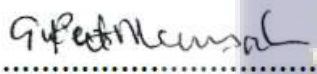

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**(Co-supervisor)**

## DEDICATION

This work is dedicated to my friend and study mate, the late Elizabeth Pobee, who always encouraged and motivated me, my wife Rosemary, and children Nana Kwadwo, Bella, and Nana Opoku for their prayers and support throughout this work.

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Finally, I thank all the study participants and my research assistants.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| **DM** | Diabetes mellitus |
| **LOS** | Length of stay |
| **ALOS** | Average length of stay |
| **IDF** | International Diabetes Federation |
| **OECD** | Organisation for Economic Co-operation and Development |
| **DKA** | Diabetic ketoacidosis |
| **CAP** | Community-Acquired Pneumonia |
| **IDE** | Inpatient Diabetes Education |
| **HF** | Heart failure |
| **CCI** | Charlson Comorbidity index |
| **NCMS** | New Cooperative Medical Scheme |

## ABSTRACT

Understanding some of the factors that affect the length of stay (LOS) during admission to the hospital, more especially among patients diagnosed with diabetes mellitus (DM), remains critical in the management of DM. LOS is a measuring tool used to determine how efficient care delivery is. This study aimed to determine average LOS and factors influencing LOS in patients diagnosed with type 1 and 2 DM and on admission to the hospital. The study was conducted at the 37 Military Hospital in the Accra metropolis. Schorr's theoretical model of factors influencing LOS served as a guide to this study. A cross-sectional survey method was used. One hundred and ten (110) patients who were admitted and discharged from the medical ward within five months were recruited. Again, a structured questionnaire consisting of patient-related factors, institutional factors, and comorbidities was used in collecting data. Data analysis used Statistical Package for Social Sciences (SPSS) version 25. Descriptive and inferential analyses were conducted. The ALOS was 8.85 days. According to Poisson regression analysis, factors that influenced LOS in DM admission were age, gender, previous history of hyperglycemia or diabetic ketoacidosis (DKA), comorbidities, financial challenge, late specialist referral, taking more time in diagnosing, and trans out difficulties ($p<0.05$). Interventions targeting the risk factors for prolonged LOS would help improve patient management experience and the cost of treatment and hospitalization.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the study

Recently, there have been several approaches to managing diabetes mellitus in adults by medical personnel in various facilities globally. Diabetes mellitus (DM) is a non-communicable disease with public health importance due to its profound implications for humans and healthcare delivery. It is a condition that impairs the body's ability to produce or store sugar. DM can be grouped into type 1, 2, and gestational diabetes mellitus. In Type 1 diabetes, the body is unable to produce insulin. The second type of DM is type 2 diabetes. This is the type in which the body can produce insulin, but the cells of the body do not respond to it as normal body cells would. The third type of diabetes is gestational diabetes, which occurs in women during pregnancy. Here, the body cells become less sensitive to insulin (Nall, 2018).

The diabetes mellitus prevalence rate keeps escalating yearly (International Diabetes Federation [IDF], 2017; Rowley, Bezold, Arikan, Byrne, & Krohe, 2017). Globally, the prevalence of DM has an extended threshold, given that it is expected to affect more than 350 million people by 2035 (Gheith, Farouk, Nampoory, Halim, & Al-Otaibi, 2016). Similarly, in an analysis of 751 population-based studies, including 4.4 million observations from 146 countries worldwide since 1980, DM prevalence has not decreased but rather almost four times increased prevalence among adults (Zhou et al., 2016). The same study further revealed that the prevalence of DM in adults alone has increased faster in low-income and middle-income countries compared to high-income jurisdictions (Zhou et al., 2016). A recent study in a systematic review of the prevalence and incidence of type 1 DM in the world after a meta-analysis showed that the incidence of type 1 DM

was 15 per 100,000 people, and the prevalence was 9.5%, which was statistically significant. The study concluded that insulin accessibility and affordability would be difficult in underdeveloped and developing countries (Mobasseri et al., 2020).

According to Menke, Casagrande, Geiss, and Cowie (2015), the prevalence of DM in a cross-sectional survey among 2,781 adults from 2011-2012 and an additional 23 634 adults from 1988-2010 adults in the United States was 12% to 14%. South Western Germany faces a similar prevalence challenge in type 2 DM, with a quarter of the population of higher ages the most affected by type 2 DM. The data further suggested the need for diabetes awareness programs, early diagnostic measures, and structured and timely health surveys (Tamayo, Brinks, Hoyer, Kuß, & Rathmann, 2016). In Arab, Meo, Usmani, and Qalbani (2017) suggested type 2 DM was highly prevalent in these countries: Saudi Arabia, Oman, Kuwait, Bahrain, and the United Arab Emirates. The study further revealed that the prevalence of DM had a significant association with Gross Domestic Product per capita and electricity consumption (Meo et al., 2017).

The Sub-Saharan region, according to studies, faces an exclusive challenge in dealing with the disease as a result of inadequate funding for non-communicable diseases, unavailability of research studies and guidelines specific to population, unavailability of medication, differences in urban-rural patients, and inequity between the public and private sector healthcare delivery (Pastakia, Pekny, Manyara, & Fischer, 2017). Group (2017) reported a high prevalence of DM in Africa among both male and female adults between 1980-2014. According to the IDF, more than 16 million people live with DM in Africa. In 2015 alone, 518,400 cases of DM were recorded in Ghana. The IDF further projected that by 2045, the number within Africa would be around 41 million. Statistically, if similar or the same conditions prevail within the next 11 years, then a projected number of 1,328,400 could be recorded in Ghana (Ogurtsova et al., 2017). Empirical

evidence in Ghana suggests a high prevalence of DM in older adults but further suggests its underestimation due to self-reporting (Gatimu, Milimo, & San Sebastian, 2016). Subsequently, a meta-analysis again in Ghana demonstrated an overall prevalence of DM among adult Ghanaians as high as 6.46% (95% CI: 4.66–8.26%) based on the inverse-variance random-effects model (Asamoah-Boaheng, Sarfo-Kantanka, Tuffour, Eghan, & Mbanya, 2019). Again, in a municipality in Ghana, there was a high prevalence of type 2 DM between the ages of 30 to 70 years and above but high in older adults, obese people, those with hypertension, and those who consume alcohol (Bawah et al., 2021).

Several studies have revealed the risk factors contributing to DM and its complications. Globally, evidence suggests that a sedentary lifestyle, early intrauterine exposure, and global nutritional changes are the significant risk factors for DM (Forouhi & Wareham, 2019; Zheng, Ley, & Hu, 2018). For instance, in the United Kingdom, several risk factors were confirmed as contributory factors to type 2DM in meta-analyses and Mendelian randomization studies; these risk factors included a range of biomarkers, medical conditions, and dietary lifestyle, environmental and psychosocial factors (Bellou, Belbasis, Tzoulaki, & Evangelou, 2018). In Shangai, a study revealed a high prevalence of type 2 DM and documented hyperlipidemia as a risk factor for one diagnosed with DM (G.-Y. Chen et al., 2015). In Sub-Saharan Africa, it has been shown that risk factors such as being overweight and obesity contribute strongly to one getting DM. However, insufficient evidence supports genetics as a type 1 and 2 DM risk factor. Meanwhile, the African-American sample showed a type of genotype as a risk factor for type 1 DM (Adeyemo et al., 2015).

In urban dwelling Nigeria, physical inactivity, advanced age, and unhealthy diet were the most critical risk factors for one being diagnosed with DM among Nigerians (Uloko et al., 2018). The study proposed a national diabetes care and prevention policy (Uloko et al., 2018). A case-control

study among patients receiving care at the outpatient departments in a hospital in Ghana showed several risk factors for type 2 DM. For instance, persons in the middle socioeconomic class, with physical inactivity and lack of fruit consumption, had a greater risk of developing type 2 DM (Gudjinu & Sarfo, 2017). Again, according to Asamoah-Boaheng et al. (2019), family history of diabetes, physical inactivity, and age ≥40 years were significant risk factors for DM in a systematic review and meta-analysis in Ghana.

Papatheodorou, Banach, Bekiari, Rizzo, and Edmonds (2018) documented microvascular and macrovascular as the main complications of DM, with microvascular complications comprising neuropathy, nephropathy, and retinopathy where macrovascular comprises cardiovascular diseases, peripheral diseases, and peripheral artery diseases. Microvascular complications are more prevalent than macrovascular complications (Deshpande, Harris-Hayes, & Schootman, 2008). Bailey et al. (2016), in a cross-sectional survey that included 24 communities in Zambia and Western Cape province in South Africa, revealed that old age, as well as obesity, were the risk factors for one developing DM with 44.2% of the population unaware of their DM diagnosis. In a systematic review and meta-analysis of risk factors for DM among adults in Ghana, the following statistically significant risk factors were attributed to DM in adults: family history of DM, physical inactivity, and age greater or equal to 40 years. Complications due to chronic DM were between 8.1% - 41.5% for retinopathy, 21% - 22% for albuminuria, 6.7% - 46.3% for nephropathy, and 21.9% - 60% for neuropathy (Asamoah-Boaheng, Sarfo-Kantanka, Tuffour, Eghan, & Mbanya, 2018).

This study looks into how DM in adults is managed but with particular reference to their length of stay (LOS) in the hospital while on admission. In managing adult DM, LOS in the hospital is a very significant indicator for the patient, relatives, the facility, and the country and, as such, should

be calculated and monitored (Baniasadi, Khorrami, Jebraeily, Khamzade, & Kisomi, 2018). LOS is when a patient remains in a hospital or other healthcare facility as an in-patient until discharged (Organisation for Economic Co-operation and Development [OECD], 2018). LOS is an essential healthcare tool as it can be used as an indicator for measuring the efficacy of hospital management and progress (Si, You, Liu, & Huang, 2017).

A study by Comino et al. (2015) established that the length of stay for patients with DM was always higher than for those without DM. The LOS of in-patients cannot be measured without critically looking at the average length of stay (ALOS). ALOS "refers to the average number of days that patients spend in the hospital. It is generally measured by dividing the total number of days all inpatients stay during a year by the number of admissions or discharges; day cases are excluded" (OECD, 2018). Siazon (2019) attributed longer ALOS of 5.32 days in September 2015 to possible diagnoses, the severity of one's illness, and climatic changes within the setting. However, Desai et al. partly attributed a decrease in ALOS of 3.64 days in 2003 to 3.24 days in 2014 to a standardized simple protocol regimen for managing DKA (Desai et al., 2018). Consequently, in recent times, the ALOS of managing diabetic ketoacidosis (DKA) has decreased to 3 days after implementing critical pathways in a 462-bed teaching hospital (Martin, McKinney, Hoody, & Fish, 2016). The mean duration LOS of DKA in South Africa was eight days (Ndebele & Naidoo, 2018), but the picture looks different in Ghana. Median LOS stands at five days (Sarfo-Kantanka et al., 2016).

### 1.2 Problem Statement

In managing DM in adults on admission in most hospitals in Ghana, neither LOS nor factors influencing LOS are looked at in planning their care, even though LOS has been seen as an essential healthcare tool (OECD, 2018). Anecdotal evidence by nurses in the medical wards of the

37 Military Hospital shows that several patients admitted due to DM spend more than seven days in the ward before they are discharged. This can significantly affect the patient, the hospital, and other patients seeking healthcare due to the unavailability of hospital beds. Although studies have been done on adult DM and its management in Ghana (Nkansah et al., 2021; Opoku, Stephani, Busse, & Quentin; Owusu, 2019), limited studies have been conducted on factors influencing LOS in DM management in adults on admission. For instance, in a survey of the management of DM in urban Ghana, Pei (2015) revealed LOS in DM as one of the factors that influenced the cost of hospitalization but did not establish the causal factors leading to the LOS, which is critical in dealing with LOS. Prolonged LOS of people with DM is a likely predisposing factor to hospital-acquired infection (Baek et al., 2018a). This study examines factors influencing the LOS of adult in-patients with DM in Ghana. The study is imperative because proper and in-depth knowledge about factors associated with LOS and effective monitoring will help manage the LOS of inpatients (Huang, Xie, & Qiu, 2016).

### 1.3 Research Questions

1. What is the average length of stay of patients with Diabetes Mellitus on admission?
2. What hospital-related factors contribute to the length of stay of patients with Diabetes Mellitus on admission?
3. What patient-related factors contribute to the length of stay of patients with Diabetes Mellitus on admission?
4. What co-morbidities are associated with the length of stay of patients with Diabetes Mellitus on admission?

### 1.4 Study Objectives

1. To determine the average length of stay of patients with diabetes on admission.
2. To examine the relationship between hospital-related factors and the length of stay of patients with Diabetes Mellitus on admission.
3. To examine the relationship between patient-related factors and patient's length of stay with Diabetes Mellitus on admission.
4. To identify co-morbidities associated with the length of stay of patients with Diabetes Mellitus on admission.

### 1.5 Significance of the Study

The short length of stay of patients with diabetes mellitus does not only look at the financial gains or loss of a hospital but also goes a long way to affect the care of patients and the whole population. The discharge process starts when a patient is admitted to the hospital. It is, therefore, essential to include the patient and family and, if possible, the one who will pay the hospital bill in the discharge planning. This process helps prepare patients and families to cope well within their community.

When patients are given the necessary information regarding their condition, treatment regimen, complications, and an update on cost while on admission, they become psychologically stable, and all forms of fear and anxiety are resolved. It also speeds up their recovery rate, reducing their length of stay. This will go a long way in addressing the socioeconomic implications and health complications associated with length of stay. Additionally, this study will be very significant in addressing the unavailability of beds during emergencies, which, in most cases, leads to mortality in the country.

Another essential reason this study will bring to bear is how important professionals have to specialize in giving optimum care in various disease conditions. For instance, a nurse specializing in endocrinology cares very well for patients with DM.

Lastly, the study will form the grounds for more robust studies on length of stay not only in diabetes mellitus but all other conditions within healthcare institutions across the country.

### 1.6 Operational Definitions

**Length of stay**: This is the period a patient remains in a hospital (medical wards) as an in-patient (OECD, 2019).

**A long length of stay**: This is a period in which a patient remains in a hospital as an in-patient for more than seven days (Desse & Eshetie, 2016).

**A short length of stay**: This is a period a patient remains in a hospital as an in-patient within seven days (Desse & Eshetie, 2016).

**An average length of stay**: The average number of hospital days patients spend (Ravaghi, Afshari, Isfahani, & Bélorgeot, 2019).

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

The literature review of this study brings to bear how Schorr's theoretical model seeks to identify factors that influence the length of stay in adults with DM on admission. Various literature covering and relating to all the identified constructs and concepts and the study's objectives were reviewed. The first part of this chapter discusses the three conceptual frameworks reviewed for this study. One of these three conceptual frameworks was chosen to model the study. The theories include Andersen and Newman's framework of health services utilization (Andersen & JF, 1995), Schorr's theoretical framework of factors that influence LOS in hospitals (Schorr, 2012) and Papi, Pontecorvi, and Setola (2016), a new model for length of stay in the hospital. The limitations of the models that were not used and the justification of Schorr's theoretical framework for LOS are discussed.

The second part of this chapter focuses on the adaption of constructs from Schorr's theoretical framework concerning the study's objectives. The literature search was done by searching the following sources: Scopus, CINAHL, Science Direct, Google Scholar, PubMed, and Sage journal online to obtain current articles, journals, and books on the proposed study area. Current literature on the proposed study area was evaluated and compared, and gaps were identified. This justifies how this study was done. The following keywords aided in the search in the various databases. Thus, "length of hospital stay," "average length of hospital stay," "DM admissions," "factors contributing to the length of stay and DM," "patient-related factors and LOS in DM," and "co-morbidities associated with LOS in DM."

## 2.2 Theoretical Framework

Theoretical underpinning brings to bear how variables are interconnected in a study. It gives an in-depth explanation of a research outcome. Osanloo and Grant (2016) documented the theoretical framework as the blueprint or a pathway for research work. Therefore, a theoretical framework underpinning a study is imperative because it helps researchers situate and contextualize theories into their work as a blueprint (Ravitch & Carl, 2019).

Few theories guide the study of hospital length of stay. Among these theories are Andersen and Newman's framework of health services utilization (Andersen & JF, 1995), Schorr's theoretical framework of factors that influence LOS in hospitals (Schorr, 2012), and Papi et al. (2016) new model for the length of stay in the hospital.

### 2.2.1 Andersen and Newman Framework of Health Service Utilization

The framework was first developed by Andersen in 1995 and has since gone through several phases, with the current phase being the fourth. The main focus of this framework is to uncover conditions that speed up or delay people in their quest to utilize healthcare services. The framework again views a person's accessibility to and usage of healthcare in three main categories: Predisposing factors, which encapsulate the sociocultural characteristics of an individual before his illness. The second one looks at the available logistics to the person needing healthcare and the need factor. Andersen (1995) stated, "Perceived need will better help to understand care-seeking and adherence to a medical regimen, while evaluated need will be more closely related to the kind and amount of treatment that will be provided after a patient has presented to a medical care provider." Carefully appraising this theory, it can be said that it focuses on how an individual utilizes healthcare services, which does not address the proposed research objectives entirely.

### 2.2.2 Papi, Pontecorvi, and Setola's new model for the LOS of patients (hypergamma)

This new model uses a new density model called hypergamma estimation. This model was developed by Papi et al. (2016). The model uses the data available to calculate the actual LOS of patients in the hospital. The model again introduced measures that are used to model the financial risks. This, therefore, provides a blueprint that serves as an operational guideline for managing hospital beds. Though this model is instrumental in calculating the actual LOS in hospitals, it does not look at relationships existing between variables. Given this, this model cannot address all the study objectives.

### 2.2.3 Schorr's Theoretical framework for determining LOS

The constructs and the concepts of Schorr's theory best address the proposed study objectives. The theory aims explicitly at factors influencing LOS in a hospital, though it did not examine the relationship between the independent variable affecting LOS. Schorr's theory proposed four determinants for the length of hospital stay during admission. Patient characteristics, in theory, deal with the patient's medical history, knowledge of healthcare and his current medical condition, family support, religion, age/sex/gender/race, residence, type of procedure, and severity of the condition. Another determinant was Clinical caregiver characteristics, which deal with culture, specialty area, training level, team, quality of care, and physician choice of prescribed medications.

Characteristics of the social or family environment were another determinant of this theory, which talked about the patient's educational level, his/her peers, political systems around him, economics, and community. The last determinant here is the characteristics or properties of the healthcare system, which were admitting service (surgical vs. medical), the structure of the services being rendered, types of services and available technology, palliative care, health insurance, long-term care, access, setting occupancy, transfers between hospital and care settings venue (emergency vs.

non-emergency department) and geographic location (urban vs. rural). Schorr's theory addresses the study objectives explicitly. In dealing with hospital-related factors affecting LOS, this theory discusses clinical caregiver factors such as specialist care given to patients when needed while on admission. Therefore, patients should be referred to the appropriate specialist on time within or outside a facility to facilitate early and correct diagnosis. Again, in a care delivery system within the hospital setting, collaboration with the multidisciplinary team in holistic care delivery is critical in determining a patient's recovery and LOS. When the multidisciplinary team works together, they can identify patients' problems early and treat them on time, significantly affecting their recovery and LOS in the hospital. Another hospital-related factor that this theory talks about is quality care.

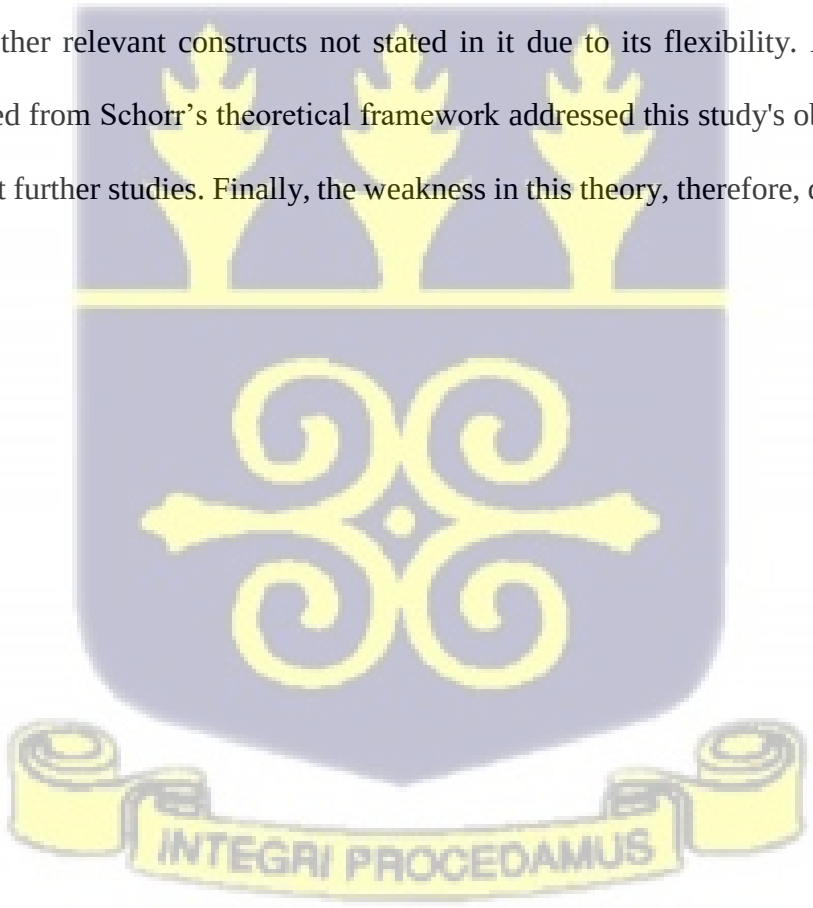
According to WHO, quality care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes through evidence-based professional knowledge (WHO, 2020). When patients admitted to the hospital receive quality care from knowledgeable professionals, it goes a long way to affect the outcome of their disease, which directly impacts their LOS. Hospital-acquired infection is a type of infection that a patient acquires during a long-term hospital stay. Therefore, quality care, early specialist referral, and good collaboration with a multidisciplinary team in a care hospital will strongly affect the number of days patients spend and funds. Schorr again made mention of patient characteristics as one of the factors influencing LOS, which addresses the relationship between patient characteristics and LOS. Here, both the study objective and the theory looked at some of the following patient factors: patient's current diagnosis, demographic characteristics, e.g., age, sex, and education, among others, which have direct predicting effects on LOS. Though the care facility has a vital role in the LOS of patients during admission, the patients also have crucial roles to play. The patient's present

medical condition, either stable or critical, and the response to standardized required treatment for their conditions determine their recovery and when they will be discharged from the hospital. Again, patients' adherence to prescribed medications, dietary regimens, and even ability to pay hospital bills play vital roles in their recovery during their stay in the hospital.

The following variables will be adapted from Schorr's theory for this study. The reason is that they will be specifically relevant to the study in achieving the set objectives. These are (1) patient-related factors/characteristics such as demographic factors (Age, sex, etc.), present or past medical history which addresses these objectives of the study, (2) Hospital factors/clinical caregiver factors such as healthcare insurance/type of payment, trouble transferring between departments, late referrals, over 30 days' admission, and late diagnosis. (3) Co-morbidities associated with the length of stay of patients with DM on admission are one of the main objectives of this study. Though Schorr's theory did not state comorbidity as a characteristic factor influencing length of hospital stay, comorbidity, as stated by the researcher in this study as an objective, can be said to be a patient characteristic influencing LOS in the hospital. This can be considered an additional or secondary diagnosis to the patient's present or past medical history, DM. Several studies have underlined the critical role comorbidities play in patient recovery from their primary or acute diagnosis, which, if not dealt with exclusively, could result in several mortalities (Catala-Lopez et al., 2018; Fathi et al., 2021). For instance, a study in Canada to evaluate the impact of comorbidity on DM hospitalization concluded that patients with comorbidities had the highest odds of hospitalization (Petrosyan et al., 2017). In this study, this objective will seek to establish whether a secondary diagnosis alone could impact a patient's LOS, hence the need to address it separately.

In this study, relevant current literature and standard practices aided in addressing what shorter LOS and longer LOS meant. LOS remains a significant healthcare indicator for managing hospital

beds and planning care for patients and the healthcare facility. It has been demonstrated in the model that several factors contribute to the LOS of patients during admission. Previous studies have shown that sociodemographic factors, institutional factors, and comorbidities contribute to prolonged LOS in inpatients with DM (Almashrafi, Alsabti, Mukaddirov, Balan, & Aylin, 2016; Co-operation & Development, 2019; Desse & Eshetie, 2016; Echouffo-Tcheugui et al., 2016). More significantly, several studies adopted Schorr's theory and demonstrated patient characteristics and institutional/medical caregiver characteristics as the main reasons for LOS during in-patient admissions (Buttigieg, Gauci, Bezzina, & Dey, 2018; Campbell, Cegolon, Macleod, & Benova, 2016; Pertile, Pavanello, Soffiati, Manica, & Piffer, 2018). The theory again accommodates other relevant constructs not stated in it due to its flexibility. Additionally, the constructs adapted from Schorr's theoretical framework addressed this study's objectives and can be adapted to suit further studies. Finally, the weakness in this theory, therefore, did not affect this current study.



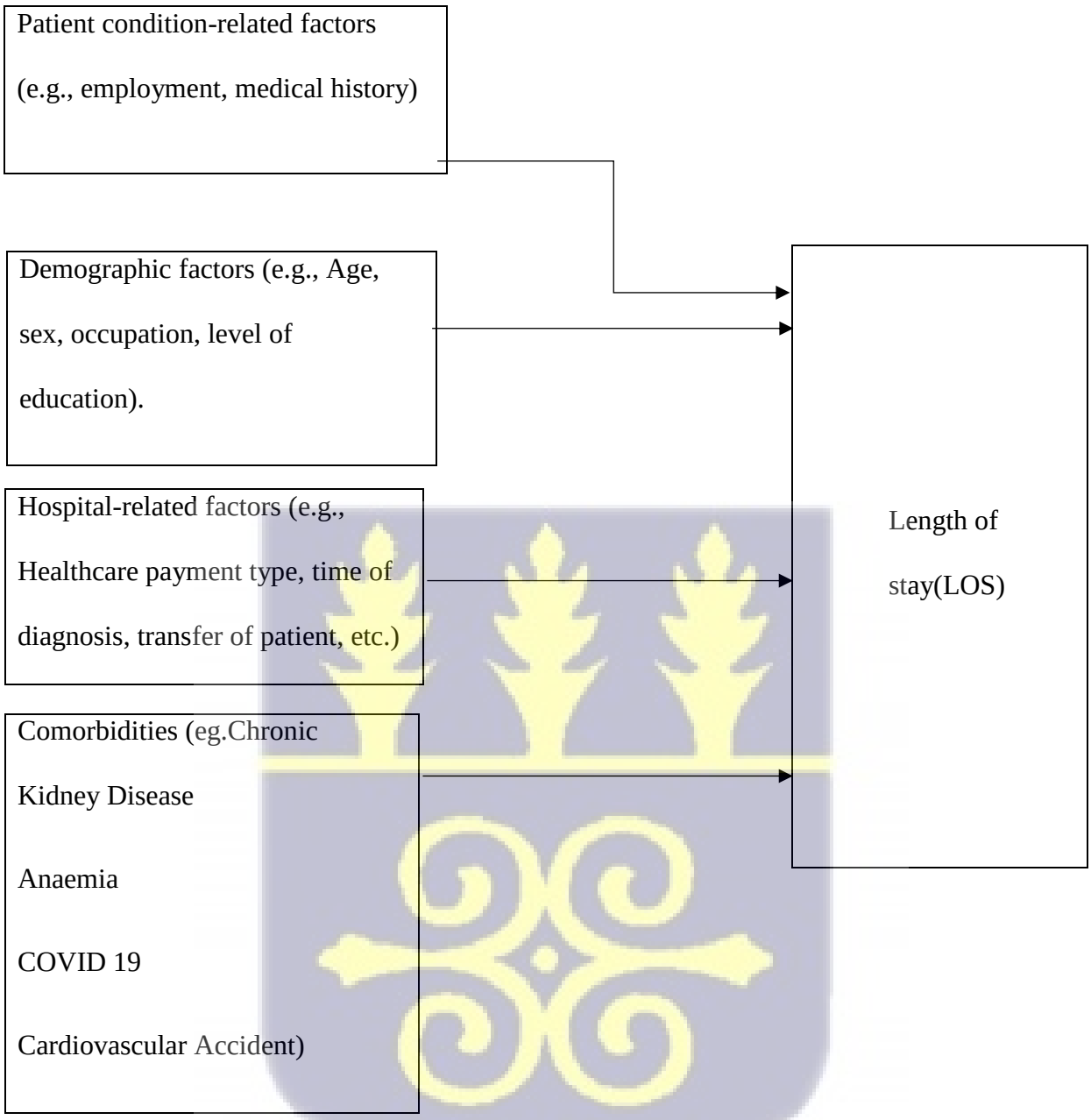



**Fig 1: Conceptual Framework**

## 2.3 Review of Related Literature

This section of the study reviewed the research work done in the following thematic areas concerning the LOS of patients with DM on admission. They were LOS in the hospital, patient-condition-related factors and LOS in DM, demographic factors influencing LOS in DM, hospital factors and LOS in DM, and comorbidities and LOS in DM.

### 2.3.1 LOS in the hospital

Various healthcare systems have recently emphasized managing available resources in their institutions effectively, with significant strategies to reduce costs without compromising the quality of care (Garg, McClean, Barton, Meenan, & Fullerton, 2012). According to Vasilakis and Marshall (2005), hospital LOS is regarded as a reliable and valid proxy that can be used to ascertain how efficiently hospital resources are being used. However, a study by Freitas et al. (2012) revealed LOS as a direct measure of hospital stay cost irrespective of the outcome of the patient's care. Several studies have demonstrated the effects of longer LOS in patients during admission periods (Klineberg et al., 2016). Methicillin-resistant Staphylococcus aureus (MRSA) infection during hospital admission in some patients in some European hospitals was a result of longer LOS (de Kraker, Wolkewitz, Davey, & Grundmann, 2011).

In a large prospective cohort of hospital admissions in Argentina, data analysis demonstrated that the additional LOS of patients on admission due to nosocomial infection was 11.23 days (Barnett et al., 2011). Glance, Stone, Mukamel, and Dick (2011) suggested that a longer LOS due to nosocomial infection had higher medical costs 2-2.5 folds higher than patients with the same principal diagnosis. However, in a recent study, MRSA and readmission did not have any effect on LOS, which was in contrast with findings demonstrated in similar studies(Barrasa-Villar, Aibar-Remón, Prieto-Andrés, Mareca-Doñate, & Moliner-Lahoz, 2017). On the other hand,

shorter LOS helps manage hospital beds to make beds always available for patient care (Kudyba & Gregorio, 2010). For this reason, a recent study suggested that classifying patient stay in the hospital into diagnosis-related categories with fixed reimbursements could incentivize hospitals to improve LOS to maintain and operate stable margins (Medicare & Services, 2018). LOS of a patient is calculated by subtracting the date of admission from the date of discharge (WHO, 2022). According to OECD (2018), ALOS is the average number of days that patients spend in the hospital, which is measured by dividing the total number of days all inpatients stay during a year by the number of admissions or discharges here day cases.

In 2012, ALOS was 8.8 days among 893 patients with DM in an acute medical unit when the relationship between dysglycaemia and LOS in the hospital was investigated (Evans & Dhatariya, 2012). Again, in a study to identify the association between admission glucose level and LOS in DM, the ALOS was 4.5 ± 5.6 days at the internal medicine in Sweden(Björk, Melin, Frisk, & Thunander, 2020). Meanwhile, the ALOS of DM previously stood at 4.40 days; the minimum LOS was one day, and the maximum LOS was 45 days(Baek et al., 2018b). More recently, in Romania, ALOS stood at 7.3 days in, with several factors contributing to this (Bala, Rusu, Ciobanu, & Roman, 2022)

### 2.3.2 Patient condition-related factors and LOS in DM

Here, literature on the following patient-related factors (hyperglycemia, DKA adherence to medications, and readmission predicting LOS are reviewed. These patient-related factors were reviewed based on the study framework, objective, and the adopted questionnaire. Mendez et al. 2013, in a study to find out whether increased glycemic variability independently had an impact on LOS, concluded that a previous diagnosis of DM has no impact on patient LOS on admission. However, patients diagnosed with hypoglycemia had 56% longer LOS than those without

hypoglycemia (P<0.001). Arifulla, Lisha Jenny, Sreedharan, Muttappallymyalil, and Basha (2014) in a hospital in the United Arab Emirate also explained that a proportion of 87% of men on anti-diabetic medication adhered to their medications higher than that of females (81%). However, adherence to different regimens (daily, twice, or three times daily) was not considered. Again, patients with first and second degrees, as their academic qualifications, adhered to their medications more than those with secondary school certificates. Using a chi-square test, all these factors, gender adherence to medication, and educational qualification had a significant association with LOS (Arifulla et al., 2014). However, according to Lohiya, Kreisberg, and Lohiya (2013), in a study done to identify the factors that influence the readmission of persons with episodes of DKA in two private community teaching hospitals, psychosocial and socioeconomic factors contributed to poor adherence to insulin therapy thereby contributing to their readmission due to reoccurrence of DKA.

In a retrospective study among 272,758 adults with DM, black patients had a significantly higher risk of readmission and longer LOS due to their low-income status after adjusting for all other factors (Rodriguez-Gutierrez et al., 2019). The study's findings echo the need to address the persistent racial/ethnic differences in healthcare quality (Rodriguez-Gutierrez et al., 2019). An observation has been made in sub-Saharan Africa where it was reported that people with low educational levels find it difficult to appreciate their condition, thereby leading to non-compliance to their treatment regimen but notwithstanding, people who experienced side effects of antidiabetic medication did not comply with their medication (Kassahun, Fanta Gashe, & Rike, 2016). This study was consistent with a study done by Rubin (2015) on the readmission of patients with DM, which also revealed racial/ethnic minorities and even public insurance as major contributory risk factors for the readmission of patients admitted with DM. In a public hospital in Romania, longer

LOS was significantly associated with DM patients who were diagnosed with chronic kidney disease, cardiovascular disease, and foot ulcers. However, diabetic neuropathy was associated with shorter LOS (Bala et al., 2022). According to Evans and Dhatariya (2012), patients who recorded blood sugars greater than 6mmol/l on admission had longer LOS, but interestingly, hyperglycemia, which is responsible for 28-day mortality and readmission, is not investigated. Another important patient-related factor impacting LOS during admission is the patient's socioeconomic status and background, such as income, education, employment, and social support. For this, Hu, Gonsahn, and Nerenz (2014) observed that increases in readmissions were higher among patients living in highly deprived neighborhoods. Again, patients with a presence or history of a known disease and reported to an urban teaching hospital were risk factors for readmission within 30 days. However, patients who were married were not significantly readmitted. Increased LOS in patients with low Socioeconomic status would be consistent with a lack of access to resources to pay admission bills after discharge (material deprivation). On the other hand, in a prospective observational study, which was done in India on the factors affecting ALOS of 100 patients in the Inpatient Department in a tertiary care center, there was no statistically significant association between socioeconomic factors and ALOS (Badgal, 2015). However, insurance was a strong predictor of ALOS.

In the United States of America, Everett and Mathioudakis (2019) studied the relationship between the type of hospital insurance used by patients, discharge against medical advice, and DKA readmission in adults with type 1 DM by the use of the National Readmission Database. They suggested strong predictors of DKA readmission strongly depended on the type of health insurance and discharge against medical advice. Patients with Medicaid insurance were stronger predictors of DKA admission than patients with private insurance. The finding in the study was in contrast with the study done in India. However, the study used middle and higher socioeconomic

participants, which cannot accurately represent the general population. Including participants with low socioeconomic backgrounds could have given a clearer picture of the association between socioeconomic status and ALOS since all socioeconomic status categories would have been considered. In a documented study in Europe on socioeconomic differences in the association between DM and hospital admission, there was a significant association between longer LOS in DM in older people and socioeconomic status (Rodríguez-Sánchez & Cantarero-Prieto, 2019). However, Song, in China, revealed weather conditions containing sulfur dioxide and carbon monoxide related significantly to LOS in type 2 DM, whereas D. Chen, Liu, Tan, and Zhao (2017a) related a longer LOS in the hospital to patient's type of insurance (New Corporative Medical Scheme) in multiple linear regression. In a documented finding in the Eastern Region of Ghana, using a descriptive cross-sectional method, it was suggested that a substantial economic burden exists in managing people with type 2 DM and its complications (Amon & Aikins, 2017). Though the study concluded that the longer one stays with type 2 DM, the higher the economic impact, studying the cost of treatment during hospitalization could have shown another dimension of a socioeconomic burden on DM.

#### 2.3.2.1 Demographic factors influencing LOS in DM

The researcher reviews the related literature on demographic factors predicting LOS in DM. These include sex, age, employment, and educational status. As demonstrated in the background, it is clear that studies globally have documented an increasing prevalence of Diabetes Mellitus in adults with its associated factors (Comino et al., 2015; Golinvaux, Bohl, Basques, Baumgaertner, & Grauer, 2015). These seem to have a direct effect on healthcare services as well as administrators. In a diabetes prevalence of 9.0% sample of 23,779, the age-adjusted admission rate was 631.3 per 1000, with a mean length of stay of 8.2. The risk of one being hospitalized was attributed to age,

gender, household income, smoking, BMI, physical activity, and how healthy one is, but the increased risk was instead associated with age, obesity, people with hypertension, and hyperlipidemia (Comino et al., 2015). Among the gender risk groups were male people with low economic income, current smokers, and those with depression or anxiety (Comino et al., 2015). Meanwhile, Golinvaux et al. (2015) concluded that geriatric DM patients who underwent hip fracture surgeries had no extended postoperative length of stay. It has also been documented in Iran that there is a significant association between gender and length of stay, with females having longer. However, on the other hand, stress was a significant predictor of length of stay in men than in females (Baharlooei, Alavi, & Adelmehraban, 2017). Bala et al. (2022) showed a significant relationship between age (40 – 65 years) and LOS in DM, whereas being a male or female had no statistical significance with LOS. In China, Chen, Liu, Tan, and Zhao (2017) revealed a significant relationship between age 80 to 90, type of medical insurance, occupation, and LOS. On the other hand, there was no significant relationship between LOS and gender. This study regarding gender was in contrast with studies done by (Baharlooei et al., 2017; Comino et al., 2015; Chio et al., 2017). Again, in a study done in Pennsylvania to determine the impact of type 2 DM on LOS, the following demographic factors thus, increasing age and male sex, were found to increase one's likelihood of longer LOS (Enomoto, Shrestha, Rosenthal, Hollenbeak, & Gabbay, 2017). Similar observations were made in sub-Saharan Africa, where a general hospital in northwest Ethiopia recorded a prolonged LOS of more than seven days among patients admitted due to DKA, as variances were observed among age groups. For instance, patients aged between 35 and 44 had shorter LOS (Abegaz, Mekonnen, Gebreyohannes, & Gelaye, 2018). Although various authorities have alluded that demographic factors influence patients' ALOS in a hospital, Desse and Eshetie (2016) maintained no significant association between the length of hospital stay and

sociodemographic characteristics. Desai et al. (2018) also upheld that there was no significant association between length of hospital stay and sociodemographic characteristics, that is, age, sex, and residence in a chi-square analysis. Again, Carlos et al. 2013, revealed no relationship between age, race, and LOS in increased glycemic variability among hospitalized patients.

According to Borges, Ferraz, and Chacra (2014), being older has been associated with non-adherence. It is typically caused by weak or diminished thinking or cognition, which affects the typical length of stay for patients upon admission—regarding demographic parameters linked to 30-day readmission, older and male patients had a much higher risk of doing so than younger and female patients (Hu et al., 2014). These results contrasted with a study by Everett et al. (2019), which found that female sex and younger age were predictors of one's risk of being readmitted owing to DKA within 30 days. The amount of education of a patient was a significant predictor of ALOS in a tertiary care facility, according to Badgal (2015). Subsequently, in Europe, Rodríguez-Sánchez and Cantarero-Prieto (2019) demonstrated a significant association between ALOS and people with medium educational status regardless of variables used in the regression model.

### 2.3.4 Hospital Factors and LOS in DM

Again, related literature concerning hospital-related factors (diagnosing, early specialist referral, transfer between departments, hospital-acquired infection) predicting DM LOS was examined. Adult patients with DM who require admission for management end up in the hospital and are then managed by a multidisciplinary team. According to Atun et al. (2017), a DM survey in Sub-Saharan Africa suggests an insufficient healthcare system at all levels is needed to deliver sufficient care for DM and its associated risk factors. Some of these factors are a simple diagnostic tool for diagnosis and monitoring, insufficient knowledge demonstrated by healthcare providers, lack of complete record-keeping, and lack of sufficient treatment (Atun et al., 2017). In the quest

to assess whether in-hospital LOS and mortality could be explained by early risk factor assessment, it was concluded that LOS was highly associated with how staff who render care services to patients with DM in the hospital perceive and react to risk factors associated with DM (Azadeh-Fard, Ghaffarzadegan, & Camelio, 2016). LOS in DM patients is considerably reduced as well as 30day readmission when they are managed by a team specialized in DM, thereby saving costs to the patient and the hospital (Mandel et al., 2019)

Empirical evidence suggests that the following factors were associated with prolonged LOS in DM patients on admission to Guangdong Shantou Central Hospital in China between 2011 and 2013: hospital-acquired infection, surgery, diagnoses within three days, department transfers, and treatment efficacy(Huang et al., 2016), but in the USA it has been established that using insulin pens lead to reasonable glycaemic control thereby reducing hospital LOS (Smallwood, Lamarche, & Chevrier, 2017). In Canada, a study described clinical outcomes and risk factors for DM patients with severe to moderate community-acquired pneumonia (CAP). A risk factor for prolonged LOS was associated with disease complications, duration of prescribed antibiotics, and administration of steroids (Bader, Abouchehade, & Yi, 2015). However, in another jurisdiction, Hussain, Alkharaiji, and Idris (2020), in evaluating the effects of Inpatient Diabetes Education (IDE), it was demonstrated that IDE reduces LOS in DM admission periods. Additionally, looking at clinical caregivers as a factor influencing LOS in DM management, a hermeneutic literature review of 45 publications was done by Lawler, Trevatt, Elliot, and Leary (2019) to determine if nurses specialized in DM influence the experiences and outcomes of their clients. It was established that their expertise in discharging their duties reduces patients' LOS in the hospital. According to Lindholm, Hargraves, Ferguson, and Reed (2012), limited English proficiency was one crucial institutional contributory factor to LOS during admission. According to the study, a patient who

did not receive interpretation during admission and discharge processes from a professional interpreter had longer LOS in the hospital, the reason being that professionals give better care, instruction, and education to patients than their relatives (Karliner, Jacobs, Chen, & Mutha, 2007). More recently, in data sampled from 50 hospitals with 12,888 participants, hospitals with more beds and a faster bed turnover rate had shorter LOS in patients with type 2 DM. However, grade 3 hospitals, hospitals with lower doctor-to-nurse ratios, and hospitals with more daily visits per doctor had longer LOS (W. Liu et al., 2021).

### 2.3.5 Comorbidities and LOS in DM

Comorbidity is "Any distinct additional entity that has existed or may occur during the clinical course of a patient with the index disease under study." (Feinstein, 1970). Several studies have documented the effects of comorbidity on LOS during hospitalization with or without DM (H. Liu et al., 2022; Terzano et al., 2017). People living with DM continue to have a greater risk of being on admission due to infection (Harding, Benoit, Gregg, Pavkov, & Perreault, 2020; Policardo, Seghieri, Anichini, & Francesconi, 2017). This exposes them to so many problems. For instance, patients on admission due to DM have a greater prevalence of polypharmacy than those without DM (Formiga et al., 2016), further worsening or complicating their condition (Low et al., 2017). In the USA, comorbidity was identified by Rubin (2015) as a risk factor in hospital readmission of a patient diagnosed with DM. This affirms a previous study to estimate the cost of readmission in DM. Thus, costs associated with hospitalized diabetic patients in the USA were $124 billion. Out of which, an estimated $25 billion was attributable to 30-day readmissions alone (Association, 2013). In a linear regression analysis, Cromarty, Parikh, Lim, Acharya, and Jackson (2014) showed that patients on admission due to DM had a longer LOS because of these co-morbidities, end-organ sequelae, and hospital-acquired diagnoses.

A documented study in Italy by Valent, Tonutti, and Grimaldi (2017) revealed a significant increase in LOS among patients with DM who had other conditions such as infections, acute myocardial infarction, and acute renal failure. Similarly, Lee et al. (2017) also demonstrated an association between DM and extended hospital LOS due to vascular disease and infection in a medical unit in a community public hospital. They suggested involving a more DM-specific multidisciplinary team with skilled general practitioners may reduce inpatient LOS. In a multi-stage sampling using 50 hospitals and 12,888 patients diagnosed with type 2 DM, patients with complications and other comorbidities had a longer LOS in the hospital(W. Liu et al., 2021). Previous evidence affirms these findings in a retrospective longitudinal cohort study when 27,473 patients were used by Cheng, Wang, and Ko (2019), who concluded with a piece of evidence that DM complications such as amputation, nonfatal stroke, and nonfatal ischemic heart disease contributed to prolonged LOS during admission periods. Again, a retrospective study in Australia using hospital secondary data revealed a prolonged LOS in comorbid DM in patients admitted with acute exacerbation of chronic obstructive pulmonary disease (Parappil, Depczynski, Collett, & Marks, 2010). Similarly, in another study by Echouffo-Tcheugui et al. (2016), using data from the Get with Guidelines-Heart Failure registry, logistic regression showed a longer LOS in patients admitted with heart failure (HF) and DM as compared with those without DM but only HF. According to Martínez-Huedo et al. (2017), an analysis from a Spanish National Hospital Discharge Database between 2010-2014, type 2 DM patients who underwent total hip and knee arthroplasty had a longer LOS than those without DM. However, a multivariate regression analysis to identify predictors of LOS after total hip arthroplasty in China, DM among other conditions, and the Charlson Comorbidity Index (CCI) score did not show any significant relationship in LOS (Ding et al., 2020). This study contrasted with the study by Martinez-Heude et al. (2017). In a

study done in some selected Peruvian hospitals to identify the association between LOS and diabetic foot, it was revealed that the ALOS for patients with diabetic feet was 32 days and for those with a history of hypertension, 9.1 days. Analysis again showed that a diabetic foot and a history of hypertension increase a patient's LOS (Mejia et al., 2018). However, in another jurisdiction, D. Chen, Liu, Tan, and Zhao (2017b) revealed shorter LOS in DM patients with chronic or acute plus chronic complications compared to those without. Again, cerebrovascular accidents and coronary artery disease in China were comorbidities that contributed significantly to longer LOS in diabetic foot ulcers (Kim et al., 2016). In a more recent study, Lui et al. (2021) documented cardiovascular diseases and patients with the International Classification of Diseases coded complication types E11.1, E11.2, E11.4, and E11.5 as the significant cause of longer LOS in DM during hospital admissions.

# CHAPTER THREE

# METHODOLOGY

## 3.1 Introduction

This chapter provides details of the methodology of the study. It covers the research design, the research setting, the sampling and sampling technique, the research instrument, data gathering, procedure, validity and reliability, and ethical considerations.

## 3.2 Research Design

This study adopted a cross-sectional approach to collect and analyze data. This approach involves collecting data using a structured questionnaire from a study population at one point (Setia, 2016). According to Polit and Beck (2014), cross-sectional surveys are flexible. They are, therefore, inexpensive and make it possible to cover several areas of human conditions and behaviors. The critical importance of this approach is its ability to provide quick results when information is needed in current situations. This type of design was suitable for this study because it made it possible to draw associations between the identified variables influencing Length of Stay and mitigated biases.

## 3.3 Research Setting

The study was conducted at the 37 Military Hospital in the Greater Accra Region of Ghana. It is located between Kotoka International Airport and Accra Central. Ghanaians within and outside Accra are, therefore, able to access the hospital quickly. The hospital has a 500-bed capacity and was built in 1941 to deliver healthcare services to all military personnel and their families and senior civil servants within the Ministry of Defense. Healthcare services were later opened to all Ghanaian citizens to date. The 37 Military Hospital is also a Teaching Hospital that is made up of

various departments. Thus, the Medical record unit, Medical, Surgical, Pediatrics, Obstetrics and Gynecology, Dental, Pathology, Physiotherapy, Pharmacy, Radiology, Laundry unit, Nutrition department, Morbid Anatomy department, and the Public Health division. The hospital serves the country regarding national disasters and all categories of health emergencies. The medical department of the 37 Military Hospital comprises three general wards, one male special ward, and a female special ward. The study, therefore, made use of patients admitted to these units. Apart from healthcare service delivery, the hospital also has schools that train health professionals in the following categories: nursing, anesthesia, medicine (postgraduate), and Emergency Medical Technician. Three medical wards were used for this study: James Cole ward, Bandoh ward, and Opoku ward. Both military and civilians served as unit heads. The reason for choosing this facility is because it is one of the tertiary institutions in Ghana, which is considered the second largest referral hospital in Ghana. The hospital serves and receives all kinds of medical emergencies and referrals from all hospitals nationwide, irrespective of the patient's background.

### 3.4 Sources of Data

The study used primary data. Using a questionnaire, the data were obtained from patients diagnosed with DM at the 37 Military Hospital, Accra.

### 3.5 Study Population

The target population in a study is a group of elements that a researcher wants to know more about (McLeod, 2019). In this study, patients diagnosed with DM and on admission at the three medical wards of 37 Military Hospital were the target group for the study.

The inclusion criteria for this study were;

1. Patients diagnosed with DM and admitted to the medical wards.
2. Individuals who were aged 18 years and above.
3. Only participants who were willing to consent to the study.

### 3.6 Sample and Sampling Technique

The sample size for the study was calculated based on Krejcie and Moragn's (1970) sample size determination. The formula assumes a 95% confidence level and a 0.05 level of precision.

Krejcie and Morgan's formula is below:

$$s = X^2NP(1-P) / d^2 (N -1) +X^2P(1 -P)$$

Where:

s = required sample size.

$X^2$ = the table value of chi-square for I degree of freedom at the desired confidence level (3.841).

N = the population size (140).

P = the population proportion (assumed to be .50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.05).

Therefore:

$$s = 3.841(140x.50)(1-.50) / .05^2 (140 -1) +3.841^2x.05(1 -.50)$$

$$s = 103$$

From the formula above, the least sample size was 103. Thus, a sample size of 110 was adequate for this study, which catered to incomplete questionnaires and the withdrawal of participants.

### 3.7 Sampling Procedure

Sampling in a research study refers to the method used in selecting cases from a target population (Taherdoost, 2016). In this study, respondents were selected based on a proportionate sampling technique. This sampling technique is used when a population comprises subgroups that are different in number (Alvi, 2016). This enabled the researcher to select the appropriate respondents based on the inclusion and exclusion criteria for the study. First, the list of all persons diagnosed with DM and admitted to the wards (sample frame) was obtained from the hospital administrator and ward masters. Respondents were selected from the sample frame. The selection of the participants from the three wards was unequal due to the number of admitted persons available within the study period in each ward. Of the three wards, one was for females (Ward 1), and two wards (Ward 2 and 3) were for males. Overall, one hundred and ten (110) participants were selected for the study. Specifically, sixty-two (62) participants were selected from the female ward (Ward 1), thirty-one (31) from Male Ward 1, and seventeen (17) from Male Ward 2. The researcher or the two nurses recruited from the units interviewed selected participants on the day of discharge.

### 3.8 Instrument

A questionnaire (*see Appendix E*) was considered an appropriate primary data collection instrument. To achieve the stated objectives of the study, standardized instruments were used to collect the needed data. A questionnaire developed by Li et al. (2018) was adopted. This questionnaire about the impact factors of LOS asks respondents about the leading cause that extends LOS in their opinion. It has ten items. The responses to the items were categorical, such as Yes or No, with the last item asking respondents to state other reasons that prolong LOS. Demographic and patient medical histories in the questionnaire were extracted from their folders. The questionnaire had three sub-sections. Section A contained the patient's demographic

information, such as age, sex, level of education, occupation, and mode of payment of hospital bills. Section B is the patient's medical history, including the patient's previous history of admission, current DM admission diagnosis, comorbidities, baseline blood sugar levels, and patient dietary regimen. Do patients conform to the prescribed dietary regimen? Does the patient refuse medications? Does the patient have any DM-related complications during admission? Did this complication prolong LOS? Section C includes hospital-related factors, including Patients Hospitalized over 30 days, patient's other reasons, trouble transferring patients between departments, identifying diagnoses, and referring to the other doctor and others. Other measures again included in the questionnaire were the date of admission, date of discharge, and the number of days spent on admission.

### 3.9 Measurement of variables

Here, all the variables in the study are explained, including how they are measured in the study. They were categorized under dependent and independent variables. Measuring variables in research is critical because it helps determine which kind of statistical analysis a researcher should use in data analysis (Saint-Germain, 2008).

#### 3.9.1 Dependent variable

The dependent variable for the study is Length of Stay (LOS). Length of stay was measured using two variables: date of admission and date of discharge. Respondents' dates of admission and discharge were extracted from the hospital records. The admission date was subtracted from the discharge date to determine the number of days spent at the hospital.

The average length of stay (ALOS) was calculated using the admission and discharge book at the medical wards. The following dates were used in calculating the ALOS, dates of admission and discharge, and the total number of DM admissions throughout the study. Therefore, the total

number of occupied hospital days for all respondents was divided by the total number of respondents to attain the ALOS

### 3.9.2 Independent variables

The independent variables are patient demographics, condition-related factors/medical history, and hospital-related factors.

Patient demographic factors (*see Appendix A*) include age, sex, level of education, occupation, and payment of hospital bills.

Patient condition-related factors/medical history (*see Appendix B*) include the previous history of diabetes mellitus admission, baseline blood sugar level; the patient admitted diagnosis, dietary regimen, patient refusal of medications, DM-related complications during admission, and complications prolonged patient stay in the ward.

Hospital-related factors (*see Appendix C*) include progressive disease, over 30 days of hospitalization, patient other reasons, Transfer out difficulties, delayed diagnosis, and late specialist referral. This information was obtained from patients and extracted from their sheets, nurses' changes book, and 24-hour report book using an adopted standardized questionnaire about the impact factors of LOS in DM during the admission period.

### 3.10 Pre-testing of the instrument

Pre-testing of the study was done to determine how valid and reliable the questionnaire was for the main study. (Baillot, Mampuya, Comeau, Méziat-Burdin, & Langlois, 2013). The pre-test was done at the International Maritime Hospital, Tema. Ten (10) patients were used. This was done after the institutional review board of the study setting issued the ethical clearance certificate. It helped to determine the average time needed to administer the questionnaire, whether the

participants would have issues, and what the issues were. The findings of the pretest guided the researcher in making amendments, such as grouping patients' baseline blood sugar levels into four levels to the questionnaire. Two research assistants were recruited and trained to assist in data collection.

### 3.11 Data collection procedure

Permission was sought from the hospital administrator, ward masters, and participants before the participants were selected to respond to the survey. The participants were selected from the three medical wards of 37 Military Hospital. As explained earlier, three medical wards were used for the study. Before administering the questionnaires, the research team explained the purpose of the study, the responsibilities of the participants as well as the ethical issues. Only those who consented to take part in the study were given questionnaires. Again, opportunities were given to them to ask questions. Instructions to complete the questionnaires were read to them, and a few participants were selected to summarize the instructions. The intention for doing this was to establish the participants' understanding of the instructions. The participants were then reassured that the data was for only academic purposes and would not be shared with anyone apart from the principal investigator, supervisors, and data analyst. Data collected were protected by a password on the computer all the time.

A consent form (*see Appendix D*) was given and explained to each participant before participating in the study. An Information sheet (*see Appendix D*) was given to respondents on the possibility of withdrawing from the study if they so wished, even after they had accepted to participate. They were again reassured that their withdrawal would not affect the care they received from the wards. Patients' names were also not included to ensure anonymity. During the interaction with the respondents, COVID-19 protocols were observed. Education was given to the respondents that the

consent forms, questionnaires, and other study documents would be kept under lock and key. The researcher/ research assistants and the respondents had their face masks on properly during the interaction. Again, the researcher/research assistants always maintained a distance of at least 3 meters from the respondents. Alcohol-based hand sanitizers were made available to maintain hand hygiene as often as possible throughout the interaction. The data was collected from persons diagnosed with DM who had stayed in the hospital and were discharged from February to July at the 37 Military Hospital. Participants answered the questionnaires on their day of discharge and handed them over to the research team once completed. Each questionnaire took approximately 40 minutes- one hour to complete.

### 3.12 Reliability and Validity

Reliability can be explained as the consistency and trustworthiness of measurements of characteristics that can be assessed using any reliability test method (Streiner, Norman, & Cairney, 2015). Pre-testing of the research instrument was done with ten patients to enhance reliability at the International Maritime Hospital, Tema, to identify and modify areas that needed correction to align with the questionnaire. Again, Cronbach's alpha coefficient of reliability of the instrument was calculated, which was 0.702, and was considered acceptable for adapted instruments (DF Polit & Beck, 2013). Conversely, validity is the accuracy and meaningfulness of inferences based on a study result (Ellis, 2013). The researcher aimed for the research outcome to be as trustworthy as possible through carefully followed procedures in the entire research process. The questionnaire was subjected to peer review by research experts who ensured the items in the questionnaire were in line with each other without any ambiguities and focused on items that met the intended objectives of the study.

### 3.13 Data management and analysis

Data management in a study deals with how data collected by a researcher is efficiently processed and stored and is easy for retrieval for analysis (Lieuwen et al., 2006). Participants were assisted in responding to the questionnaire at their convenience in their hospital beds. The questionnaires were retrieved the same day they were administered. The coding of completed questionnaires was done immediately. A data assistant manager was recruited from the study setting with expertise in data retrieval and statistics and a Diploma qualification. Again, the data collected was examined for errors using descriptive statistics, summarising, and finding patterns associated with the variables. Poisson regression was also employed to describe the relationship between all the independent variables, thus patient-related factors, hospital-related factors, comorbidities, and LOS. This type of regression is used when a dependent variable is count data and when there are also one or more independent variables (Lund, 2016). Using Poisson regression, the data collected by the researcher passed all the five assumptions required, thereby giving valid results. Poisson regression assumes that the dependent variable must consist of count data, there should be one or more independent variables, which can be measured on a continuous, ordinal, or nominal/dichotomous scale, there should be independence of observation, the distribution of counts should follow a Poisson distribution and lastly, mean and variance must be identical. In this study, the dependent variable was count data. More than one independent variable was measured on a dichotomous scale/nominal scale. All independent variables were measured at a single time and were unrelated. Again, the data set was tested for Poisson distribution using SPSS.

Computer backup records were done throughout the analysis process, with data stored on a computer with a password by only the researcher. Completed questionnaires have been kept in a

secured place under lock and key in a safe cabinet, which will be kept for five (5) years before destruction.

Descriptive statistics such as frequency, tables, and means were used to describe the respondents' socio-demographic characteristics, Patient condition-related factors/medical history, and health-related factors. Furthermore, poison regression was used to examine factors related to the length of stay among persons with DM.

### 3.14 Ethical Considerations

Every research study is commenced after seeking approval for clearance ethically. To ensure moral ethics, every researcher must stick to the three main ethical principles of the Belmont Report. Thus, justice, respect for human dignity, and beneficence. Ethical clearance was sought from the 37 Military Hospital Institutional Review Board. This was done by submitting the study proposal and a letter from the School of Nursing and Midwifery. An introductory letter from the School of Nursing and Midwifery at the University of Ghana was attached to the clearance. It was submitted to the Deputy Director of Nursing in charge of the medical wards, which enabled me to gain access to the study participants in the study setting. These ethical principles, such as confidentiality and privacy, were adhered to (DF Polit, Beck, & Hungler, 2001).

The research procedures that were followed in this study have been explicitly explained in this chapter. The next chapter is where I discuss the findings of the study.

# CHAPTER FOUR

# RESULTS

## 4.1 Introduction

This chapter presents the data of the study. The factors explored in this chapter include patient demographics, patient condition-related factors/medical history, and hospital-related factors.

## 4.2 Socio-demographic Characteristics

As shown in Table 4.1, about 62(56.4%) females and 48(43.6%) males were interviewed. With regards to the age group, about 1 (0.9%) were between 18-31 years, 33 (30%) were between 32-45 years, 17 (15.5%) were aged 46-59, and more than half 59 (53.6%) of the respondents were aged 60 and above years. In terms of educational background, about 3(2.7%) were uneducated, 20(18.2) had Primary/JHS, 52(47.3%) had O level/SHS and 35(31.8%) had tertiary education status. The number of DM patients admission who were retired was 63(57.3), unemployed were 4(3.6%)., and those employed were 33(39. 1%). For the mode of payment of hospital bills, 88(80%) of patients had national health insurance or Army sponsorship, with 22(20%) paying their bills through cash.

**Table 4.1 Percentage distribution of Socio-demographic characteristics of the patients (N=110)**

| Variable | Frequency (N=110) | Percentage |
|---|---|---|
| **Age** | | |
| 18-31 years | 1 | 0.9 |
| 32-45 | 33 | 30.0 |
| 46-59 | 17 | 15.5 |
| 60 and above | 59 | 53.6 |
| **Sex** | | |
| Male | 48 | 43.6 |
| Female | 62 | 56.4 |
| **Occupation** | | |
| Employed | 33 | 39.1 |
| Unemployed | 4 | 3.6 |
| Retired | 63 | 57.3 |
| **Mode of payment bill** | | |
| Insurance/Army sponsor | 88 | 80.0 |
| Cash paying | 22 | 20.0 |
| **Total** | 110 | 100.0 |

### 4.3 Patient-related factors/medical history

According to Table 4.2, about 86 (78.3%) of the patients had a previous history of DM admission. On blood sugar levels, about 5 (4.5%) of patients had baseline blood sugar levels between 4mmol/l-6mmol/l, while about 45 (40.9%) had blood sugar levels between 6.1mmol/l-12.0mmol/l. For dietary regimens, 42 (38.2%) of the patients were on a dietary regimen prescribed by the dietician, while 68(61.8%) were not on any dietary regimen. Regarding patient refusal of medication, about 108 (98.2%) patients indicated no refusal of medication. In addition, about 24

(21.8%) patients indicated DM-related complications, and 23 (20.9%) indicated complications with prolonged stay. Finally, 76.4% of the patients admitted had challenges buying prescribed medications on time and having prescribed investigations done outside the hospital.

**Table 4.2: Percentage distribution of patient-related factors/medical history**

| Variables | Frequency | Percentage |
|---|---|---|
| **Previous history** | | |
| No | 24 | 21.8 |
| Yes | 86 | 78.2 |
| **Baseline blood sugar level** | | |
| 12.1mmol/l-18.0mmol/l | 28 | 25.5 |
| 18.1mmol/l and above | 32 | 29.1 |
| 4mmol/l-6mmol/l | 5 | 4.5 |
| 6.1mmol/l-12.0mmol/l | 45 | 40.9 |
| **The patient admitted diagnosis of DM** | 110 | 100 |
| **Dietary regimen** | | |
| No | 68 | 61.8 |
| Yes | 42 | 38.2 |
| **Conform to a dietary regimen.** | | |
| No | 71 | 64.5 |
| Yes | 39 | 35.5 |
| **Refuse medication** | | |
| No | 108 | 98.2 |
| Yes | 2 | 1.8 |
| **DM related complications** | | |
| No | 86 | 78.2 |
| Yes | 24 | 21.8 |
| **Complication prolonged stay** | | |
| No | 87 | 79.1 |
| Yes | 23 | 20.9 |
| **Total** | **110** | **100.0** |

### 4.4 Hospital-related factors

The results in Table 4.4 show the health-related factors of patients diagnosed with DM. The results show that about 98 (89.1%) had their disease progressing compared to their last time of admission. Regarding long-term hospitalization, about 1 (0.9%) was hospitalized over 30 days, and about 103 (93.6%) had other patient reasons. Among patients who needed to be transferred out to another

unit within the hospital, 107 (97.3%) patients, there was no trouble transferring them to other units. Regarding diagnosis, about 32 (29.1%) patients indicated that it took more time for health professionals to diagnose them, and about 8 (7.3%) expressed that it took time for them to be referred to other doctors.

**Table 4.3: Percentage distribution of hospital-related factors**

| Variable | Frequency | Percentage |
|---|---|---|
| **Progressing disease** | | |
| No | 12 | 10.9 |
| Yes | 98 | 89.1 |
| **Hospitalized over 30 days** | | |
| No | 109 | 99.1 |
| Yes | 1 | 0.9 |
| **Patients other reason** | | |
| No | 103 | 93.6 |
| Yes | 7 | 6.4 |
| **Trouble in transferring patient** | | |
| No | 107 | 97.3 |
| Yes | 3 | 2.7 |
| **It takes time to identify a diagnosis.** | | |
| No | 78 | 70.9 |
| Yes | 32 | 29.1 |
| **Takes time to refer to the other doctor** | | |
| No | 102 | 92.7 |
| Yes | 8 | 7.3 |
| **Total** | **110** | **100.0** |

The number of patients with comorbidity apart from DM complications was 49 (44.5). All 110 patients had to do at least an investigation or purchase medications outside the hospital. Among them, 26 (23.6%) had their investigations or medication purchases delayed due to financial constraints.

### 4.5 Length of stay (LOS)

The minimum LOS was three days, whereas the maximum LOS was 35 days. Regarding patient admission over 30 days, only 1 (0.9%) patient spent more than 30 days on admission. Lastly, out of the 110 patients, the average length of stay (ALOS) was 8.89 days.

### 4.6 Test of statistical significance for Poisson regression

Before conducting Poisson regression, the data was tested for its statistical significance. Results from the table showed that One-Sample Kolmogorov-Smirnov Test 2 was statistically insignificant (p=1.100) in using Poisson regression in predicting or assessing the contributory factors of LOS among patients.

**Table 4.4 Test of statistical significance for Poisson regression**

**Descriptive Statistics**

| | N | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Number of days spent | 110 | 8.85 | 6.189 | 3 | 35 |

**One-Sample Kolmogorov-Smirnov Test 2**

| | | Number of days spent |
|---|---|---|
| N | | 110 |
| Poisson Parameter | Mean | 8.85 |
| Most Extreme Differences | Absolute | .039 |
| | Positive | .039 |
| | Negative | -.154 |
| Kolmogorov-Smirnov Z | | .505 |
| Asymp. Sig. (2-tailed) | | 1.100 |

a. Test distribution is Poisson.
b. Calculated from data.

### 4.7. Hospital-related Factors Predicting Length of Stay

The Poisson regression analysis from Table 4.5 depicts that the likelihood ratio chi-square test indicates that the whole model was a significant improvement in fit over a null (no predictors) model (P<.000). Again, over 30 days of hospitalization was a significant predictor of LOS (b=1.529, S.E. .1753, P=.000). The predicted log count of the number of days for patients who spent more than 30 days on admission due to DM (coded 1) was 1.529 units greater than that for

patients who spent less than 30 days on admission (coded 2). The incidence rate for patients who spent more than 30 days on admission was (.217), thus 21.7% greater than that for those who spent less than 30 days on admission. Delay of patient diagnosis was also another predictor of LOS (b=.270, S.E.=.0723, P=.000). The predicted log count of LOS for patients who had their other diagnosis apart from DM delayed (coded 1) was .270 units greater than that for patients whose diagnosis did not delay (coded 2). The incidence rate for patients' delayed diagnosis was (.764)76% greater than early diagnosis. Additionally, a late specialist referral was also a predictor of LOS (b=.273, S.E.=.761, P=.0013). The predicted log count of LOS for late referral of patients to a specialist (coded1) was .273 units greater than that for patients referred early when needed (coded2). The incident ratio (found in the exp(B) column) indicates that for a patient being referred early to specialists, the incidence rate (for LOS in the hospital) was .761 times greater than that for those who were not referred early. Lastly, trans-out difficulties either within the hospital or outside the hospital for a procedure predicted LOS (b=.693, S.E.=.1089, P=.000). The predicted log count of LOS for trans-out difficulties (coded 1) was 693 units greater than that for those who did not have trans out difficulties (coded 2). The incidence rate for trans-out difficulties was .500 (50%), greater than that for those who were trans-out quickly.

**Table 4.5 Poisson regression showing hospital-related factors of LOS**

| Parameter estimates | | | Hypothesis test | | | Omnibus test | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **B** | **Std. Error** | **Wald chi-square** | **Sig.** | **Exp(b) (or)** | **Likelihood ratio chi-square** | **Sig.** |
| Progressing disease | .489 | .1257 | 15.154 | .000 | 1.631 | 112.309 | .000 |
| Over 30 days hosp. | 1.529 | .1753 | 76.103 | .000 | .217 | | |
| Transfer out difficulties | .693 | .1089 | 40.447 | .000 | .500 | | |
| Delay diagnosis | .270 | .0723 | 13.925 | .000 | .764 | | |
| late specialist referral | .273 | .1101 | 6.151 | .013 | .761 | | |

### 4.8 Patient condition-related factors predicting Length of Stay

A history of DM-related admission significantly predicted LOS in the hospital (b=.156, S.E.= .0830, P=.020). The predicted log count of the days for patients with DM-related conditions as their previous diagnosis (code 1) was .156 units greater than those with no previous DM-related admission (code 2). The incident ratio (found in the Exp(B) column) indicates that for patients having previous DM-related admission, the incidence rate (for the number of days spent in the hospital) was 1.169 times greater than that for those who did not have previous DM admission. Progressing disease of patients was a significant predictor of LOS in the hospital (b=.279/ S.E.= .1340, P=.037). The predicted log count of the number of days for patients whose disease conditions progressed (code 1) was .279 units greater than those whose disease conditions were not progressing (code 2). The incident ratio (found in the Exp(B) column) indicates that for patients with their disease condition progressing, the incidence rate (for the number of days spent in the hospital) was 1.322 times greater than that for those whose disease conditions are not progressing.

The complication in DM during hospital admission was a significant predictor of LOS in the hospital (b=.508, S.E.=.1318, P=.000). The predicted log count of the number of days for patients who had complications in their condition (coded 1) was .508 units greater than that for those who did not have any complications (coded 2). The incident ratio (found in the Exp(B) column) indicates that for patients having complications in their conditions, the incidence rate (for the number of days spent in the hospital) was .601 times greater than that for those who did not have complications. Co-morbidity significantly predicted LOS (b=.348, S.E.=.1649, P=.035). The predicted log count of patients who had other comorbidities apart from their primary DM diagnosis (coded 1) was .348 units greater than that for those who did not have any comorbidity (coded 2). The incidence rate of LOS for DM patients with other disease conditions was 1.416 (41%), greater than that for those with no other comorbidities.

Patients other reason did not influence LOS (b=.122, S.E =.1825, P = .504). Here, the predicted log count of the number of days for patients who stated other reasons for their LOS was .122 units. The incident ratio for patients with other reasons not predicting LOS was .885 (88%). Another factor that did not predict LOS in this study was the mode of payment of hospital bills (b = -.377, SE= 1.4848, P = .800). The predicted log count of patients who had either insurance or were sponsored by the Army (coded 1) was -.377 units compared to those who paid their bill by cash (coded 2). Finally, another factor that did not influence LOS in this study was patients' baseline blood sugar levels on admission.

**Table 4:6 Poisson regression showing Patients-related factors and comorbidity of LOS**

| Parameter estimates | | | Hypothesis test | | | Omnibus test | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **B** | **Std. Error** | **Wald chi-square** | **Sig.** | **Exp(B) (OR)** | **Likelihood ratio chi-square** | **Sig.** |
| Previous hist. of DM=1 (yes) | .156 | .0830 | | .020 | 1.169 | | |
| | .140 | 1465 | .914 | .339 | | | |
| Baseline blood sugar 1(4mmol/l-6mmol/l | -.119 | .0767 | 2.410 | .121 | | | |
| Baseline blood sugar 2(6.1mmol/l-12mmol/l | | | | | | | |
| Baseline blood sugar 3(12.1mmol/l-18mmol/l | .152 | .0873 | 3.033 | .082 | | | |
| Baseline blood sugar 4 (18.1 mmol/l-above) | 0[a] | - | - | - | 1 | | |
| Mode of payment of bill =1 (insurance/army sponsor) | -.377 | 1.4848 | .064 | .800 | .686 | | |
| Mode of payment of bill =2 (cash) | 0[a] | . | . | . | 1 | | |
| DM related complication=1 | .508 | .1318 | 3.143 | .000 | 1 | | |
| DM related complication=2 | 0[a] | - | - | - | - | | |
| Patient other reasons | .122 | .1825 | .446 | .504 | .885 | | |
| Comorbidity | .348 | .1649 | 4.447 | .035 | 1.416 | | |

**Demographic Factors Predicting Length of Stay**

The Poisson regression analysis from Table 4.7 shows that the likelihood ratio chi-square test indicates that the full model was a significant improvement in fit over a null (no predictors) model (P<.001). Male sex was a significant predictor of LOS (b=.487, S.E.=.0645, P=.000). The predicted log count of patients who were males (coded 1) was .487 units greater than that for

females (coded 2). The incidence rate of LOS for male DM patients was 6.952(95%), greater than that for females. The likelihood ratio chi-square test again indicates that the full model was a significant improvement in fit over a null (no predictors) model (P<001). It, therefore, suggests that certain age groups (18-31years and 46-59years) were significant predictors of LOS in DM admission (b=.712, S.E. .2333, P=.002 and b=-.278, S.E. .1008, P=.006 respectively). The predicted log count of the number of days for patients who had their ages between 18-31years (coded 1) and 46-59years (coded 3) were -.712 and -.278 greater than that for the other age groups (coded 2) and (coded 4). The incident ratio (found in the Exp(B) column) indicates that for those ages between 18-31 years and 46- 59 years, the incidence rate for LOS was 2.038 and .622 times greater than that for the other age groups. Patients ' level of education was another significant predictor of LOS in DM during admission. Uneducated patients (coded 1) and those with primary or junior high school qualifications (coded 2) had longer LOS than those with O'level and tertiary certificates, respectively.

**Table 4:6 Poisson regression showing demographic and LOS**

| Parameter estimates | | | Hypothesis test | | | Omnibus test | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **B** | **Std. Error** | **Wald chi-square** | **Sig.** | **Exp(B) (OR)** | **Likelihood ratio chi-square** | **Sig.** |
| Sex=1 (male) | .487 | .0645 | 56.972 | .000 | 6.952 | 163.717 | .000 |
| Sex=2 (female) | 0[a] | . | . | . | 1 | | |
| Age=1(18-31yrs) | .712 | .2333 | 9.312 | .002 | 1 | 2740.938 | .002 |
| Age=2(32-45yrs) | .080 | .0731 | 1.196 | .274 | 1 | | |
| Age=3(46-59yrs) | .278 | .1008 | 7.619 | .006 | 1 | | .006 |
| Age=4(60 and above) | 0[a] | - | - | - | | | |
| Occupation=1 (Employed) | - 2.147 | 1.2018 | 3.190 | .074 | .117 | | |
| Occupation=2 (unemployed) | - 3.238 | 3.2499 | .993 | .319 | .039 | | |
| Occupation=3 (retired) | 0[a] | . | . | . | 1 | | |
| level of education=1 | -.604 | .2642 | 1567.120 | .022 | 1 | | |
| level of education=2 | -.232 | .1001 | | .020 | 1 | | |
| Level of education=3 | .036 | .0718 | | .613 | 1 | | |
| level of education=4 | 0a | | | | | | |

### 4.9 Co-morbidities predicting length of stay

From table 4.7, co-morbidities associated with the length of stay of patients with Diabetes Mellitus on admission included CKD (1.8%), anemia (2.8%), covid 19 (4.6%), CVA (1.8%), pneumonia and malaria (3.6%), cellulitis (2.7%), BPH, liver abscess (4.6%), atrial fibrillation (1.8%), appendicitis (2.7%), AHF (7.3%), osteoarthritis (1.8%), diabetic retinopathy (8.2%), gangrenous foot (2.7%), gastritis (3.6%), hypotension (1.8%), neuropathy (2.7%), stroke (7.3%), pressure sore (2.7%) and UTI and sepsis (8.2%). In the Poisson regression model, comorbidity was a predictor of LOS. The likelihood ratio chi-square test indicates that the full model was a significant improvement in fit over a null (no predictors) model (P<.000). Co-morbidity was a significant

predictor of LOS (b=.348, S.E.=.1649, P=.035). The predicted log count of patients who had other comorbidities apart from their primary DM diagnosis (coded 1) was .348 units greater than that for those who did not have any comorbidity (coded 2). The incidence rate of LOS for DM patients with other disease conditions was 1.416 (41%), greater than that for those with no other comorbidities.

**Table 4.7 Co-morbidities associated with patients diagnosed with Diabetes Mellitus on admission**

| Variables | Frequency | Percentage (%) |
|---|---|---|
| **Comorbidities** | | |
| None | 30 | 27.4 |
| Chronic Kidney Disease | 2 | 1.8 |
| Anemia | 3 | 2.7 |
| COVID 19 | 5 | 4.6 |
| Cardiovascular Accident | 2 | 1.8 |
| Malaria | 4 | 3.6 |
| Cellulitis | 3 | 2.7 |
| BPH, Liver abscess, | 5 | 4.6 |
| Atrial fibrillation | 2 | 1.8 |
| Appendicitis | 3 | 2.7 |
| Acute Heart Failure | 8 | 7.3 |
| Osteoarthritis | 2 | 1.8 |
| Diabetic retinopathy | 9 | 8.2 |
| Gangrenous foot | 3 | 2.7 |
| Gastritis | 4 | 3.6 |
| Hypotension | 2 | 1.8 |
| Neuropathy | 3 | 2.7 |
| Stroke | 8 | 7.3 |
| Pressure sores | 3 | 2.7 |
| Urinal Tract Infection, sepsis | 9 | 8.2 |
| Total | 110 | 100.0 |

# CHAPTER FIVE

# DISCUSSION

The study's primary purpose was to determine the factors influencing the LOS of adult in-patients with types 1 and 2 DM. The chapter, therefore, presents the discussions and findings of the study. The chapter is discussed in sections. Thus, the sociodemographic characteristics of the respondents, observations, and findings align with the study objectives.

## 4.5.Socio-demographic characteristics of respondents

Among the total number of respondents, the majority were females, who represented 56.4%, and males 43.6%. The findings of the study suggested that male observation had a prolonged LOS (OR=.95, P=.000). Ages 60 and above years, 46-59 years, and 32-45 years revealed (OR= .49, P=.002, OR= .37, P=.000 and OR=46, P=.001). These findings are consistent with the study done by Enomoto et al. (2017) in Pennsylvania to determine the impact of type 2 DM on LOS with increasing age and male sex found to increase one's likelihood of longer LOS. Baharlooei, Alavi, and Adelmehraban (2017) also documented a significant association between gender and length of stay in DM, with females having more extended stays. In contrast, Chen Liu, Tan, and Zhao (2017) demonstrated a contrasting view of sex, which was not a significant predictor of LOS in DM. Ages between 80-90 years were a significant predictor of LOS, which shares a similar view with this study. In terms of occupational level, this study, again, has found that 40 (39.1%) of the patients were employed, 4 (3.6%) unemployed, and 63 (57.3%) retired. However, in the Poisson regression model, there was no statistically significant association or relationship between occupation (p=.319) and mode of payment of bills (p=.800) on LOS. These findings contradict the study by Chen Liu, Tan, and Zhao (2017), who revealed a significant relationship between the type

of medical insurance a patient had and the occupation of LOS in DM management. The possible reason for this finding in the study was that most of the patients were employed and either subscribed to a national insurance scheme or sponsored by the hospital so they could pay their bills to prevent delays. In this study, patients' educational level (O'level/tertiary) did not predict their LOS, whereas patients who were uneducated or had JHS/SHS predicted LOS significantly. This finding was consistent with a study by Rodrigues-Sanchez and Cantarero-Prieto (2019) in Europe, who demonstrated a significant association between ALOS and people with medium educational status. The practical reason for these findings was that patients with low educational levels, below O'level and tertiary, did not know enough about their disease condition and possible complications. In this study,76.4% of patients had financial challenges concerning prescribed medication purchases and other requested investigations, affecting their LOS significantly. This finding is consistent with findings by Abegas et al. (2016) on socioeconomic factors influencing DKA readmission but in contrast with a similar study by Badgal (2015) in India. Again,

**5.2 Hospital-related factors of LOS**

An institutional-related factor is one of the factors influencing patients' stay in the hospital concerning LOS during admission, which has been documented by researchers across the world (Lee et al., 2017; Azadeh-Fard, Ghaffarzadegan & Camelio, 2016). Though in Ghana, the management of DM has been looked at, studies concerning institutional factors influencing LOS in DM are yet to be given scholarly attention. The ALOS of the study stood at 8.85 days, almost similar to the ALOS in South Africa, which was eight days (Ndebele & Naidoo, 2018). This was because most patients had additional diagnoses besides their primary diagnosis, which was also being managed. Another reason was that the number of days spent by patients on the ward was not taken into consideration by clinicians as part of their management plan during admission.

Empirical evidence shows that ALOS is still high in Sub-Saharan Africa compared to Europe, which stands three days after implementing some protocols (Martin et al., 2016).

The study also revealed that among patients who needed to trans out to another unit within the hospital, three patients out of 6 patients had trans out difficulties. Eight out of 18 patients who needed referrals to a specialist were done late. These findings were concurrent with the theoretical framework that guides the study, revealing transfer difficulty between hospitals and care settings as an institutional factor influencing patients' LOS. The possible reasons that accounted for these difficulties were performing surgical procedures outside the hospital because the hospital does not have the requisite human and material resources to do such surgical procedures (heart surgery), the patients who were also referred to other units were delayed because the receiving units were not ready at the time. All 110 patients had to do at least an investigation or purchase medications outside the hospital. Among them, 26 (23.6%) had their investigations or medication purchases delayed due to financial constraints. These findings in the study are supported by empirical evidence that suggests that over 30 days of hospitalization, transfer out difficulties, delayed diagnosis, late specialist referral, diagnoses within three days, and department transfers were associated with prolonged LOS in DM patients on admission in Guangdong Shantou Central Hospital in China between 2011 and 2013 (Huang et al., 2016). Meanwhile, it has been established in the USA that using insulin pens leads to reasonable glycaemic control, thereby reducing hospital LOS (Smallwood, Lamarche, & Chevrier, 2017). This was not investigated in this study, though most patients were using an insulin pen. Further studies can look at this management area in Ghana.

The study again found that most laboratory investigations and scans were done outside the hospital. All 110 patients had some laboratory investigations done outside the hospital, but in Poisson regression analysis, it did not affect their LOS. Incidentally, patients with financial challenges in

having their investigations done on time had longer LOS. The reason that might have accounted for this factor in the study was that patients should have their monies paid before their investigations were done because the hospital did not own those facilities and, therefore, operated by cash and carry system. Therefore, patients who did not have money readily available could not do their investigations on time, extending their LOS. A previous study suggests low socioeconomic status contributed to an extended hospital stay (Abegaz et al., 2016).

Additionally, among the total observation, 2.7% had bedsores during the admission period, whereas 3.6% had malaria, which prolonged their LOS. This finding was consistent with a study by Baek et al. (2018), who documented hospital-acquired infection as one factor influencing LOS in DM. One possible explanation for this finding in this study was that though these patients had their blood sugars managed and controlled within seven days, further treatment for infections acquired in the hospital during their DM management might have extended their LOS. In Canada, a study that was done to describe clinical outcomes, as well as risk factors for DM patients with severe to moderate community-acquired pneumonia (CAP), a risk factor for prolonged LOS, was associated with disease complications, duration of antibiotics regimen, and administration of steroids (Bader et al., 2015). These findings for disease complications were not consistent with the findings of this study.

Patients' disease complications did not predict their LOS in this study, possibly because patients who had complications in their disease conditions were managed well. The choice of prescribed medications was not investigated in this study. In another jurisdiction, Hussain et al. (2020), in evaluating the effects of Inpatient Diabetes Education (IDE), demonstrated that IDE reduces LOS in DM admission periods, whereas Trevatt, Elliot, and Leary (2019), in the quest to determine if nurses specialized in DM influence the experiences and outcome of their clients established that

their expertise in the discharge of their duties shortens LOS in the hospital. In this current study, the lack of needed education from nurses, doctors, and dieticians could have accounted for patient LOS during admission because, though meals were provided for them in the hospital, it was observed that most patients were still eating meals brought to them from home as well at any time because they felt they were hungry.

### 5.3 Patient-related factors influencing LOS

In a study done in Pennsylvania to determine the impact of type 2 DM on LOS, the following demographic factors, thus increasing age and male sex, were found to increase one's likelihood of longer LOS (Enomoto et al., 2017). These findings were in line with the findings revealed by this study, where male observation had a prolonged LOS. Again, the study also showed that ages 60 and above years, 46-59 years and 32-45 years had a significant impact on one's LOS (OR= .49, P=.002, OR= .37, P=.000 and OR= .46, P=.001). On the contrary, in China, Chen Liu, Tan, and Zhao (2017) revealed no significant relationship between LOS and gender. Again, it has also been documented in Iran that there is a significant association between gender and LOS, with females having a longer length of stay (Baharlooei, Alavi & Adelmehraban, 2017). The possible reason that may have accounted for the findings in this study for gender was that male patients had more comorbidities than female patients, though the number of females in the study was more than the males. Interestingly, no possible reason could account for the prolonged LOS in the above age categories.

The study revealed that 89.1% of DM patients had their disease conditions progressed or deteriorated as compared previously. This finding notably compares with a study by Siazon (2019), who attributed longer ALOS of 5.32 days to patients' diagnosis and severity of their DM conditions. Additionally, the study showed a significant relationship between patients diagnosed

with hyperglycemia and DKA with LOS (P=0.00 and P=0.004, respectively). It was observed that most patients with these two diagnoses spent several days on a sliding scale. This might have contributed to their prolonged LOS. The study also found out that for an increase/change in the dietary regimen (B= -.710) being pessimistic, there is a decrease in the incidence rate of length of stay among patients at the hospital (OR=.492, p=.000). Similarly, for an increase/change in conformity to diet (B= -.553) being pessimistic, there is a decrease in the incidence rate of length of stay among patients at the hospital (OR=.575, p=.000). Furthermore, for an increase in DM and related complications (B=.021), there is an increase in the incident rate of LOS among patients at the hospital (OR=.021, p=.027). Studies reviewed in the literature suggest that DM and DM-related complications prolong patients' length of hospital stay on admission (Mejia et al., 2018). The possible practical reason is that some patients with DM complications had to be referred and seen by a specialist, which usually takes time to refer. For baseline blood sugars in this study, none of them predicted LOS in DM as compared with a study by Evans et al. (2012), who revealed a significantly longer LOS in DM with baseline blood sugar greater than 6mmol/l.

### 5.4 Co-morbidities associated with length of stay of patients with Diabetes Mellitus on admission

The study finally revealed that for an increase (B=.348) in comorbidity, there is an increase in the incidence rate of LOS among patients at the hospital (OR=.416, p=.035). Similarly, Lee et al. (2016) also demonstrated an association between DM and extended hospital LOS due to vascular disease and infection in a medical unit in a community public hospital. Again, a retrospective study in Australia using hospital secondary data revealed a prolonged LOS in comorbid DM in patients admitted with acute exacerbation of chronic obstructive pulmonary disease (Parappil, Depczynsk, Collett & Marks, 2010). Echouffo-Tcheugui et al. (2016), using data from the Get with Guidelines-

Heart Failure registry, logistic regression showed a longer LOS in patients admitted with heart failure(HF), and DM; others were CKD, cellulitis, diabetic retinopathy, gastritis, hypotension, stroke, pressure sore, UTI and sepsis. Additionally, a similar study documented prolonged LOS due to diabetic foot and hypertension in DM (Mejia et al., 2018). These findings are further compared to the findings in this study. However, Chen, Liu, Tan, and Zhao (2017) revealed shorter LOS in DM patients with chronic or acute plus chronic complications than those without. The possible reason for this finding in the study was that although most patients had their primary DM diagnosis well managed and could have been discharged within seven days, secondary diagnoses kept them on admission, extending their LOS. Incidentally, Schorr's theoretical framework suggests that a patient's medical history, including comorbidity, influences his or her LOS in the hospital (Schorr, 2012).

### 5.5 Summary

The findings of this study were consistent with the constructs of the adopted theoretical framework for LOS and the reviewed literature. The study found that some hospital-related factors, patient-related factors, and comorbidities influence LOS in DM. The ALOS was 8.85 days. The least number of days spent by a patient was three days, whereas the maximum number of days spent was 35 days.

The study showed that Female observations were more than male observations. Meanwhile, male observation was a significant predictor of longer LOS in DM. Though age was a significant predictor of LOS in this current study, ages between 32-45 years and 60 years above did not predict prolonged LOS compared to the other year groups. Interestingly, though baseline blood sugar levels did not significantly predict LOS, admission diagnosis of hyperglycemia or DKA did significantly.

### 5.6 Evaluation of Schorr's theoretical framework of LOS

The theoretical framework for factors influencing LOS developed by (Schorr, 2012) was the framework that guided the study. The framework benefited the study because the adopted constructs addressed the study's objectives. Again, the framework covers all the predictors of LOS in the adopted LOS questionnaire developed by (Li et al., 2018), which helped to identify the factors or predictors influencing LOS in DM patients during admission periods. The factors/predictors of LOS in DM that were adopted constructs of Schorr's theoretical framework were patient demographics, socioeconomic status of a patient, patient medical history, and hospital/clinical caregiver factors.

The main thematic areas that emerged from the study were patient demographic factors influencing LOS, socioeconomic and patient condition-related factors influencing LOS, institutional-related factors influencing LOS, and comorbidities influencing LOS. The thematic areas guided the study by reviewing related literature, findings, and discussion.

### 5.7 Recommendations of the theoretical framework

The researcher recommends that Schorr's theoretical framework developed in 2012 be used by hospital administrators and clinical caregivers regarding healthcare delivery. It should always be considered when patients are admitted into various wards within the hospital; when this is done from the day of admission, the factors influencing LOS in the study can be addressed holistically without compromising quality care.

# CHAPTER SIX

# SUMMARY, IMPLICATION, LIMITATION, CONCLUSION, AND RECOMMENDATION

The summary, implications, limitations, and recommendations of the study are presented in this chapter.

## 6.1 Summary of the Study

The study investigated the factors influencing the length of stay in adult in-patients with diabetes mellitus types 1 and 2 at three medical wards at the 37 Military Hospital in the Greater Accra Metropolis.

The theoretical framework for determining the length of hospital stay developed by Schorr (2012) guided this study. A cross-sectional study design was used with a structured questionnaire to collect data from 110 respondents who were on admission in the three selected medical wards. Data were collected on the number of days patients spent during admission, patient-related factors, hospital-related factors, and comorbidities associated with DM. A convenient sampling technique was used to recruit respondents based on sample size calculation.

Data were entered into the Statistical Package for Social Sciences version 25. Descriptive statistics, including frequencies and percentages, were used to describe the proportions of the variables. At the multivariate level, Poisson regression analysis was used to examine factors related to the length of stay.

The study's findings revealed that the average length of hospital stay was 8.85 days, whereas the least and maximum number of days spent on admission were three and 35 days, respectively. Male

patients represented 43.6% of the population, whereas females represented 56.4%. The male patients had a longer length of hospital stay than the female patients, who did not predict the length of stay at the hospital. Age was also a significant predictor of the length of hospital stay. Other patient-related factors that predicted LOS were DM complications, hyperglycemia or DKA, financial restraint in doing investigations outside the hospital and progressing disease of patients. Hospital factors, late specialist referral, patient not on the dietary regimen, trans out challenges, over 30 days hospitalization, and delayed diagnosis contributed to delayed LOS.

Finally, 72.6% of the respondents had other comorbidities besides DM diagnosis, with diabetic retinopathy being the highest comorbidity (8.2%) in some patients.

### 6.2 Implications of the study

The study outcome has implications for patients, healthcare providers, and clinical pathways for managing DM within various hospitals. These include nurses and doctors at 37 Military Hospital and the Ministry of Health (MoH).

#### 6.2.1 Implication for clinical practice (nurses and doctors).

The study showed that hospital/clinical caregiver factors influenced LOS in patients on admission with DM as their diagnosis. Clinical pathways or protocols should be implemented to deal with these institutional factors that prolong patients' LOS, thereby reducing LOS without compromising the quality of care delivery. Healthcare professionals, in planning care for their patients, should include their patients' financial capabilities as well as bed turnover time to make hospital beds available all the time and also reduce the cost of healthcare to the individual, the institution, and the government of Ghana.

Additionally, doctors and nurses should consider the importance of diet in managing DM, as this would also help reduce LOS in the hospital. Therefore, They should stress the importance of dietary regimens in DM management to their patients even though they already know them. Therefore, implementing IDE would go a long way to help in reducing LOS.

### 6.2.2 Implication for Policy and Education to Ministries of Health (MoH) and Defence

The study has significant implications for policymakers within the health sector. The study showed that patients diagnosed with DM spend an ALOS of 8.85 due to some patient-related factors, institutional factors, and comorbidities. This study's ALOS was more than previous studies on DM management. In collaboration with the 37 Military Hospital, the MoH should put strategies in place to reduce LOS in the facility, as this would go a long way to reduce the high cost of care to patients and the country.

### 6.2.3 Implication for 37 Military Hospital/Ghana Health Service

The study concluded that financial restraint was a significant factor for LOS. This was because patients had to do their investigations, and some medications purchased outside the hospital (private) were cash and carry. It, therefore, meant that patients who did not have money had to get money before requested investigations were done, thereby extending their LOS. The hospital needs a robust laboratory and imaging department to produce quick test results, enhancing quick clinical decision-making. The hospital again needs to implement effective clinical pathways or protocols, as previous studies have demonstrated how effectively they can reduce LOS without compromising quality care.



### 6.2.4 Implication for Research.

- There is a need for researchers in Ghana and the sub-region to investigate the factors influencing LOS in patients during admission.

- Future studies should examine the association between LOS and the cost of hospitalization among a larger population in Ghana.
- Future studies should examine the effects of longer and shorter LOS during admission in patients diagnosed with DM.

### 6.3 Limitations of the study

There are some limitations to this study. Some of the responses were taken from caregivers and health workers, and these responses may not reflect the experiences or views of patients diagnosed with DM. In addition, the study was cross-sectional. Hence, causality cannot be established.

### 6.4 Conclusion

The study results showed enough evidence of factors that prolong LOS among adult patients diagnosed with DM during admission to the hospital. The result again showed that the ALOS of DM patients on admission (8.85 days) was higher than reviewed studies in developed countries like the USA and China. The difference is a result of measures put in place to monitor LOS and how important LOS is in the management of patients diagnosed with DM.

The findings, however, revealed powerfully how comorbidity contributes to LOS in patients diagnosed with DM and financial constraints in accessing services outside the hospital. Among the total population, 30 had no comorbidity during their entire admission period. Among these comorbidities, diabetic retinopathy and sepsis were the highest among the population. There was statistical significance demonstrating how the following factors (sex, age, previous history of DM, delayed diagnosis, trans out difficulties, over 30 days hospitalization and progressing disease of the patients, dietary regimen, and late specialist referral) influence LOS during admission. The study revealed a significant relationship between DM-specific diagnosis (hyperglycemia and DKA). Patients with any of these two diagnoses had longer LOS, but hypoglycemia was not a

significant predictor of LOS. Finally, these predictors, ages between 18-35 years, 60 years and above, baseline blood sugar, level of education, and mode of payment of hospital bills did not predict LOS in this study.

### 6.5 Recommendations

The following recommendations were made based on the findings of the study.

#### 6.5.1 To the 37 Military Hospital

- LOS should be part of all patients admitted to any hospital unit, especially those diagnosed with DM.
- Almost all patients did their requested laboratory tests and images outside the hospital. This study recommends that the hospital put robust systems in place so that the hospital does at least 90% of requested laboratory investigations, such as images.
- There is a need to have a standardized clinical protocol for managing DM, as documented by Martin, McKinney, Hoody, and Fish (2016).

#### 6.5.2 To the Ministry of Health (MOH)

- The MOH should put a strategic plan in place to deal with factors that increase LOS in all patients on admission to all care facilities. When LOS is given the needed attention at this management level, it will help reduce LOS without compromising quality care.

#### 6.5.3 To Researchers in the Area of DM and LOS

Researchers in the area of diabetes mellitus

- Should investigate the factors influencing LOS and its financial implications among in-patients diagnosed with DM in the Ghanaian perspective in a larger population.

- Examine the clinical caregiver as a factor influencing LOS in DM management in the hospital in a larger population.

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# APPENDICES

## Appendix A: Patient Demographic Factors

| Variable | Measurement | Categories |
|---|---|---|
| Age | This measures the age of the respondent at the time of the survey. | 18-31<br>32-45<br>46-59<br>60 years and above |
| Sex | The sex of the respondents | Male<br>Female |
| Level of education | The highest educational level of participants at the time of the survey | Uneducated<br>Primary<br>JHS<br>O'level/SHS<br>Tertiary |
| Occupation | This measures the occupation of participants at the time of the survey | Employed<br>Unemployed<br>Retired |
| Payment of insurance bills | This measures how respondents pay their hospital bill | Insurance/Army<br>Cash |

**Appendix B: Patient condition-related factors/medical history**

| Variables | Measurement | Categories |
|---|---|---|
| Previous history of diabetes mellitus admission | This measures the previous history of diabetes mellitus admission | Yes<br>No |
| Baseline blood sugar level | This measures the baseline blood sugar level of respondents | 1=4mmol/l-6mmol/l<br>2=6.1mmol/l-12mmol/l<br>3=12.1mmol/l-18mmol/l<br>4=18.1mmol/l- above |
| Patients admitted diagnosis | This measures patient-admitted diagnosis | Hyperglycemia, DKA, hypoglycemia, and others |
| Dietary regimen | This measures whether the patient has been put on any dietary regimen | Yes<br>No |
| Prescribed dietary regimen | This measures if patients conform to the prescribed dietary regimen | Yes<br>No |
| Patient refusal of medications | This measures patient refusal of his/her medication | Yes<br>No |
| DM-related complications during admission | This measures patients' DM-related complications during admission | Yes<br>No |
| complication prolonged the patient's stay in the ward | This measures if patients with complications prolonged stays in the ward | Yes<br>No |

**APPENDIX C: Hospital–related factors influencing LOS**

| Variables | Measurement | Categories |
|---|---|---|
| Progressive disease | This measures the progressive disease of patients | Yes<br>No |
| Over 30 days hospital | This measures the duration of patients duration of hospitalization | Yes<br>No |
| Patient other reasons | This measures other reasons | Yes<br>No |
| Transfer out difficulties | This measures the difficulty in transferring patients to other units | Yes<br>No |
| Delay diagnosis | This measures the delay in diagnosis of patients | Yes<br>No |
| Late specialist referral | This measures the late referral of patients to a specialist | Yes<br>No |

**Appendix D: Participant Information Sheet and Consent Form**

School of Nursing and Midwifery

University of Ghana

Legon.

Date: 30th August 2020 Phone number: 0208345997

RE: Research Study: A study on factors influencing length of stay in patients with diabetes mellitus at 37 Military Hospital and Greater Accra Regional Hospital.

Dear Sir/ Madam

I am a Master of Philosophy student at the School of Nursing and Midwifery, University of Ghana. As part of the degree award, I am doing this research in partial fulfillment of the course. The topic I have chosen aims to identify the factors influencing the length of stay in inpatients with diabetes mellitus.

The research findings might help in taking steps to put in place measures to improve the services in healthcare delivery. There are no foreseeable risks or discomfort with participation; however, the research team can help participants when needed.

The study would involve you completing the questionnaire enclosed with this letter. The the questionnaire should take about thirty (30) minutes of your time to complete. I would kindly ask you to answer truthfully and independently without discussion with others to allow for more accurate results. Confidentiality and anonymity will be fully assured, as your name is not required on the questionnaire; only the research team will have access to your form. It would not affect you if you decide to participate in this study. However, if, at any point during the study, you decide not to continue, your decision will be upheld. Should you decide to participate, please complete the enclosed questionnaire and return it to the research team immediately. By completing this

questionnaire, it is understood that you are consenting to participate in this study. If you have any questions, please do not hesitate to contact me at the above address or telephone number. Your participation is appreciated.

Yours Sincerely,

James Ofori Abina

**Appendix E: Informed Consent Form**

**Title**: Factors influencing length of stay of adult in-patients with diabetes mellitus

**Principal Investigator**: [James Ofori Abina]

**Address**: [School of Nursing and Midwifery, University of Ghana- Legon, P. O. Box LG 43, Accra]

**General Information about Research**

This study aimed to determine the Factors influencing the length of stay of adult in-patients with Diabetes Mellitus at the 37 Military Hospital. In this study, the

Patient demographic characteristics and patient condition-related factors were asked. Nurses' views on managing diabetes mellitus patients were also sought.

One hundred and thirty (110) patients were cohorted for the study and were required to respond to a structured questionnaire, including their social demographics and current condition-related factors. Again, they were required to provide responses to possible hospital-related factors that they think influence the length of stay in managing their conditions.

**Possible Risks and Discomforts**

The study did not involve anticipated risks; observations were not required to engage in an experimental activity. None of the study observations refused to answer those questions. They were, therefore, given the necessary support.

**Possible Benefits**

The study's results are expected to provide information that will form the basis for developing measures to shorten the length of stay without compromising quality healthcare delivery.

**Confidentiality**

All identifiable information obtained during the study remains confidential and will be disclosed only with your permission. When the study results are published or discussed at conferences, no information will be included to reveal the study observations' identity unless specific consent is sought.

**Voluntary Participation and Right to Leave the Research**

Participating in this study was voluntary (no compulsion). Participants were also respected. Again, the participants had the right to ask further questions to clear any doubts in the data collection process. No participant or patient withdrew from the study, and the information provided did not affect care delivered to them by nurses and doctors who cared for them.

**Appendix F: Questionnaire**

SCHOOL OF NURSING AND MIDWIFERY

UNIVERSITY OF GHANA- LEGON

I am grateful for your willingness to partake in this study on factors influencing the length of hospital stay in the medical ward. I am undertaking this research in partial fulfillment of the award of an MPhil degree in Nursing. This research is strictly for academic purposes, and the information given will be treated confidentially.

Please select the appropriate answer.

I. Date of admission:

II. Date of discharge:

III. The number of days spent:

**Patient demographics.**

1. How old are you? (a) 18-31[ ] (b) 32-45[ ] (c) 46-59[ ] (d) 60 and above

2. What is your sex: (a) Male [ ] (b) Female[ ]

3. What is your level of education?

(a)Uneducated [ ] (b)Primary/JHS [ ]

(c) O level/SHS [ ] (d) Tertiary

4. What is your occupation?

(a) employed (b) unemployed (d) retired

5. How are you going to pay your hospital bills?

(a) Insurance/Army (c) cash

**A patient's related factors/medical history**

6. Do you have a previous history of diabetes mellitus admission?

(a) Yes (b) No

7. Diagnosis?.....

8. What was the patient's baseline blood sugar level…….

(a) 4mmol/l-6mmol/l ( )

(b) 6.1mmol/l-12mmol/l ( )

(c) 12.1mmol/l-18mmol/l ( )

(d) 18.1mmol/l-above ( )

9. What was the patient's admitted diagnosis……..

10. Has the patient been put on any dietary regimen?

(a) Yes ( ) (b) No ( )

11. If yes, does the patient conform to the prescribed dietary regimen?

(a) Yes ( ) (b) No ( )

12. Does the patient refuse some of his/her medication(s)?

(a) Yes ( ) (b) No ( )

13. Did the patient have any DM-related complications during admission?

(a) Yes ( ) (b) No ( )

14. If yes, did this complication (s) prolong the patient's stay in the ward?

(a) Yes ( ) (b) No ( )

**Hospital related factors**

Questionnaire about the impact factor of LOS

A. What is the main cause that extends LOS, in your opinion?

(1) The progressing disease of the patient.

Yes ( ) No ( )

(2) Patients Hospitalized over 30 d.

Yes ( ) No ( )

(4) Patient's other reasons.

Yes ( ) No ( )

(7) Trouble in transferring patients between departments.

Yes ( ) No ( )

(8) Takes time in identifying a diagnosis.

Yes ( ) No ( )

(9) Takes time in referring to the other doctor.

Yes ( ) No ( )

(10) Other specify……

**Contacts for additional information.**

In case of any pertinent about the research or the need for further clarification, please contact:

Name: James Ofori Abina (Principal investigator)

Telephone number: 0208345997

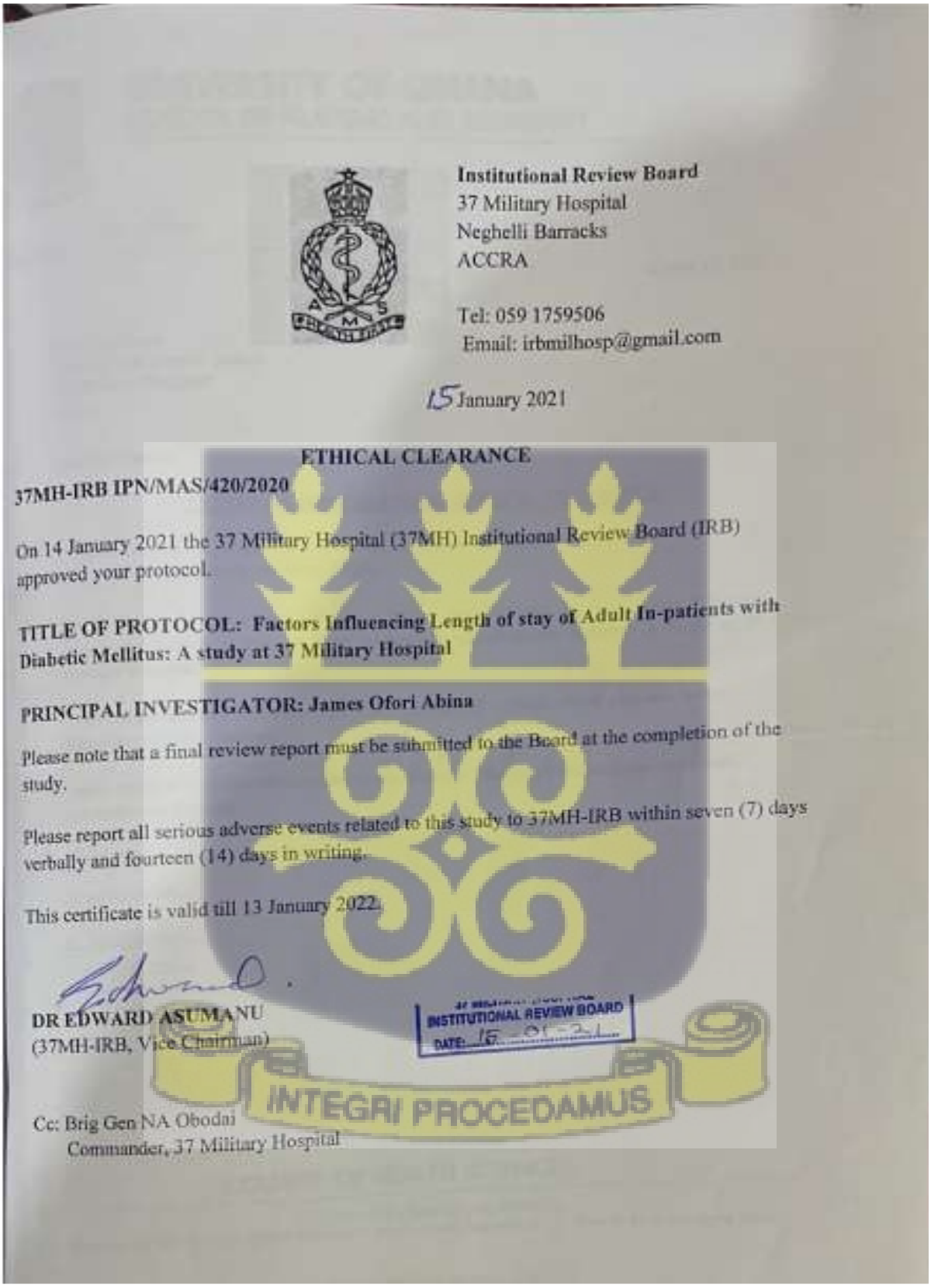
Name: Dr. Gwendolyn Mensah (Supervisor)

Telephone number: 0208127756

Name: Dr. Samuel Adjorlolo (co-supervisor)

Telephone number: 0204197158

**Appendix G: Ethical Approval Letter**



Institutional Review Board
37 Military Hospital
Neghelli Barracks
ACCRA

Tel: 059 1759506
Email: irbmilhosp@gmail.com

15 January 2021

**ETHICAL CLEARANCE**

**37MH-IRB IPN/MAS/420/2020**

On 14 January 2021 the 37 Military Hospital (37MH) Institutional Review Board (IRB) approved your protocol.

**TITLE OF PROTOCOL: Factors Influencing Length of stay of Adult In-patients with Diabetic Mellitus: A study at 37 Military Hospital**

**PRINCIPAL INVESTIGATOR: James Ofori Abina**

Please note that a final review report must be submitted to the Board at the completion of the study.

Please report all serious adverse events related to this study to 37MH-IRB within seven (7) days verbally and fourteen (14) days in writing.

This certificate is valid till 13 January 2022.

DR EDWARD ASUMANU
(37MH-IRB, Vice Chairman)

INSTITUTIONAL REVIEW BOARD
DATE: 15-01-21

Cc: Brig Gen NA Obodai
Commander, 37 Military Hospital

# UNIVERSITY OF GHANA
## SCHOOL OF NURSING AND MIDWIFERY

Ref. No.: ID: 10754057

August 31, 2020

**The Chairman**
**Institutional Review Board**
**37 Military Hospital**
**Accra.**

Dear Sir/Madam,

**LETTER OF INTRODUCTION – ETHICAL CLEARANCE**

I write to introduce to you **James Abina Ofori**, an M.Phil Nursing student in the School of Nursing and Midwifery, University of Ghana, Legon.

The Scientific Review Committee of the School has approved the thesis topic: **"Factors Influencing Length of Stay of Adult In-Patients with Diabetes Mellitus: A Study at 37 Military Hospital."**

As part of the School's requirement, the student is required to obtain ethical clearance before embarking on data collection.

I hope that the Committee will consider the proposal and grant him ethical clearance to enable him undertake the study.

Thank you.

Yours faithfully,

Charles A. Klutse
**School Administrator**

INTEGRI PROCEDAMUS

COLLEGE OF HEALTH SCIENCES

P. O. Box LG 43, Legon, Accra, Ghana.
• **Telephone:** (0) 303 970 801 / 0553 089 267 • **Email:** nursing@ug.edu.gh • **Website:** www.nursing.ug.edu.gh

**UNIVERSITY OF GHANA**
DEPARTMENT OF MENTAL HEALTH
SCHOOL OF NURSING

Ref. No.:.....*ID: 10754057*.....

August 31, 2020

**The Chairman**
**Institutional Review Board**
**37 Military Hospital**
**Accra.**

Dear Sir/Madam,

SUPPORT LETTER – ETHICAL CLEARANCE

This letter is to support the application for ethical clearance of **James Abina Ofori**, an M.Phil Nursing student in the Department of Community Health, School of Nursing and Midwifery, University of Ghana, Legon.

As part of the programme, he is to undertake a research on the topic: **"Factors Influencing Length of Stay of Adult In-Patients with Diabetes Mellitus: A Study at 37 Military Hospital."**

I hope that the Committee will consider the proposal and grant him ethical clearance to enable him undertake the study.

Thank you.

Yours faithfully,

Dr. Samuel Adjorlolo
**Co-Supervisor**

INTEGRI PROCEDAMUS

COLLEGE OF HEALTH SCIENCES

• P.O. Box LG 43, Legon, Accra, Ghana. • Telephone: +233 (0) 302 513 250 / 0289 531 213
• Email: mentalhealth.son@chs.ug.edu.gh • Website: www.nursing.ug.edu.gh

**UNIVERSITY OF GHANA**
DEPARTMENT OF ADULT HEALTH
SCHOOL OF NURSING

ID: 10754057

Ref. No.:.....

August 31, 2020

The Chairman
Institutional Review Board
37 Military Hospital
Accra.

Dear Sir/Madam,

SUPPORT LETTER – ETHICAL CLEARANCE

This letter is to support the application for ethical clearance of **James Abina Ofori**, an M.Phil Nursing student in the Department of Adult Health, School of Nursing and Midwifery, University of Ghana, Legon.

As part of the programme, he is to undertake a research on the topic; **"Factors Influencing Length of Stay of Adult In-Patients with Diabetes Mellitus: A Study at 37 Military Hospital."**

I hope that the Committee will consider the proposal and grant him ethical clearance to enable him undertake the study.

Thank you.

Yours faithfully,

Dr. Gwendolyn Mensah
**Principal Supervisor**

INTEGRI PROCEDAMUS

COLLEGE OF HEALTH SCIENCES

• P. O. Box LG 43, Legon, Accra, Ghana. • Telephone: +233 (0) 302 513 250 / 0289 531 213
• Email: adulthealth.son@chs.ug.edu.gh • Website: www.nursing.chs.ug.edu.gh

**UNIVERSITY OF GHANA**
DEPARTMENT OF MENTAL HEALTH
SCHOOL OF NURSING

Ref. No.: ID: 10734057

August 31, 2020

The Officer-in-Charge
Medical Division
37 Military Hospital
Accra.

Dear Sir/Madam,

**SUPPORT LETTER – ETHICAL CLEARANCE**

This letter is to support the application for ethical clearance of **James Abina Ofori**, an M.Phil Nursing student in the Department of Community Health, School of Nursing and Midwifery, University of Ghana, Legon.

As part of the programme, he is to undertake a research on the topic: "**Factors Influencing Length of Stay of Adult In-Patients with Diabetes Mellitus: A Study at 37 Military Hospital.**"

I hope that the Committee will consider the proposal and grant him ethical clearance to enable him undertake the study.

Thank you.

Yours faithfully,

Dr. Samuel Adjorlolo
Co-Supervisor

COLLEGE OF HEALTH SCIENCES
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• Email: mentalhealth.son@chs.ug.edu.gh • Website: www.nursing.ug.edu.gh

**UNIVERSITY OF GHANA**
DEPARTMENT OF MENTAL HEALTH
SCHOOL OF NURSING

Ref. No.: ID: 10754057

August 31, 2020

The Commander
37 Military Hospital
Accra.

Dear Sir/Madam,

SUPPORT LETTER – ETHICAL CLEARANCE

This letter is to support the application for ethical clearance of **James Abina Ofori**, an M.Phil Nursing student in the Department of Community Health, School of Nursing and Midwifery, University of Ghana, Legon.

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Thank you.

Yours faithfully,

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**Co-Supervisor**

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**UNIVERSITY OF GHANA**
DEPARTMENT OF MENTAL HEALTH
SCHOOL OF NURSING

Ref. No.:.....*ID: 10754057*.....

August 31, 2020

The Commanding Officer
37 Military Hospital
Accra.

Dear Sir/Madam,

SUPPORT LETTER – ETHICAL CLEARANCE

This letter is to support the application for ethical clearance of **James Abina Ofori**, an M.Phil Nursing student in the Department of Community Health, School of Nursing and Midwifery, University of Ghana, Legon.

As part of the programme, he is to undertake a research on the topic: **"Factors Influencing Length of Stay of Adult In-Patients with Diabetes Mellitus: A Study at 37 Military Hospital."**

I hope that the Committee will consider the proposal and grant him ethical clearance to enable him undertake the study.

Thank you.

Yours faithfully,

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