COMPARING HOSPITAL – BASED QUALITY OF CARE FOR CHILDREN WITH SICKLE CELL CRISIS IN NORTHERN MALAWI

MARIA MTANGWA KUMWENDA (MScNECT0920)

Research Dissertation Submitted to the Faculty of Health Sciences in partial fulfilment for the award of Master of Science in Nursing Education (Clinical Teaching)

FACULTY OF HEALTH SCIENCES

DEPARTMENT OF NURSING AND MIDWIFERY

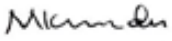
MZUZU UNIVERSITY

APRIL, 2025

DECLARATION

I, Maria Mtangwa Kumwenda, hereby declare that my thesis, **"Comparing Hospital-Based Quality of Care for Children with Sickle Cell Crisis in Northern Malawi,"** is entirely original work of mine under the guidance of Dr. Ferestas Mpasa and Mrs. Etta Phiri of the Department of Nursing and Midwifery. I also declare that this work has not previously been submitted in whole or in part for a degree at any other university in Malawi or elsewhere. The use of works from other individuals in this thesis has been appropriately acknowledged.

MARIA MTANGWA KUMWENDA



Registration Number: (MScNECT0920)

Date: 28th April 2025

SUPERVISORS CERTIFICATION

This is to certify that the thesis entitled **"Comparing Hospital-Based Quality of Care for Children with Sickle Cell Crisis in Northern Malawi,"** is a bonafide research done by Maria Mtangwa Kumwenda in partial fulfillment of the requirement of the degree of **Master of Science in Nursing Education (Clinical Teaching).**

Signature:  Date: 28th April 2025

Ferestas Mpasa PhD (Main Supervisor)

Signature:  Date: 28th April 2025

Ettah Phiri MScCHN (Second Supervisor)

ACKNOWLEDGEMENTS

I thank the **Lord God Almighty** for the abundant grace and mercy that protected me throughout every stage of this endeavor, and made it possible for it to become a reality. I give Him the utmost praise for granting me the necessary courage from the start to the end

I convey my sincere appreciation to Mzuzu University, for providing me an opportunity to be a student of this esteemed institution, and to conduct this study.

It is my privilege to express my sincere thanks and profound gratitude to my esteemed supervisors, Dr. Ferestus Mpasa and Mrs. Ettah Phiri, for the mentorship and support they accorded me during the time I was writing this thesis. It has been a blessing for me to work with you. I managed to conquer all the challenges and difficulties in my coursework due to your inspiration. Working under your supervision has been a wonderful opportunity. I am at a loss for words.

“Thank you all”.

I further appreciate the support I received from the library staff of Mzuzu University. Your guidance and encouragement have made this work a success.

The Directors of the three hospitals in the Northern Region also deserve a special word of thanks for allowing me to conduct my study at their facilities, and for their assistance throughout the data-collecting phase. I want to express my profound gratitude to the medical professionals - doctors, nurses, and clinicians - who agreed to take part in the study. This research was made possible by you.

I appreciate all of my friends and colleagues' cooperation and assistance with my studies. I firmly acknowledge that they have aided in my growth personally.

DEDICATION

I dedicate my thesis to my family, husband Jumani, mother, and everyone else for their endless love, support, and encouragement. You deserve special thanks for your unwavering spiritual and moral support. God bless you all.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

CHAM	Christian Health Association of Malawi
CPDs	Continuous Professional Development Sessions
CPG	Clinical Practice Guidelines
ED	Emergency Department
ETAT	Emergency Triage Assessment and Treatment
FBC	Full Flood Count
HbA	Hemoglobin A
HbF	Hemoglobin F
HbS	Hemoglobin S
HCP	Health Care Providers
HCWs	Health Care Workers
HSSP	Health Sector Strategic Plan
LMIC	low Middle-Income Countries
LTOT	Long-term oxygen therapy
MOH	Ministry of Health
mRDT	Malaria Rapid Diagnostic Test
MZUNIREC	Mzuzu University Research and Ethics Committee
NHLBI	National Heart, Lung and Blood Institute
NMT	Nurse Midwife Technicians
NRS	Numeric Rating Scales
PCA	Patient Controlled Analgesia

PAQC	Pediatric Admission Quality of Care
PCV	Packed Cell Volume
RBC	Red Blood Cells
RN	Registered Nurse
SARA	Service Availability and Readiness Assessment
SCC	Sickle Cell Crisis
SCD	Sickle Cell Disease
SCT	Sickle Cell Trait
SDGs	Sustainable Development Goals,
SPA	Service Provision Assessment
SPSS	Statistical Package for the Social Science
VAS	Visual Analog Scales
VOC	Vaso - Occlusive Crisis
WHO	World Health Organization

DEFINITION OF TERMS

Health Care Providers: These are health professionals who provide health care for the clients and patients in hospitals or communities, and they include doctors, nursing staff, medical practitioners, nutritionists, dieticians, etc. In this study, health care workers are doctors, clinical officers/technicians, and nurses.

Hyperhemolytic Crisis: It is an accelerated rate of red blood cell destruction causing anemia. In this study, it refers to children who were presenting with a haemoglobin level of less than 5g/dl on admission.

Quality of Care: It is providing the patient health services in accordance with evidence-based knowledge to produce the best outcome for the patient. In this study, quality of care is all the necessary care (including patient assessment and management) that was done/provided to children in SCC according to the guidelines.

Sickle Cell Crisis: These are several acute conditions that occur as a result of the sickling of red blood cells. They include vaso-occlusive crisis, aplastic crisis, splenic sequestration crisis, hyperhemolytic crisis, hepatic crisis, dactylitis, and acute chest syndrome. In this study, it refers to painful vaso-occlusive crisis.

Sickle Cell Disease (SCD): An inherited disorder of the red blood cells that affects hemoglobin characterised by the presence of an atypical form of hemoglobin S. In this study, SCD is a child who was diagnosed with the condition through laboratory tests.

Vaso-Occlusive Crisis: These are events of hypoxic injury and infarction that can cause severe pain in affected areas. In this study, it refers to children who presented with pain on admission.

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Background: Sickle Cell Disease (SCD) affects millions of people globally. It carries a high mortality of 50% - 90%. In Malawi it contributes a significant proportion of (3.1%) of paediatric hospitalisations demanding quality care. The most serious acute complication of SCD is Sickle Cell Crisis (SCC). Little is known on the quality of care given to children with SCC.

Aim of the study: To compare the quality of care provided to hospitalised children in Sickle Cell Crisis in selected hospitals in Northern Malawi thus Mzuzu Central, Rumphi District and Ekwendeni Hospitals.

Methodology: A quantitative approach employing a descriptive cross-sectional design was used. Data was collected from Nurses, Doctors and Clinical Officers working in paediatric wards and files of children who were hospitalised due to SCC between 2019 and 2021 using probability sampling. The sample sizes of 87, 28, and 9 for case file review and 36, 11, and 6 for health care workers were used, respectively, at a 95% confidence level. Data was collected using a self-administered questionnaire and the checklist. Statistical Package for Social Sciences (SPSS) version 26 was used to analyse data focusing on descriptive and inferential statistics. Mzuzu University Research Ethical Committee approved the study (MZUNIREC/DOR/23/14), and permission was obtained from study sites.

Results: The results indicated high availability of resources for managing SCC across all hospitals. However, a significant proportion of children did not receive oxygen therapy as part of their management, with 100% (n=9) at Mission, 82.1% (n=23) at District, and 56.3% (n=49) at Central Hospitals. Most children did not receive the correct amounts of fluids as per the guidelines. The absence of standardized guidelines was a significant challenge ($p = 0.042$).

Conclusion: Lack of accessibility to guidelines, pain assessment tools and shortage of staff affect the delivery of quality care in hospitals in Northern Malawi.

Keywords: Comparison, Sickle Cell Disease, Painful Crisis, Quality Care

CHAPTER ONE

INTRODUCTION AND BACKGROUND INFORMATION

1.0 Introduction

Quality care in a hospital setting is a foundation of patient safety, recovery and overall being. It directly influences the effectiveness of a health care team. In Pediatric care, quality care for children with Sickle Cell Disease (SCD) is important because it significantly improves the quality of life and patient outcomes for these children. Recent research indicated that 7.74 million individuals worldwide continued to suffer from sickle cell disease (SCD) during 2021. The patient population with SCD has expanded by 41.4% from 2000 when the initial count was 5.46 million according to Thomson et al. (2023). Sub-Saharan Africa reports 79 percent of the worldwide annual SCD births as 405,000 babies are born with SCD every year in this region (Thomson et al., 2023). Research demonstrates that Sub-Sahara Africa children with SCD attain a survival rate of only 50% to 90% before their fifth birthday when there is insufficient medical care available (Wonkam & Makani 2019; Ambrose et al. 2018). The SCD disease burden in Malawi stands at a considerable level. The SCD population is expected to increase to about 2,000 newborn cases each year (According to UNC, 2020) while the sickness remains a primary reason for child mortality. The area experiences high child mortality from inadequate public health support measures for SCD management (Grosse et al., 2011).

Children with SCD often present with acute medical complications that need quick appropriate care to enhance patient well-being while preventing death (Grosse et al., 2011). The most common acute complication of SCD is Sickle Cell Crisis (SCC), specifically acute painful crisis, that requires frequent hospitalisations (Almuqamam et al., 2018; Darbari et al., 2020). As such the main therapeutic targets in SCD management consist of treating acute painful crisis or vaso-occlusive crises (Crossley et al, 2022). Quality care for a crisis according to evidence-based guidelines for the management of SCD, requires effective pain management to address severe pain symptoms, adequate hydration to maintain proper blood flow and prevent the sickling of red blood cells (RBCs), supplemental oxygen therapy to ensure adequate oxygenation of tissues and antibiotics to prevent infection drugs (Yawn et al., 2014, ASH, 2020). Other interventions for crisis include; blood transfusion if the hemoglobin (Hb) level is

less than 6 g/dl. These are critical and constitute high-quality care for SCC. Critical interventions are what define high-quality treatment of SCC.

The field of SCD treatment faces ongoing limitations in existing care approaches despite recommending research-proven medical strategies. Research shows that SCD children experience delayed pain medication episodes when suffering from Vaso occlusive crisis in emergency situations that result in unsatisfactory healthcare experiences and prolonged suffering (Almuqamam et al., 2018; Kavanagh & Hirshon, 2020; Rees et al., 2022). The analgesic treatment schedule for SCD follows the National Heart Lung and Blood Institute (NHLBI) evidence-based guidelines. These guidelines stipulate the requirement for starting medications during triage whereas subsequent administration should occur after patients reach the hospital within sixty minutes. Patients should receive 30-minute additional doses of medication until their occlusive pain crisis reaches control points as defined by quality measures for Paediatric SCD (Yawn et al., 2014). Latent treatment brings poor life quality alongside extended hospital stays because complications develop (Darbari et al, 2020; Seaser et al, 2022).

Health care professionals in African settings demonstrate insufficient knowledge about SCD management according to studies from Abdeldafie &Alaaimi 2022; Mbiya et al, 2020, Ngonde et al, 2024; Jonathan et al, 2022. The poor SCD care practice stems from limited specialized training which results in variable treatment approaches. The resulting ineffective pain management in children stems from this circumstance (Kahsay & Pitkäjärvi 2019). Research conducted by Olusesan et al. (2017) at a Nigerian tertiary care facility showed that morphine received limited use for treating pain in children with SCD. The poor pain treatment results from insufficient knowledge about guidelines. Medical experts tend to develop a fear of addiction when treating patients with severe pain through morphine administration (Brennan-Cook et al., 2018). Nursing staff holds a belief that affects their needed decisions about prescribing morphine. Hospital stays become longer because children typically experience intense pain that medical staff does not remedy through appropriate procedures.

Studies show that disease modifying therapy remains poorly employed in SCD management space where its proven capability to decrease pain incidents and hospital visits and associated complications exists. In Sub-Saharan Africa Hydroxyurea stands as the main disease modifying treatment yet it exists only in selective medical institutions. Several drugs including

Voxelotor, Crizanlizumab and L-Glutamine show they can both decrease SCD complications which cause frequent crisis and enhance patient outcomes according to Adegoke et al., 2018, Carden & Little, 2019, Rai & Ataga, 2023 along with Tanhehco et al., 2022. Various obstacles prevent proper usage of these treatments especially financial hurdles and bureaucratic regulations along with inadequate laboratory facilities (Kilonzi et al, 2021). The curative treatment for SCD called bone marrow transplant remains limited by both donor availability and high safety risks that increase with patient age (Gluckman et al., 2017). Salinas Cisneros & Thein (2020) confirmed the same. All these points to low quality care for individuals including children with SCD.

The Malawi Government pursues multiple interventions through its health quality improvement framework to enhance patient care quality. The approach targets enhanced patient care delivery for various health conditions. The attention directed toward quality-of-care improvements in Malawi has not solved the ongoing inconsistent delivery of healthcare. Resource limitations stand as one of the main obstacles according to QMHS (2017). An insufficient number of qualified healthcare professionals impacts the Malawian healthcare system since these staff provide crucial special care to children with SCD. The shortage of required pharmaceutical products along with missing pain management medicines and other supportive medications negatively affects the delivery of appropriate quality healthcare services (Khuluza & Haefele-Abah, 2019). These elements produce inadequate health treatment for children suffering from vaso occlusive crisis. These factors then raise both the sickness rates and death rates in this at-risk community population.

Research is absent regarding the specific quality care provided to children with SCC in hospitals of Malawi. SCC exhibits vital clinical significance because it creates life quality deterioration and establishes the basis for persistent complications that shorten patient lifespan. The quality of care given to children with SCC needs evaluation at the three hospitals which are part of the Northern Region of Malawi. Research results may guide intervention strategies to optimize the crisis quality care received by SCD children thus enabling them to effectively control their medical condition while enhancing their life quality. The researcher decided to perform this research thus the study's purpose.

1.1 Background Information

The delivery of high-quality pediatric care in Malawi serves as one essential strategy to achieve goals under the third Sustainable Development Goal (SDG) concerning Non communicable Diseases (NCDs) reduction and health service delivery at universal levels. Challenging healthcare delivery results in various adverse consequences as well as lasting patient symptoms coupled with diminished trust toward medical facilities (Kruk et al., 2018). The key elements for delivering quality care include a strong structure and process and interaction relationship (Donabedian, 1988; Berwick & Fox, 2016). The strategic core competencies for SCC comprise sufficient qualified personnel whereas material resources and emergency response systems and evidence-based protocols such as SCD along with proper supportive systems also matter.

SCD occurs as a health problem that affects millions of individuals worldwide. The abnormal condition occurs frequently in populations of Africa and the Indian Sub-continent together with the Mediterranean Basin and the Middle East according to Piel et al. (2013). A total of 5% of humanity has inherited one of two major hemoglobin deficits known as sickle-cell disease or Thalassemia. Statistics show African-Americans hold the leading position among those who inherit the recessive disease trait (Cordovil, 2018). Sickle-cell disease results in the birth of 400 000 children annually worldwide (Kato et al, 2018; Wonkam & Makani 2019). Research suggests that SCD will affect 14,242,000 newborns from 2010 to 2050 according to Piel et al (2013).

The scientific data shows that Africa bears the highest share of Sickling Disorders worldwide. The medical literature from Wonkam & Makani (2019) and Oron et al, (2020) indicates that Sub-Saharan Africa witnesses approximately 75 percent of all SCD-diagnosed newborns. The high prevalence rates in the Region sustain alarmingly high rates of childhood fatalities linked to SCD. Approximately 90% of African SCD patients would not survive childhood expectancy if no effective medical interventions were implemented. Non-resource areas like Sub-Saharan Africa would witness the premature death of roughly 90% of SCD affected infants before reaching five years of age according to Wonkam & Makani (2019) and Ambrose et al. (2018). Detailed healthcare strategies supported by dedicated resources must be put in place to handle the serious medical challenges facing SCD patients in these at-risk populations.

SCD affects Malawi significantly and the main reasons for childhood disease-related morbidity. The available data shows sickle cell disease affects 0.1% of the population but sickle cell traits impact 9.1% of Malawian residents according to McGann et al. (2018). A research study conducted in Malawi found different Sickle Cell Trait (SCT) prevalence rates between 3.9% in Dedza and 9.7% in Kasungu (Tegha et al., 2021). Malawi's actual number of sickle cell disease and sickle cell trait cases remains unresolved because there exists no national data-sharing platform. The annual number of SCD births in the country stands at 2,000 according to UN data (2020). The existing statistics reveal that SCD affect the population of Malawi yet additional systematic data collection is needed to fully comprehend the magnitude of this disorder.

The disease leads to substantial involvements in pediatric hospital stays. SCD represented 2.7% of pediatric hospital admissions at Mzuzu Central Hospital and 1.4% at Rumphi District Hospital while Ekwendeni Mission Hospital admitted 0.5% of such patients in 2020 according to the Pediatric Admission Registers (2020). Mzuzu Central Hospital had less SCD cases in 2020 at 2.7% in comparison to their 2018 admissions totals of 3.1% (Chimbatata et al., 2021). A decline in admissions seems likely because pediatric care givers avoided hospital visits due to COVID-19 testing issues. Hospital admissions due to sickle cell disease in Malawi reveal that painful crises affected 54.3% of children with SCD and the disease caused 1.4% patient deaths (Chimbatata et al., 2021). The statistics demonstrate that SCD represents a substantial public health issue in Malawi despite inadequate attention when compared to other chronic diseases like Human Immunodeficiency Virus (HIV) that leads to annual births of similar numbers of infants with the condition.

The growing number of children with SCD requires attention to establish effective treatment methods and quality healthcare services in order to enhance clinical success rates while reducing mortality statistics. The high mortality rates from SCD complications including SCC led health organizations to produce particular guidelines for management. The World Health Organization (WHO) together with the NHLBI created thorough direction documents for SCD complication management. (NHLBI, 2014; WHO, 1991). Malawi implements specific aspects of the Management of Childhood Illnesses guidelines (2018) to deliver care to patients. The successful implementation of these guidelines produces the necessary quality standards for treating children affected by SCC.

A multitude of research papers document ongoing problems with high-quality SCD medical care provision (Oyeku & Faro, 2017). In a Brazilian study researchers evaluated SCD patient care quality through monitoring growth rate and development levels as well as minimum follow-up numbers where findings showed only 36.6% monitoring with 28.6% receiving adequate follow-ups (Gomes et al., 2011). Similar research in Ghana discovered gaps within three dimensions of quality care combined with nurse limitations regarding comprehensive care (Korkortsi, 2021). The deficiency in delivering complete medical care in resource-deficient countries derives from insufficient funding for offering elite medical assistance (Oron et al., 2020; Sinkala et al, 2018). These include lack of routine newborn screening, limited disease modifying therapy, and effective pain management, among others. As such, children with SCD may experience frequent hospitalisations, lower quality of life, and reduced life expectancy compared with developed countries where there is better access to comprehensive care. Providing comprehensive quality care for children with SCC would improve the quality of life for these children who will live with the conditions for the rest of their lives.

Research studies mainly examined SCD follow-up care practices while creating a knowledge gap about the quality levels of acute care for children with SCC. Quality care for children in Stall Cross, as defined by guidelines, requires immediate and appropriate pain treatments. Nurses need to assess and treat pain as quickly as possible and maintain proper hydration since both steps help maintain blood flow and prevent red blood cell sickling alongside additional oxygen therapy for reducing complications (Yawn et al., 2014, ASH, 2020).

The Government's efforts to develop clinical practice have not resolved the inconsistent care quality in Malawi because resource limitations present a primary challenge (MOH, Quality Management for Health Sector, 2017). During clinical teaching of nursing students the researcher noted different ways hospitals in northern Malawi handled children with SCC. The hospitals of Mzuzu Central, Rumphi District and Ekwendeni Mission hospitals are teaching facilities for healthcare for health care professionals including nursing students. Such deficiencies in care quality at these sites endanger both student learning experiences and clinical training throughout their studies. There is scanty data on the quality of care for hospitalised children with SCC especially in acute care in Malawi. This paucity in data makes it unclear whether the quality of care for children in SCC in Malawi meets the necessary

standards. The researcher needed to evaluate health care quality delivered to children in SCC across Northern Region Malawi through selected hospitals.

1.2 The Statement of the Problem

Quality of care is a fundamental health policy concept essential for achieving UHC, particularly within the framework of the SDGs (WHO, 2018). This includes access to quality health services (NHP, 2018). Sickle cell disease (SCD) is a chronic condition that predisposes affected individuals to frequent hospitalizations due to episodes of crisis, requiring both emergency and continuous care. Effective management of SCD is crucial for preventing early mortality and reducing complications. Adherence to evidence-based guidelines such as timely pain management, adequate hydration, and oxygen therapy to prevent sickling is critical to improving patient outcomes (Yawn et al., 2014).

In Malawi, SCD contributes significantly to pediatric hospital admissions, accounting for approximately 3.1% of cases, with anemia, sepsis, and painful crises being the most common clinical presentations (Chimbatata et al., 2021). Although Malawi has made strides to reduce the under-five mortality from 64 to 48 deaths per 1,000 live births (MDHS, 2024). Despite this achievement, mortality rate is still high to reach the target of 25 deaths per 1,000 live births in the year 2030. If quality care is not implemented children with SCD with be greatly affected. Hospital data from 2020 indicate that pediatric admissions due to SCD constituted 2.7% at Mzuzu Central Hospital, 1.4% at Rumphi District Hospital, and 0.5% at Ekwendeni Mission Hospital (Mzuzu Central Hospital, Rumphi District Hospital & Ekwendeni Mission Hospital Pediatric Admission Registers, 2020). These figures underscore the considerable burden SCD places on healthcare resources in Northern Malawi. Addressing this burden requires a focused effort to improve patient management and clinical outcomes.

Despite the Government of Malawi prioritizing quality clinical care in the Health Sector Strategic Plan (HSSP, 2017–2022), disparities in SCD management persist across hospitals in Northern Malawi. The Ministry of Health (MOH) has emphasized improving healthcare quality through the implementation of guidelines and standard operating procedures (SOPs) at all points of care (QMHS, 2017). However, researcher observations indicated inconsistencies in the management of SCC, suggesting gaps in adherence to best practices.

Given these concerns, this study aimed to assess the quality of care provided to hospitalised children with SCD at Mzuzu Central, Rumphi District, and Ekwendeni Mission hospitals. By examining current practices and identifying gaps in care, the study sought to generate valuable insights that may inform quality assurance programs and strengthen efforts to improve pediatric SCD management in Malawi.

1.3 Broad Objective

To assess the quality of care provided to hospitalised children in Sickle Cell Crisis at selected hospitals in Northern Malawi.

1.4 Specific Objectives

The specific objectives of the study were to:

i. Assess the availability of inputs that enable the provision of quality care to children in Sickle Cell Crisis in the selected hospitals.

ii. Compare current practices for the provision of care for Sickle Cell Crisis with the existing WHO, NHLBI and Queens Paediatric Guidelines in the selected hospitals.

iii. Determine the challenges experienced by health care workers in providing quality care to hospitalised children in Sickle Cell Crisis in the selected hospitals.

1.5 Research Questions

The research study answered the following three questions.

i. What is the availability of patient care inputs for provision of quality care for Sickle Cell Crisis to hospitalised children in selected hospitals?

ii. What are the current practices related to the provision of quality care for children in Sickle Cell Crisis as compared to existing guidelines in selected hospitals?

iii. What challenges are experienced by health care workers in the provision of quality care to children in Sickle Cell Crisis in the selected hospitals?

1.6 Significance of the Study

The research investigated missing information regarding quality of care provided to children in SCC in hospitals of Northern Malawi. Available research did not provide an extensive evaluation of acute Paediatric patient management through examination of structure process dimensions in prior studies. The Ministry of Health together with hospital managers can create new strategies because of these identified gaps which will contribute to enhance clinical practice. To address this issue healthcare facilities must have qualified medical personnel along with critical medications and procedural guidelines as well as proper tools for managing acute episodes.

The research findings may provide training institutions with useful data to enhance their clinical teaching activities within these healthcare facilities used for student instruction. The teaching approach should include real-life scenario simulations along with case studies while using evidence-based curriculum content which delivers students the most updated information. The research results can help strengthen both student supervision as well as clinical instruction which seeks to boost competence levels in SCC child care along with other related skills.

The findings may further help healthcare providers provide timely and effective interventions during SCC episodes. This can significantly reduce severity of pain episodes, enhance overall well-being, and improve the quality of life in children. This will help to reduce mortality related to the disease. The research study recognized a need to study how quality care in case management practices can be strengthened.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

A thorough evaluation of literature regarding child Sickle Cell Crisis care quality forms the base of this chapter. The literature search used computerized databases which included HINARI, Pub Med, Sage Journal, Tailor and Francis, and Google Scholar databases. A systematic search included terms like “quality care”, “children”, “sickle cell disease”, “Sickle Cell Crisis,” “vaso-occlusive crisis,” “painful crisis,” and “structure/inputs availability” which were applied according to the search protocol. The researcher conducted this research to determine published data regarding the quality of healthcare received by children with SCC. The examination covered the period between April 2022 during the proposal development stage until the production of the discussion section. The assessment reviewed numerous studies about SCD management throughout both developed and developing countries and Malawi to understand the research context.

The research objectives enabled the review to consist of quality care analysis as a crucial evaluation method to assess healthcare service suitability for the needs of children with SCD. English-language articles composed the research materials because they provided better comprehension for readers. The investigation consists of six essential domains that guide the literature review: (1) Sickle Cell Disease, (2) Public health significance of sickle cell disease and (3) Global Standards of quality care for sickle cell in children, (4) Sickle Cell care quality in Malawian context and (5) Access to resources for SCD management, (6) Delivery challenges of quality care.

2.1 Sickle Cell Disease

The genetic blood disorder SCD develops due to mutations in the hemoglobin beta gene disposed on chromosome 11(Hoban et al., 2016). Beta-globin exists because this specific gene of the human body provides necessary instructions through DNA for generating such substance. Beta-globin functions as part of hemoglobin within red blood cells to transport oxygen throughout the body. A single genetic alteration occurs when the sixth base in beta-

globin gene changes adenine (A) to thymine (T). The mutated HbS gene replaces regular HbA production in the red blood cells (McCance. & Huether, 2016). & Huether, 2016).

A person must receive SCD disease genetics from both parents to develop the condition because this genetic pattern functions as autosomal recessive. Children obtain SCD when they receive ill-form genes from both their parents. People who have one mutated sickle cell gene and one healthy gene will carry the disease but remain without symptoms (Kato et al, 2018). Persons holding both normal and sickle cell genes are diagnosed with sickle cell trait (SCT) (HbAS). The clinical onset appears only in children who receive two mutated genes through heredity from both of their parents. A 25% probability exists for transmitting both mutated genes and leading to SCD when both parents possess one SCT gene during conception.

The HbS abnormality generates stiff sickle-shaped red blood cells when particular circumstances occur. Red blood cells adopt an abnormal sickle shape especially in low oxygen conditions when hemoglobin S polymers form. The structural transformation of hemoglobin presents overwhelming functional complications for oxygen transport according to Oron et al. (2020). A variety of conditions lead to the sickle-shaped deformation of red blood cells. The pathological process of sickle cell disease is triggered by hypoxia as well as dehydration and exposure to cold temperatures along with rapid weather changes and both stress and infections (Borhade & Kondamudi, 2022). The sickling of red blood cells becomes more likely after triggering events that strengthen polymerisation and result in various health complications including SCC.

SCD brings both immediate and long-term clinical problems among patients. Patients with SCD experience the most dangerous immediate complication known as SCC. The disease represents several acute conditions called vaso-occlusive crisis, aplastic crisis, splenic sequestration crisis and hyperhemolytic crisis with acute chest syndrome and other complications included (Borhade & Kondamudi, 2022). The combination of vaso-occlusive and hemolytic crises constitutes the most common crises that drive patients to seek medical attention through frequent hospital admissions (Almuqamam, Diaz – Frias, et al., 2018; Darbari et al., 2020).

The disease manifestations in children extend from severe widespread pain to early strokes and leg sores and premature organ-related mortality (Piel et al, 2017). Acute pain usually begins in

early infancy about 6 months old according to Darbari et al. (2020). This is so because of the presence of fetal haemoglobin F (HbF) which does not contain abnormal HbS. Fetal hemoglobin is gradually replaced by adult haemoglobin HbA at about 6 months onwards. The protective quality of HbF in sickling processes causes a reduced number of vaso-occlusive crises and related complications. Children with SCD experience pain as their primary symptom but these pain episodes have a nature that is unpredictable and episodic (Krauss et al., 2016). An ischemic pain develops because the sickle-shaped deformed erythrocytes obstruct blood vessels and block tissue oxygen delivery (Lakkakulaet as, 2018; Oron et al, 2020; Inusa et al., 2019). In children, pain crisis can manifest as painful swelling of the hands and feet known as hand-foot syndrome or dactylitis. The pain normally affects multiple areas of the body specifically the chest area, the abdomen, back region as well as the long bones according to McCance and Huether (2016).

Pain crises in SCD patients require accurate assessment and timely management often involving opioid analgesics, adequate hydration, and other pharmacological non-pharmacological interventions. Other management include antibiotics such Gentamycin, Ceftriaxone to prevent infections which are a major trigger for crisis and blood transfusion if Hb is less than 5 g/dL or the child presents with heart failure (Yawn et al., 2014).

Hydroxyurea along with L-glutamine serve as main disease-modifying therapies in the long-term management strategy for SCD. The treatments escalate HbF amounts to stop RBC sickling which leads to marked better clinical results through decreased pain crisis events and hospital admissions. Bone marrow transplantation serves as the treatment to cure SCD (Salinas Cisneros & Thein, 2020). This medical procedure replaces defective bone marrow responsible for SCD with healthy donor stem cells to provide treatment.

Daily administration of Folic acid (5 mg) combined with penicillin (daily dose) for pneumococcal prevention and antimalarials for malaria prevention form the essential preventive measures for children with SCD. Vaccination against *S.pneumoniae* and *H.influenza* type b is recommended to all infants with SCD. (Yawn et al., 2014, ASH, 2020). The implementation of these preventive measures delivers substantial improvements regarding the health results for children receiving this care.

2.1.1 Public health Importance of Sickle Cell Disease

WHO declared SCD as a public health priority in 2008 because of its substantial impact on African, Middle Eastern and Indian populations together with certain American regions. The United Nations declared the establishment of 'World Sickle Cell Day' through the 63rd United Nations Assembly held in 2010 when they designated June 19th. People across the globe commemorate this day with the dual purpose of spreading SCD disease information and gathering resources to improve clinical outcomes for SCD patients (Thein & Thein, 2016). About 7.74 million individuals worldwide have SCD while Sub-Saharan Africa reports 405,000 new SCD births per year which accounts for 79% of the annual global SCD births (Thomson et al., 2023). The disease affects this region to such a substantial extent that it requires global intervention efforts from member states. In response to this situation the WHO issued a 2010 request for nations to establish SCD prevention programs as well as management and care strategies to fight the combined health issues and disease burden.

Under conditions of limited healthcare resources in Sub-Saharan Africa the prognosis for unrunted SCD children becomes grave since they face a 50% to 90% mortality risk before they reach five years without appropriate medical interventions (Ambrose et al. 2018). People born with SCD in high-income countries have a survival rate exceeding 94% and their current expected lifespan spans from 40 to 60 years (Abdel-Hadi et al., 2023). Sickle cell disease-related deaths occur because most African children who have the condition remain undiagnosed after their second birthday (Macharia et al., 2018). Children during their second year of life experience elevated disease complications, but remain undiagnosed with the illness. The absence of a timely diagnosis during childhood typically leads to premature death since children cannot receive proper quality care on time. These alarming statistics highlight the need for targeted healthcare strategies and resources to address the challenges posed by SCD in children.

In 2021, the United Nations showed its renewed dedication through advocating for additional research funding and disease treatment research together with population-based awareness programs aimed to stop worldwide disease burdens. Progress has been achieved regarding SCD patient care within developed nations. Most countries having high SCD burden including ones located in Sub-Saharan Africa fail to include disease prevention funding into their budgetary plans (Moeti et al., 2023). The current lack of care systems leads to restricted medical

equipment availability and shortages of necessary drugs which prevents appropriate treatment from being provided to patients. According to Jonathan et al (2022) SCD resources at Reginal Hospital were found to be inferior compared to those in the National Hospitals in a resource availability survey done in Tanzania. The doctors in Mbiya et al (2020) DRC study reported Hb electrophoresis test limitations because of insufficient laboratory equipment which produced diagnostic and management difficulties for SCD patients resulting in substandard care in African hospitals. The investment of countries in resources for SCD management would lead to better care delivery while simultaneously decreasing mortality rates associated with SCD.

A significant financial strain develops from SCD costs its expenses to family budgets as well as healthcare organizations. Children with SCD force their families to endure recurrent medical expenses that start from monitoring the disease over time and refilling medications and carrying out additional regular visits (Inusa et al, 2019). The disease exists across an entire lifespan which intensifies financial expenses for patients and their families. Remedial healthcare is unaffordable for families dealing with sickle cell disease because numerous African countries lack substantial health insurance systems as documented by Ogamba et al. (2020).

Average health care expenditures during one year for SCD treatment reached 20,206 US dollars according to Shah et al. (2020), who reported that the highest expenses occurred in patients who experienced more than three VOC episodes. Life time health care expenses amount to 1 million dollars for SCD patients in US according to recent studies and research demonstrates Ghanaian families pay 25% of their annual earnings for SCD medical care (WHO, 2024). The economic impact of SCD on sub-Saharan African countries leads households to spend significant portions of their revenue on healthcare expenses directly connected to SCD through hospitalization admissions and outpatient visits and medication costs (Ngolet et al, 2016). The necessity for SCD funding prioritization by governments and international agencies becomes essential because it should integrate with universal health care provisions. Enhancing government support for SCD management would decrease family financial strain thus generating better life quality for affected patients.

2.1.2 *Quality of Care for Sickle Cell Disease Children Globally*

The improvement of worldwide disease-related mortality requires optimal SCD care services. Adequate high-quality care facilities together with sufficient resources ensure that most affected newborns can survive to become adults in high-income regions. Countries that provide proper SCD care have eliminated the mortality risk that SCD patients of childhood experience according to Piel et al (2017). The typical life span of SCD patients differs from those without the condition by 20–30 years Serjeant et al., (2018) yet their possibility to reach middle adulthood remains strong. Life expectancy together with mortality numbers experienced significant improvement because of comprehensive care programs which provide prompt and accessible medical services to patients. Ballas (2015) suggests that such progress results from having ample resources for diagnosing and treating and providing care to patients. These nations provide their SCD patients with enhanced medical results and better quality of life.

The provision of complete care resources functions as a main quality factor for treating children with SCD. A proper quality care model for SCD depends on a structured team of healthcare professionals. Patient care for SCD needs collaboration among hematologists with primary care physicians as well as pain specialists who work alongside social workers. The approach uses newborn screening as one element in addition to quality patient management and life quality enhancement practices (Esoh et al., 2021). The entire program for SCD treatment starts when recognition of the disease occurs leading to complication prevention and management approaches. The districts which carry the highest SCD burden in low- and middle-income countries experience major challenges with broad access to complete medical services. The lack of newborn screening programs together with substandard medical infrastructure and expensive healthcare costs produces unfavorable disease outcomes leading to early childhood mortality (Grosse et al., 2011).

The initiation of newborn screening acts as a fundamental step to establish excellence in SCD care. Early diagnosis through this process enables essential disease management that dramatically lowers the death rates of this disease. The establishment of newborn screening differs by country at various levels of income quite extensively. Newborn screening programs became mandatory in the United States of America (USA) along with the United Kingdom (UK) and France and Canada as countries achieve good functional sickle cell disease clinic

status (Chonat & Quinn, 2017). Patients in sub-Saharan Africa and many other low- and middle-income countries face a problem with the development of routine newborn screening programs indicating a need for early diagnosis. Efforts to initiate the program began within individual countries yet development toward this goal was sluggish. The American Society of Hematology's (ASH) Consortium on Newborn Screening in Africa (CONSA) together with WHO launched newborn screening implementation nationwide in 2020 to enhance both early detection and SCD care improvement across Africa.

The seven countries of Ghana, Kenya, Liberia, Nigeria, Tanzania, Uganda and Zambia participated in this program (Rahimy et al., 2019; Galadanci et al, 2024). The programs have successfully expanded newborn screening and care accessibility but only a few nations have established newborn screening as an official national program. There is insufficient resource sustainability along with project-initiated events that lead to these challenges. Universal health coverage demands the government to execute new healthcare implementations.

Quality care requires effective management of SCD complications since it enhances patient life quality and decreases SCD-related death rates. The high frequency of painful VOC crises leads to hospitalization for acute care which results in increased healthcare costs and organizational financial burdens. SCD management faces major challenges in LMICs because these nations have small budgets dedicated to treating the disease (Shah et al., 2020). Medical research shows children undergoing VOC episodes usually encounter waits for appropriate pain relief medications (Almuqamam, Diaz – Frias, et al., 2018; Kavanagh & Hirshon, 2020; Rees et al., 2022). The SCD population primarily consists of Americans and these patients experience healthcare disparity and insufficient access to specialized care providers according to Yawn et al. (2014). Research shows Black SCD patients wait significantly longer than other painful condition patients do for pain relief during emergency department care and this illustrates health inequality patterns in treatment (Lee et al., 219).

Health outcomes in SCD patients significantly improved because disease-modifying therapies like hydroxyurea and L-glutamine decreased the incidence of pain crises as well as hospital stays. High-income countries provide the finest treatment options to their SCD patients. The scarcity of hydroxyurea availability in sub-Saharan Africa facilities together with other limitations restricts the quality of healthcare delivery (Adegoke et al., 2018; Carden & Little, 2019; Rai & Ataga, 2023; Tanhehco et al., 2022). The current disease modifying therapies lack

sufficient effectiveness to stop the disease from becoming a chronic condition (Singh et al., 2024). The medical field considers bone marrow transplants the sole treatment that provides full recovery from SCD (Salinas Cisneros & Thein, 2020). Widespread implementation is restricted by donor resource availability while the risks associated with the transplantation grow as patients become older (Gluckman et al., 2017).

The delivery of high-quality care for sickle cell disease poses specific obstacles in developing regions related to the insufficient knowledge base and instructional programs for healthcare providers. Medical staff fail to detect SCD symptoms properly as well as treat it appropriately because of insufficient information. The morbidity rates increase due to inadequate SCD treatment practices because healthcare providers show insufficient understanding of SCD along with its complications and modern protocols (Tshilolo et al., 2019). The insufficient knowledge about vaso-occlusive crises (VOC) among medical providers frequently results in mistreating the severity of VOC episodes which delays essential pain treatment (Piel et al., 2017).

The available research along with gathered evidence proves that children with SCD receive inadequate care in resource-constrained environments. Both low middle- and high-income countries must implement newborn screening across their national borders while improving access to essential medicines and reinforcing their health care infrastructure to enhance SCD care and treatment achieves both better survival outcomes and better survival quality for children suffering from this condition.

2.1.3 *Quality of Care for Sickle Cell Disease Children in Malawi*

The Malawian Government has increased its focus on non-communicable diseases which include HIV, and communicable diseases such as tuberculosis (TB), malaria among others through intensified interventions for reducing their occurrence and disease prevention according to HSSP III 2023-2030. However, SCD continues to receive insufficient financial support and remains disregarded by medical services. Studies conducted in Malawi reveal the country lacks basic SCD care facilities while systematic screening programs do not exist and the condition is diagnosed after symptoms appear. The diagnosis of SCD occurs too late when children manifest signs of disease because many children pass away without medical confirmation (Kamthunzi et al., 2018). Children with SCD encounter many difficulties in obtaining healthcare services at quality levels that could prevent early mortality.

The countries of Nigeria together with Ghana and DRC along with others that comprise developed nations run successful newborn screening programs for early diagnosis and improved patient care. The government of Malawi has not established such programs on a national level. Newborn screening tests for inherited hematological disorders including SCD are possible in Malawi according to Tegha et al. (2021) who studied the central region of the country. This research evaluated SCD newborn screening together with Early Infant Diagnosis (EID) for HIV testing during one examination period. The screening measures have not become standard procedure throughout the entire nation. This limited scale of program implementation delays diagnosis and provides substandard care which results in higher SCD-related child mortality numbers.

The research conducted at Mzuzu Central Hospital showed that among pediatric patients SCD diagnosis occurred most frequently after infancy with 13.2% but spanned to ages 12 to 59 months (58.8%) and later than the fifth birthday (26.5%) (Chimbatata et al., 2021). Early SCD diagnosis becomes impossible through the detected gaps which create obstacles for providing prompt and effective healthcare services. The early diagnosis of these children would enable them access to interventions which would improve their overall quality of life. Internal and external investment is needed from the government to fund newborn testing as well as improve diagnostic capabilities while broadening healthcare provider and public awareness to enhance SCD quality assessment.

Movement of resources determines the quality of healthcare that clients receive by providing medications for treating acute complications. The health clinical practices in Malawi fail to reach optimal standards because of poor treatment according to their quality management policy (QMHS, 2017). The research conducted by Khuluza & Haefele-Abah (2019) demonstrated that essential medicines existed at a 48.5% rate in public facilities while CHAM facilities reached 57.5% availability levels regarding essential medicines in Malawi. Drug supply for pediatric formulations was particularly bad because of the extensive shortage observed in this area. The list of essential medicines contains pain relief drugs that represent crucial components for SCC treatment. The study hospitals may experience comparable obstacles that will degrade the standard of care for children suffering from SCC. The study conducted in Malawi validated the safety and efficacy of SCD disease-modifying therapy hydroxyurea for reducing complications in Malawian children suffering from SCD (Mvalo et al, 2019). The healthcare alternative is unavailable under some circumstances.

The Malawi Child Health Strategy II (2021-2026) shows that specialized NCD clinics including SCD clinics with screening and treatment exist only in urban areas and provide no access to essential care for the rural population. The current situation demonstrates both the complete lack of healthcare equity for young patients and a critical need for health services expansion outside main urban centers.

2.2 Availability of resources for management of Sickle Cell Crisis

Quality care delivery for children in SCC depends on having all required necessary inputs available to provide excellent services. According to Donabedian (2003) proper evaluation of care quality requires analysis of structure inputs since these elements impact high-quality care delivery. Quality care for managing an acute SCC depends on having three main healthcare resources which include oxygen concentrators and pain relief medication and intravenous fluids with possible blood transfusions. The evaluation analyses the equipment alongside the skilled personnel who deliver efficient sickle cell crisis care.

The achievement of quality care for children in SCC requires all essential materials needed for high-quality delivery. Donabedian (2003) emphasizes structure inputs should always be evaluated for quality care assessment since they determine high-quality care delivery. Essential systems like oxygen concentrators together with pain medication and intravenous fluids with possible blood transfusions determine the quality of SCC acute care delivery.

Medical supply availability for hospital treatments represents a fundamental requirement to implement successful quality health care delivery. Literature shows that widely divergent access to these medical supplies specifically affects poor medical facilities which results in reduced healthcare quality. The lack of necessary resources leads healthcare facilities to provide delayed care which directly causes increased morbidity rates and mortality rates among SCD patients. Mpaata et al., (2017) observed that the availability of hospital resources exhibits a positive and meaningful association with patient care services in public facilities in Uganda as revealed through their research on public institution resources and patient care quality. Child healthcare services were highlighted in all eleven aspects ($r = .562^{**}$, $p<0.0001$) of the study because resource constraints result in limited ability to provide effective care which yields desired patient results.

The literature on SCD resource availability across middle and low-income countries shows that resources are sparse according to Ally & Balandya (2023). Research data about evidence-based guideline implementation exists mainly for high-resource areas despite the fact that most data collection happens in these areas. Low-resource countries particularly those in Sub-Saharan Africa that house most SCD patients are excluded from this research emphasis. The limited medical expertise combined with inadequate health care accessibility in these areas warrants additional research utilization through available resources according to Kambasu et al (2019) and Smart et al (2018).

The analysis by Jonathan et al (2022) showed that Reginal Hospital in Tanzania operated with inferior resources than Nationa Hospitals. The results demonstrate resource availability exists only in tertiary hospitals of the system. According to Mbiya et al (2020) physicians from DRC faced challenges in performing Hb electrophoresis because of deficient equipment and resources that limited proper SCD diagnosis and management thus leading to inadequate care practices. National budgets for SCD resources would generate better healthcare while reducing deaths attributed to SCD.

Several investigations conducted in Ghana point to sufficient availability of resources to handle SCD management. Korkortsi (2021) conducted an evaluation of child sickle cell disease nursing care quality in Ghana so professionals could pinpoint areas requiring enhancement. A descriptive cross-sectional survey examined nursing knowledge about comprehensive care whereas it analyzed nurses' perspectives toward structural elements and procedural and outcome measures for SCD child care. Research showed that guidelines/protocols served with resuscitation equipment and pain assessment tools/charts and necessary medication in addition to laboratory services were present. Researchers in this study found less agreement regarding resource availability compared to previous studies (Korkortsi, 2021). The shortage of resources proved to be an issue that many under-resourced nations experience.

A facility-based cross-sectional study took place at Muhimbili National Hospital and the Regional Referral Hospitals of Temeke, Amana, and Mwananyamala in Dar es Salaam for evaluating the availability of SCD care resources in Tanzanian health facilities. The inventory checklist for data collection followed the design of Tanzania National Guideline for SCD Management and Basic Health Standards for Facilities in Tanzania. Clinical resources needed to diagnose and treat SCD were found insufficient at regional-level hospitals according to study

results. The assessment revealed limited numbers of essential resources including oxygen concentrators and intravenous fluids based on indications. The situation revealed that these facilities lacked proper resources (Jonathan et al., 2022). The majority of hospital resources appear to exist in greater quantity at tertiary institutions when compared to locations outside the urban centers.

Gondwe et al. (2022) studied both human resources and material resource availability as well as barriers which impede quality care delivery for newborns. Seven Malawian public hospitals including one tertiary institution and six district hospitals located in Southern Region of Malawi served as the study sites. Healthcare professionals used an adapted version of WHO's Service Availability and Readiness Assessment (SARA) tool for data collection. The investigators found that insufficient human and material resources stood as the primary hindrance to delivering high-quality care which was mainly caused by unpredictable essential drug and supplies availability alongside irregular equipment access and essential laboratory test capabilities (Gondwe et al., 2022).

Emergency and critical services at all health facilities throughout Malawi received similar evaluations according to Kayambankadzanja (2020). Research built upon data from the Service Provision Assessment (SPA) to evaluate emergency and critical care resource availability making use of established hospital standards for low-income nations. Interview data along with clinical service inventory served as the method for obtaining information. The assessment showed that hospitals achieved a 51.6% median score while smaller health facilities obtained 37.5% regarding necessary resource availability. Resources in hospitals exhibited variations according to their specific categories. Data showed that resources in drugs amounted to 62.0% and equipment at 51.9% but support services and emergency guidelines were at 33.3% each. Resource availability scores for urban facilities surpassed those of rural facilities by a significant margin. The overall outlook performed by Hospitals in Malawi shows they do not have enough resources for emergency and critical healthcare services (Kayambankadzanja, 2020).

Research reveals that SCD pharmaceuticals receive less funding support than other medical conditions. People with SCD receive less extensive medical care as well as experience greater barriers to accessing pain medication compared to individuals handling different chronic

illnesses (Lee et al., 2019a). The limited medicine availability in government hospitals seems to stem from the insufficient financial support that the country receives from its government.

The study of Hanif & Musvoto (2023) examined financing obstacles which affect public district hospitals in Malawi during healthcare service delivery. The research established that government funding reaches public hospitals later than needed while providing insufficient funding support together with inadequate income stream generation and decreased donor support. The Government should explore service fees together with funding lobbying and innovative approaches to enhance revenue to address the healthcare funding challenges. Enhancing public hospital funding capacity through this policy would help maintain sufficient pharmaceutical supplies at hospitals as it relates to quality care delivery.

2.3 Current Practice for Sickle Cell Crisis Management

The review explores standardised guidelines which play a vital role in caring for children with SCD. Effective hospital management of children with SCD requires timely application of proper pain medication and hydration through intravenous fluids coupled with oxygen therapy and complication monitoring according to the guidelines from WHO, NHLBI and Malawi. Different healthcare setting would achieve faster recovery along with improved life quality and reduced premature patient deaths by following these guidelines. Multiple research investigations demonstrate that regular implementation of evidence-based guidelines enhances both patient results and minimizes treatment-related issues.

2.3.1 Pain Management

Many studies exist about SCC management in Paediatric patients who resulted in multiple proposed strategies for better patient outcomes. People with SCD need proper pain management as pain serves as their most significant SCC symptom during both childhood and adulthood (Krauss et al., 2016). An occluded blood vessel from sickle-shaped abnormal red blood cells triggers severe tissue ischemic pain (Lakkakulaet as, 2018; Oron et al, 2020; Inusa et al., 2019). During pain crisis children experience painful hand-foot swelling which healthcare professionals diagnose as hand-foot syndrome or dactylitis. Pain in various locations such as the chest together with the abdomen and back and the long bones establishes itself as common in SCD patients (McCance & Huether, 2016). Children with SCD may experience these painful symptoms starting from their sixth month life (Darbari et al., 2020). The chronic

status of this condition creates negative effects that damage quality of life together with overall health development during childhood growth.

SCD-related pain affects pediatric patients quality of life and increases both hospitalisation durations and readmission possibilities unless healthcare providers maintain proper management strategies (Oppong-Mensa et al, 2023; Matthie & Jenerette, 2015; Mathias & McCavit, 2015). As such, pain management stands as an essential factor for delivering high-quality care to patients who have SCD. The primary objective of SCD pain management includes reducing the number of pain occurrences and strength in Paediatric SCD patients while implementing comprehensive care strategies for physical and emotional disease aspects.

Pain management effectiveness depends on precisely assessing the pain levels experienced by children as discussed by Abazari & Namnabati (2017). The assessment approach proves essential since it detects both suffering existence along with pain assessment about its depth and character. A precise diagnosis is essential for proper treatment execution which makes unsuccessful any pain management strategy. The 2010 Declaration of Montreal backs this essential requirement through its statement that pain management access represents an essential basic human right. Any failure to treat or address pain violates both human rights according to the Declaration as stated by the International Association for the Study of Pain (2010). Every child requires an exhaustive pain assessment before receiving proper treatment. The ethical framework combined with human rights principles helps enhance patient care quality by proper pain treatment management which enables children to maintain their quality of life.

Assessing pain in children presents major difficulties because pain experiences in children are typically subjective. Standard pain assessments in children should include three components of self-report and behavioral observation and physiological measures according to Hockenberry et al. (2017). Current research approves self-report as the best practice for evaluating pain assessments. Experts agree that children should express their pain through proper measurement methods including visual analog scales (VAS), numeric rating scales (NRS), or faces pain scales which suit their age level. The exact accuracy of self-reporting depends on multiple factors including child age together with their cognitive development level and communication skills. Behavioral observation methods evaluate pain by monitoring and recording observable behaviors including facial expressions along with body movements along with changes in activity levels. Crying and measures of facial expression play a role in this process. Medical

practitioners frequently measure pain in non-verbal children and infants through the evaluation tool called FLACC (Face, Legs, Activity, Cry, Consolability) (Zieliński et al., 2020). Additional information about a child's pain experience can be obtained through heart rate measurements together with blood pressure readings and oxygen saturation results. Acute care facilities benefit from these evaluation measures because they generate crucial objective data that support self-reported symptoms and clinical observations which results in better pain control practices. This research supports findings from Britain and Jamaica and Cameroon because child pain assessment presents major challenges to healthcare professionals. Healthcare providers used the amount of crying as well as parent or caregiver reports as their main indicators to assess pain levels (Stewart et al., 2021).

Regardless of the existing tools the process of assessing pain in children remains complicated. The subjective quality of pain combined with distinguished developmental phases of children requires clinical experts to master several assessment strategies to obtain complete patient information (Sansone et al., 2023). Multiple research studies reveal that health care employees show constrained abilities in pain evaluation. This hinders effective pain management. Kemp et at (2017) investigated the pattern and nature of pain evaluations executed by intensive care physicians to examine documentation disparities between pain assessment and other vital signs in London and the South-East of England. Records were obtained from observation charts together with patients notes. The assessment of pain failed to receive documentation from physicians in almost 66% of patients studied and from nurses in 25% of patients under observation for 24 hours. The recorded pain evaluations failed to use appropriate behaviour pain assessment methods according to Kemp et al. (2017). Research conducted in Nigeria demonstrated poor physician behavior regarding pain assessment since records of pain evaluation only appeared in 8.3% of sickle cell anemia (SCA) patients admitted to emergency units. The research showed that medical professionals neglected to document which pain assessment methods they utilized for treating patients (Oshikoya et al., 2015). While inadequate documentation does not prove pain assessment absent it indicates that pain assessment was not provided because examination results remained undocumented.

Many research papers show that nurses worldwide do not make proper use of pain assessment tools (Linhares et al., 2014). The Norwegian research investigated how nurses understand postoperative pain management for children in clinical practice. The study based on questionnaire data collection and postanesthesia care unit observations in six university

hospitals revealed that valid pain assessment tools were applied during 19% of patient monitoring periods (Smeland et al., 2018). Since nurses practice among healthcare professionals who interact extensively with patients it remains essential for them to understand pain assessment in depth. Nurses need this knowledge for pain management strategies to deliver effective practices that match established clinical standards.

Many elements influence the inadequate evaluation of patients' pain situations during clinical practice. The insufficient implementation of pain assessment stems from healthcare provider doubts about pain reporting among children as well as the absence of assessment tools alongside inadequacies in tool usage knowledge and time pressures. The incorrect diagnosis of pain results from this process thereby leading nursing staff to delay implementing appropriate pain interventions. Alotaibi et al. (2018) performed a thorough investigation to understand nurse knowledge about infant and child pain assessment approaches as well as Saudi Arabian nursing attitudes toward pain management alongside the facilitators and obstacles paramedics encounter in this undertaking. The authors used Whittemore & Knafl's (2005) five-stage framework to analyze research that emerged from 2000 to 2018. Nurses from Saudi Arabia along with nurses from other countries exhibit insufficient knowledge and maintain poor attitudes pertaining to child pain assessment and pain management. A shortage in clinical knowledge emerged because Saudi Arabian healthcare facilities failed to provide proper education and crucial assessment equipment to healthcare providers. Accuracy in assessing pain in pediatric patients depends significantly on these assessment tools which directly affects their pain management accordingly. The review results highlighted that uninterrupted education programs must target nurses together with doctors and children's parents regarding Paediatric pain management practices (Alotaibi et al., 2018).

Iqbal et al. (2023) conducted a study to analyze how health care specialists in Pakistan understand the barriers to pain management. Different obstacles prevented pain assessment according to the study findings which revealed that assessment tools were not accessible in 37.5% of cases while 27.5% of healthcare professionals lacked familiarity with those tools and 19.2% of facilities operated without proper protocols. The research findings match those reported by Kahsay & Pitkäjärvi (2019) in Eretria. Pain management suffers from suboptimal treatment because nurses lack proper assessment of pain or fail to complete sufficient assessment of pain. Academic research conducted by Kholowa et al. (2017) surveyed nurses working with children at Queen Elizabeth Central Hospital Paediatric Department about their

pain management understanding and behavior in Malawi. The study discovered that nursing staff lacked adequacy when measuring pain through available assessment tools. Inadequate pain assessment by nursing staff was directly linked to the absence of proper assessment instruments.

Various research has established that clinical pain assessment for children has shown better outcomes. Paquin et al. (2019) investigated through research if introducing a morphine oral-based protocol for pain intervention in children resulted in improved SCD outcomes for Pediatric patients. The pain assessment procedure was fundamental because the protocol requested pain evaluations both prior to administering pain medication and after its delivery. The study demonstrated that first-line opiate therapy with oral morphine increased by 35% while pain assessment scale usage increased by 28% along with other metrics. The execution of the protocol led to enhanced pain assessment yet documentation failures emerged since nurses recorded the pain scores of 50% of patients during first evaluations. Use of pain scales together with proper documentation should be adopted for effective treatment of children experiencing vaso-occlusive pain crisis. The results of this research mirrored those found in United States and Canada within a multicentre study. The research examined Paediatric ED staff adherence to NHLBI 2014 guidelines and hospital admission patterns when opioids were given promptly. The data highlighted that pain received assessment and documentation taking place in all 395 cases and reassessment occurred for 363 patients leading to positive results for pain assessment (Rees et al., 2022).

Patients with vaso-occlusive pain crisis need quick access to appropriate medications that match their reported pain intensity. The NHLBI guidelines state that pain management should start within thirty minutes of triage and sixty minutes of hospital entry followed by thirty-minute dosing intervals until pain is controlled because these are quality-of-care indicators for Paediatric SCD (Yawn et al., 2014). Research studies show vaso-occlusive crisis (VOC) patients delay receiving pain relief medications according to Almuqamam, Diaz – Frias, et al. (2018), Kavanagh & Hirshon (2020), and Rees et al. (2022). According to Chakravorty et al (2018) data only 48% of children experienced timely reception of pain relief medicines during their recent urgent medical encounter.

Cacciotti et al (2017) studied USA patterns of hospitalization treatment and medication administration for SCD-related pain management in Paediatric Emergency departments. The

research team used retrospective chart analysis to obtain data for the study. The analysis showed important delays in delivering initial pain relief medication because healthcare providers took 63 minutes on average to administer it. The treatment of patients with parenteral opioids failed to meet the less than 60-minute standard as reported by Rees et al (2022) throughout the Emergency Department. Results showed that 25% (n=101) of patients received parenteral opioids during the first thirty minutes of triage and 28% (n=110) received these medications between thirty-one to sixty minutes post-triage time but 43% (n=173) required parenteral opioids more than sixty minutes from triage. Kavanagh &Hirshon (2020) investigated the approach to pain management for hospitalised SCD children. The study revealed delays in pain relief distribution because healthcare providers faced issues with pain assessment together with inconsistencies between reported patient pain levels and medical procedures for administering pain medication. An investigation in New York (USA) evaluated numerous elements which influence the duration until the first opiate pain medicine administration after ED triage. Researchers evaluated pain management strategies with reference to the American Pain Society Guideline for SCD pain management in the current setting. The Almuqamam, Frias, et al. (2018) research showed two main contributing factors behind delayed pain medication were insufficient resources combined with delayed documentation of Emergency Department nurses' task documentation.

Research has established that affected individuals with SCD receive insufficient pain management. Chronic pain develops from this condition which diminishes the quality of life for these patients. Children with VOC received a lower than suggested 0.05 mg/kg intravenous morphine delivery than the recommended 0.06 mg/kg according to Almuqamam, Frias, et al. (2018). The use of morphine for pain management in children with SCD was found to be less frequent at the Paediatric outpatient clinic of a Nigerian tertiary care facility according to Olusesan et al. (2017). The insufficient pain management occurs because healthcare professionals are missing guidelines. The research conducted by Martin et al. (2020) revealed that most clinical staff remained unaware of the recommended SCD management protocols because only 10% of all clinicians knew about proper medication dose timing while 25% delayed pain evaluation periods. An assessment of emergency nurses´ knowledge and attitude coupled with their perceived barriers toward pain management was conducted by Kahsay & Pitkäjärvi (2019) in Eretria. Essential research data showed nurses held insufficient understanding regarding SCD pain management to the extent of 57.9 percent of the study

group. The perception of addiction toward morphine administration for severe pain exists among healthcare providers according to Brennan-Cook et al. (2018). The belief about addiction sometimes drives healthcare staff into making distinct decisions regarding morphine prescriptions. Most children face uncontrolled pain as a result of this practice leading to longer than necessary hospitalization.

Other research work shows that pain control represents an essential component of quality care delivery. A research team examined London healthcare facilities to explore treatment protocols for opiate analgesia and supporting drugs which doctors prescribed to sickle cell patients experiencing severe VOC-related pain during their admission from January 2018 to December 2019. More than 100% of patients diagnosed with severe VOC received opiate analgesia medications while 81% had modified-release oral morphine and 25% needed intravenous Patient Controlled Analgesia (PCA). A total of 6% of medical cases successfully used oxycodone immediate release and modified release forms instead of morphine. Healthcare providers did not regularly prescribe support medications at the same time as administering opiate medications. Clinical data indicated substantial differences between medical professionals when treating severe VOC symptoms in paediatric sickle cell patients (Tsouana et al., 2021).

Studies demonstrate that medical staff delay starting pain medications while they also perform inadequate guideline usage for SCC assessment alongside inadequate reassessment processes. The way this practice operates causes deterioration of the standard of patient care. The sources show that SCD pain management has essential roles in shaping healthcare quality.

2.3.2 Fluid Management

Managed SCC treatment needs fluid replacement therapy since hydration functions as an essential factor for proper cellular operations. Hemoglobin S polymerization occurs when cells become dehydrated which drives the process toward rigid sickle-shaped red blood cells formation (Brugnara, 2018). The sickling process hastens when RBCs experience dehydration because HbS concentrations rise. The sickled form of RBCs creates bloodstream blockages by reducing vascular flow which contributes to blood flow restriction. Drinking adequate amounts of fluid allows your body to keep plasma volume steady while making your blood less viscous. Easily flowing blood because of hydration minimizes blood thickness which reduces the occurrence of painful blockages. Water consumption at adequate levels represents an essential

component in sickle cell disease care because proper blood flow maintenance decreases pain symptoms.

The National Heart Lung Blood Institute released 2014 evidence-based guidelines as part of sickle cell disease management that advocate for sufficient hydration of patients to treat VOC. Medical protocols recommend intravenous fluid therapy as superior to oral hydration during SCC acute phase care. Fast bloodstream delivery of fluids provides the most effective and rapid way to rehydrate because direct blood access allows the best absorption rates. Patients receive intravenous fluids through bolus or continuous infusion according to the intensity of dehydration together with their individual treatment requirements (Carden et al., 2017). By administering fluids into the bloodstream fluid volume expands rapidly together with blood flow becoming less viscous which leads to symptom alleviation and disease complications prevention.

The management of SCD depends on maintaining sufficient hydration because it improves bilirubin excretion through urination. Bilirubin appears as a waste product from the continuous red blood cell breakdown known as hemolysis that affects people with SCD. Proper hydration allows the body to produce enough urine thus promoting the removal of bilirubin from the body. The decrease of complications including gallstones and jaundice happens as a result of this intervention. Using a wide-ranging literature review Ojo et al. (2022) evaluated the present method of intravenous fluid delivery for sickle cell VOC treatments. Research data indicates that hypotonic fluids work better than normal saline when managing SCD since these fluids have less solute concentration than blood does. Using hypotonic fluids serves to enhance pain management outcomes while reducing the chance of heart stress from developing fluid overload. Normal saline produces worse management results regarding pain symptoms and increases the chance of volume overload as Ojo et al. (2022) documented. Investing effort into selecting the correct fluid type becomes vital for obtaining maximal benefits in the healthcare and well-being of patients suffering from SCD.

According to the Queen Paediatric guideline for management of common childhood diseases in Malawi patients should consume oral fluids along with intravenous bolus fluids within the initial twenty-four hours. The fluid volume calculation relies on body weight and uses a total amount equal to 1.5 times maintenance fluids. Children receiving intravenous drugs must have their IV volumes recorded while healthcare staff need to motivate patients to take more fluids

orally. The therapy starts primarily during the first 24-hour period but its continuation depends on patient response.

Oshikoya et al. (2015) researched pain management approaches for sickle cell anemia patients undergoing emergency hospital care in Nigerian medical facilities. Fluid therapy appeared as a treatment component in 91.7% of the children during their medical care according to the evaluation. Sickle cell crisis management demands fluid therapy intensely as hydration helps reduce blood viscosity and prevents vaso-occlusive complications according to the high percentage of patient treatment. These research results demonstrate that fluid therapy has become a standard treatment during emergency medical care of sickle cell anemia patients.

A retrospective single-institution study conducted by Joung et al, (2024) evaluated the hospital admission factors based on hydration and intravenous analgesics delivery speeds. Adult patients together with pediatric patients suffering from SCD who experienced VOEs were included in the review between January 2018 until August 2023. People who received intravenous fluid therapy within 60 minutes of arrival to the hospital or people who received intravenous fluid therapy and intravenous analgesia within 60 minutes of hospital attendance in acute settings showed reduced hospital admission rates when compared to patients who did not have early intravenous hydration.

The possible benefit of fluid administration in red blood cell sickling reduction still requires controlled monitoring to ensure fluid overload that results in adverse respiratory and kidney effects does not occur. Intensive intravenous fluid administration contributes to multiple adverse medical outcomes such as acute chest syndrome and development of new oxygen needs along with hospital-acquired infection acts and kidney damage and transferring patients to intensive care units (Gaut et al., 2020). Hospital stays become longer because these consequences develop sequentially.

Gaut et al. (2020) examined fluid overload development because of intravenous fluid therapy in SCD patients admitted for VOC through a Netherlands-based retrospective analysis. A total of 100 SCD patients participated in the 230 assessed VOC encounters during the research. Patients received 3 L/24 h of fluids for adults or 3 L/m2/24 h for pediatric patients before the fluids were either gradually reduced up to 72 h. The main outcome measure included lung edema on chest X-ray along with peripheral edema or weight gain together with one of the following symptoms: shortness of breath and/or oxygen requirement, reduction or

discontinuation of intravenous fluids and/or diuretic medication use. Out of 100 patients, 21 (21%) developed volume overload. Those patients who developed volume overload spent on average six days in hospital versus four days for patients without volume overload (P = 0.037) (Gaartman et al., 2021).

Single-center study researchers used retrospective data to explore how intravenous fluid therapy affected the clinical results of SCD patients admitted for vaso-occlusive episodes in children and adolescents along with young adults. The research evaluated three main clinical outcomes that included hospital length of stay (HLOS) and acute chest syndrome (ACS) development as well as transfer to the Paediatric intensive care unit (PICU). A retrospective review focused on VOE hospitalisations starting from January 2015 through April 2020. The research included 617 hospital admissions which involved 161 patients. The research confirmed that excessive fluid administration led to negative hospital outcomes that prolonged hospital stays making a financial and emotional toll on healthcare system resources (Haimed et al., 2024).

Fluid management success in the PICU depends heavily on health care provider understanding. Professional nurses serve as the main frontline caregivers for hospitalised patients at all times during the 24-hour period. As such quality healthcare depends on nurses acquiring appropriate knowledge about fluid management. Medical studies document insufficient understanding of complete SCD treatment methods in health care professionals. Korkortsi (2021) conducted research in Ghana demonstrating insufficient nurse understanding of child crisis fluid maintenance. Proper fluid prescription and patient monitoring stand as essential elements for delivering quality care to SCD patients with acute severe anaemia. The analysis, healthcare providers demonstrated knowledge comprehension rates of 13.5% for correct fluid prescriptions and 21.6% for recommended blood transfusion choices.

Stewart et al (2021) executed a multi-national interdisciplinary study of pain management approaches in sickle cell disease (SCD) between Cameroon, Jamaica and the United States of America. This study established major discoveries about applying hyperhydration therapy as an approach to manage pain. According to the study results most medical professionals favored oral hyperhydration procedures instead of intravenous delivery to manage sickle cell pain. The preference for oral delivery proved essential for teaching children to manage their condition at home. This method enables children to become accustomed to fluid consumption by mouth

because they will avoid intravenous lines both in and outside of the hospital. For appropriate home management children need to learn how to use oral hydration methods. When practitioners performed hyperhydration they would typically provide about 1000 cubic centimetres of fluids daily to affected patients.

2.3.3 Administration of Oxygen Therapy

Medical oxygen therapy serves as an essential therapeutic method for different health conditions that includes SCC treatment. Sickle-shaped red blood cells create obstructions to blood flow that leads to tissue hypoxia when oxygen fails to reach body tissues during such pain crises. The combination of tissue hypoxia with its debilitating pain produces additional threats to severe organ injury (Al-Otaibi 2019; Borhade and Kondamudi 2022). Kids who experience SCC face greater risk of hypoxia and hypoxemia since these conditions worsen their pain levels and lead to high death numbers. Oxygen therapy stands as a vital treatment during such situations because it ensures sufficient oxygen reaches vulnerable essential organs including heart lungs and kidneys as well as brain tissues which remain at high risk of hypoxic damage (Jang et al., 2021). The administration of oxygen therapy helps children with SCD experience improved quality of life because it protects tissues from hypoxia and decreases sickled red blood cells and pain while supporting all organ functions. Oxygen therapy functions as a vital treatment intervention in SCC risk management because it provides instant comfort alongside sustained benefits from avoiding oxygen loss.

Nighttime and flight administration of oxygen reduces the risk of SCCs in patients. A retrospective cohort study by Liguoro et al (2021) evaluated the acceptability together with safety aspects of nocturnal long-term oxygen therapy (LTOT) for children with SCD who experienced chronic hypoxemia. Two tertiary hospitals in London UK investigated children with SCD throughout 2014 until early 2019 who initiated LTOT. This study recorded LTOT-related adverse events while using overnight oximetry studies at steady state performed both before and after LTOT initiation as among the main outcome measures. The research results demonstrated no significant changes in vaso-occlusive pain occurrences alongside better oxygen saturation findings (mean overnight and nadir SpO2 and % of time below 90% SpO2) from the overnight oximetry tests during LTOT. Medical research proves that the therapy serves as a safe and effective course of action for SCD patients who experience hypoxemia.

Oxygen therapy is a recommended treatment by Queen Paediatric guidelines when caring for children with painful and vaso-occlusive crisis regardless of normal oxygen saturation levels. Healthcare professionals do not follow this practice when treating SCD patients. The prevalence and effectiveness of intravenous fluid and oxygen therapy used for vaso-occlusive episode (VOE) treatment in children with SCD was examined through research in a large UK London tertiary hospital by Butt & Chakravorty (2019a). This investigation served to advance upcoming studies about maximizing the use of these treatments for healthcare purposes. Healthcare personnel reviewed clinical patient information to evaluate treatment results from intervened therapies. The results of this investigation showed children who received oxygen therapy achieved bigger pain score decreases after discharge at 6.3±2.5 points more than patients who didn't receive oxygen treatment recorded 4.7±2.4 points. Oxygen therapy demonstrates clear potential value for pain control in cases of dental traumatic events in children based on this study's results. The study data showed that every fourth child (25%) did not get oxygen therapy although the analysis confirmed promising outcomes from this treatment. This poor utilization of oxygen therapy suggests substandard care delivery to some sickle cell patients. Additional research is necessary to solve the implementation discrepancy along with finding better strategies for using oxygen therapy to treat VOEs in sickle cell children.

Butt & Chakravorty (2019b) performed research at a London-based tertiary hospital which revealed that oxygen therapy was administered to only 25% of sickle cell disease patients in the midst of their vaso-occlusive episodes. The limited use of oxygen therapy demonstrates that several sickle cell patients failed to receive essential care components. The researchers at Davis et al. (2018) conducted a review of vaso-occlusive crisis treatment protocols in various medical centers to expose substantial inconsistencies in oxygen therapy utilization. Medical research shows that healthcare providers fail to apply oxygen therapy even though it demonstrates proven benefits which help both symptoms and treatment results. The United States of American data discovered that numerous Pediatric hospitals displayed inconsistent practices when delivering oxygen therapy for sickle cell crises (Thompson et al., 2017).

Researchers warn against giving supplemental oxygen for hypoxemia treatment except for highly selective cases involving VOC patients. Ethical promotion of erythropoiesis suffers because oxygen treatment at high doses inhibits the natural creation of new red blood cells. The existing anemia condition within these patients becomes more severe from oxygen therapy.

Continuous oxygen saturation monitoring stands as the best practice for such patients. Healthcare professionals only advise using oxygen therapy when blood oxygen levels reach a dangerous threshold according to Howard et al (2019) and Osunkwo et al (2020).

Al-Otaibi (2019) performed a review to assess the present-day methods of oxygen therapy prescription and administration in Saudi Arabia. Analysis of oxygen therapy showed an unsatisfactory state for prescription and administration procedures. The findings matched those of other research projects which took place in Saudi Arabia and other nations. All physicians wrote down recommended oxygen delivery modes but the prescriptions contained flow rates along with fraction of inspired oxygen (FiO2) in only 30% of those documents. The result indicates that inadequate oxygen therapy utilization could lead to negative health effects for patients. The correct prescription and delivery method for oxygen provides safe treatment because an incorrect flow rate alongside fraction of inspired oxygen (FiO2) can produce detrimental effects for individuals.

The review demonstrates that limited research exists regarding oxygen therapy administration for children suffering from SCC during their healthcare management process. Research on oxygen prescription mainly occurred within western nations which maintain sufficient healthcare resources. The available data shows that the refinement of guidelines for oxygen therapy remains insufficient for this clinical area.

2.4 Challenges in delivery of quality care in Sickle Cell Crisis

Hospitalised children in SCC are often critically ill and require the availability of adequate resources for proper care. Studies have indicated that providing high-quality care in health settings of resource limited countries can be challenging because of scarcity of resources. These resources include financial, material and human, among others. This scarcity hampers the ability to deliver timely and effective care, leading to sub-optimal patient outcomes. Children who are admitted in crisis are acutely ill, and they need timely appropriate care to improve their quality of life.

2.4.1 Shortage of Human Resource

Providing enough staff members proves essential when organizations deliver quality health care services. WHO projects that worldwide healthcare worker shortages will exceed 15 million by 2030 while these deficits will affect both low-income nations and sub-Saharan

Africa. The research confirmed health care worker shortages including nurses and physicians create obstacles to deliver quality health care (Aluko et al., 2019). The monitoring demands of children who are in crisis affect directly by what number of health care providers deliver.

The availability of patient resources does not prevent suboptimal medical treatments from occurring in high-resource countries. The shortage of health care staff in Africa causes negative effects on healthcare service quality delivery. Oleribe et al, (2019) outlined the major healthcare obstacles in Africa combined with directions for evidence-driven choices and policy creation and service ranking. A research study took place during the latest African Epidemiological Association Meeting in Maputo Mozambique and involved participants from 11 African countries together with Cuba Portugal and the United Kingdom. Research outcomes revealed that health services faced three key hurdles including insufficient staff numbers at 34.29% and insufficient healthcare funding at 30% and substandard leadership and management at 8.45% among other challenges. The three healthcare issues counted for more than 65% of all dilemmas recognized within the African medical field.

Omoleke and Taleat (2017) analyzed the modern problems affecting tertiary medical facilities throughout southwest Nigeria. A survey research design enabled the use of a self-designed questionnaire to gather data. The research results identified obsolete medical equipment together with poor remuneration and inadequate medical facilities and underfunding of hospitals and poor staff training as the medical and organizational challenges which impeded healthcare quality delivery in hospitals. These similar issues throughout the tertiary group of hospitals negatively affected the level of healthcare service quality.

The limited availability of diagnosis and treatment resources creates difficulties during quality care provision. The study by Kambale-Kombi et al, (2021) analyzed how SCD is handled in its current form as well as the management challenges occurring in North-Eastern Region of the DRC. The evaluation centered on both diagnosing and handling SCD. The research demonstrates that SCD diagnosis within the DRC mostly relies on clinical examinations alone using the Emmel test. The screening process for SCD in high-income countries uses high-performance liquid chromatography combined with capillary electrophoresis and occasional isoelectric focusing testing that demonstrates established methodologies for haemoglobinopathies testing. The study results demonstrated that SCD management facilities in the DRC operate without sufficient medical resources. Academic research demonstrates that

sub-Saharan Africa mainly uses Hydroxyurea as its disease modifying therapy yet the drug exists in limited health facilities. Numerous drugs which include Voxelotor, Crizanlizumab and L-Glutamine were identified as treatment options according to Adegoke et al. (2018), Carden & Little (2019) and Rai & Ataga (2023) and Tanhehco et al. (2022).

The research conducted by Isa et al. (2023) involved patients, caregivers, healthcare workers and stakeholders to determine obstacles in healthcare service access and affordability which would help enhance SCD care quality. Various obstacles in healthcare including personnel shortage, deficient medical equipment, delayed laboratory results, extended clinic waiting times, inadequate communication and missing holistic consultations and poor coordination of services and excessive care expenses were among the problems identified through the study.

The delivery of quality care suffers primarily from human resource scarcity together with equipment shortages according to research in Malawi. Gondwe et al. (2022) conducted an investigation into resources as well as delivery barriers affecting quality newborn care within Malawian hospitals in the Southern Region. The study confirmed personnel shortage together with limited material personnel resources as obstacles to providing quality newborn healthcare. The study results matched results reported by Msiska et al. (2018) when they researched factors blocking compassionate care delivery in Malawi. The research gathered information from three chosen health facilities through nurse/midwife participants. According to research results severe employment shortages combine with a lack of essential medical tools to interrupt the provision of quality healthcare.

The region of sub-Saharan Africa experiences financing hurdles which result in poor service quality according to Chireshe & Ocran (2020). The inadequate healthcare funding system in Malawi has led to a shortage of drugs along with equipment and staff which negatively affects the quality of service delivery. Hanif & Musvoto (2023) conducted research into funding obstacles that affected public district hospitals of Malawi when delivering healthcare services. The study design contained mixed exploratory sequential approaches through questionnaire administration and semi-structured interview distribution. Public hospitals are confronted with three key funding challenges including late government initiatives and poor financial capability of both government institutions and facilities and declining support from donors respectively. The study recommended public hospitals introduce fees for service along with supporting the government for better funding and promoting innovative ways to generate hospital revenues.

Some investigations demonstrate human resource deficiencies create essential risks for patient care but additional studies reject this principle. Kovacs & Lagarde (2022) conducted research to probe the hypothesis that Senegal's critical staff deficiency leads to lower standards of patient care. The researchers obtained their information through health posts and health centers. The facilities contain nurses and midwives and unskilled providers who must ensure all consultation types. Quality of case management served as the main study variable to measure the received care quality. Case management assessment showed no links between increased provider workloads and staffing deficits regarding provider performance quality measurements or proportion of pertinent actions taken. The results could be explained by the fact that the research took place in rural health care facilities which draw fewer patients than urban facilities.

2.4.2 Lack of knowledgeable and competent providers

Quality care depends heavily on having the right number of qualified staff members. A WHO projection estimates that the worldwide healthcare worker shortage will exceed 15 million during the year 2030 in both low-income countries and sub-Saharan Africa. Numerous research findings identify the dire shortage of medical personnel together with physicians and nurses that impedes quality healthcare delivery (Aluko et al., 2019). Children who need emergency care demand regular surveillance because health services are directly impacted by the number of care providers.

Patient care resources in high-income nations do not prevent the delivery of substandard care. Health care worker scarcity throughout Africa has a negative impact on health service quality. Oleribe et al, (2019) presented major health sector hurdles facing Africa combined with recommendations for applying evidence in decision making and shaping policies and deciding program priorities. A research analysis occurred at an African Epidemiological Association Meeting in Maputo, Mozambique while participants represented 11 African nations as well as Cuba, Portugal and the United Kingdom. Research outcomes demonstrated that insufficient human staff (34.29%) and limited healthcare funding (30%) together with improper leadership management (8.45%) emerged as main sectoral impediments among multiple factors. These three health issues together made up more than 67 percent of all perceived difficulties within African healthcare services.

The research by Omoleke and Taleat (2017) focused on evaluating the present-day issues along with hurdles affecting tertiary hospitals within Southwest Nigeria. Survey research design

enabled the data collection process through a self-made questionnaire instrument. The study documentation demonstrated that outdated medical technology and insufficient employee payment and deficient health infrastructure combined with hospital budget reduction and insufficient nurse education hindered healthcare service provision in hospitals. Several common issues affected the hospitals in the study and worked to deteriorate the standard of medical services provided.

Lack of resources needed to diagnose and manage SCD stands as a barrier in achieving high-quality health services. Kambale-Kombi et al, (2021) researched how SCD management operates in the North-Eastern part of the Democratic Republic of the Congo. The study concentrated primarily on the diagnosis together with management of SCD. The DRC continues using the Emmel test as a main diagnostic tool for SCD without utilizing any other methods which depend on clinical evaluation results. High-income countries employ high-performance liquid chromatography and capillary electrophoresis as well as isoelectric focusing machines to conduct SCD screening while these methods are widely acknowledged for haemoglobinopathies testing. The management of SCD does not receive enough financial support according to the data. The evidence shows that Sub-Saharan Africa relies exclusively on Hydroxyurea medication for SCD management as this drug exists in only a few health facilities. Voxelotor together with Crizanlizumab and L-Glutamine comprise a set of many available drugs (Adegoke et al., 2018; Carden & Little, 2019; Rai & Ataga, 2023; Tanhehco et al., 2022).

A study conducted by Isa et al. (2023) involved stakeholders alongside patients, their caregivers and healthcare personnel for determining difficulties related to healthcare accessibility and cost-effectiveness and subsequent improvements in SCD care quality. The research study uncovered healthcare staff shortages alongside facility inadequacy and prolonged medical testing periods and delayed lab results as well as excessive wait times at clinics and deficient doctor-patient communication and missing comprehensive care and fragmented healthcare services and expensive medical treatment and public ignorance about SCD and government non-emphasis on SCD management as key obstacles within the healthcare system.

The delivery of quality care in Malawi faces its main challenges from human resource shortages coupled with equipment deficiencies according to research. Gondwe et al. (2022) evaluated new-born healthcare delivery resources and barriers to quality care at all hospitals throughout

the Southern Region of Malawi. The study revealed that insufficient medical personnel along with scarce resources blocked high-quality new-born healthcare services. The research conducted by Msiska et al. (2018) about factors which hinder compassionate care delivery in Malawi produced findings that were comparable to this study. The research gathered data from nurse/midwives at three chosen health facilities. Insufficient nurses combined with massive shortages of required supplies and equipment create substantial barriers to achieve quality care delivery in healthcare facilities.

Sub-Saharan Africa faces financing difficulties that lead to problems in healthcare service quality delivery (Chireshe & Ocran, 2020). Malawi faces healthcare funding problems which cause equipment shortages and drug deficiencies as well as staff shortages thus producing substandard services. Hanif and Musvoto (2023) performed research on monetary obstacles that interfere with the healthcare service provision of Malawi's public district hospitals. The data collection was done through questionnaires and semi-structured interviews using an exploratory sequential mixed method design. Inadequate government funding arrives late to public hospitals along with poor income-generation ability of healthcare institutions and both donor support reduction and additional funding problems proved challenging for these facilities. The recommendations involved hospital fee-for-service implementation alongside government funding advocacy and hospital and Council innovation toward revenue capabilities.

Multiple research studies show that healthcare shortages influence patient care yet some academic works contradict this assumption. Kovacs & Lagarde (2022) conducted research to determine whether the essential staff shortage in Senegal leads to inferior patient care. Scientists gathered data in both health centers and health posts through their investigation. Caring medical staff consisting of nurses together with midwives and unskilled providers without medical training deliver all types of consultations in these facilities. Quality of care received was the main outcome variable with the quality of case management serving as the measurement parameter. Polls showed that workloads along with staff inadequacy did not affect providers' management quality or their implementation of essential medical actions. The low number of health facility visits at rural locations could explain why the researchers obtained these results because comparisons involved urban versus rural facilities.

2.4.3 Lack of Guideline Use in Managing Sickle Cell Disease

The delivery of high-quality care depends on applying evidence-based guidelines as recommended by Keiffer (2015). Alongside its evidence-based care delivery clinical practice guidelines lower the practice variations between health care professionals (Kredo et al., 2016). Universal practice requires this measure to succeed at the worldwide level. Literature reveals that guidelines in many low and middle-income countries either fail to exist or undergo inadequate compliance (Hanefeld et al., 2017). The care delivery method will be affected by this condition because it deteriorates the overall standard of care.

Current research indicates that medical providers lack knowledge about the SCD management guidelines. The practice becomes poor since guideline implementation is fundamental for evaluating the quality-of-care delivery. Research conducted by Smeltzer et al. (2021) examined potential medical practice barriers in United States healthcare that impede optimal SCD patient care. The research pursued the objective of promoting nationwide adoption of SCD care guidelines. In this study, large number of healthcare providers remained unaware of the NHLBI 2014 SCD care guidelines thus showing a lack of knowledge about national SCD care standards. The Nigerian study conducted by Wichelt (2018) demonstrated that 47.8% of HCW did not recognize the presence of SCD national guidelines for care. Medical practitioners in North Carolina measured by Lunyera et al. (2017) demonstrated a knowledge gap about 2014 SCD guidelines as (66%) of them reported complete unawareness. Masese et al (2019) conducted a study to determine ED provider perceptions of SCD pain treatment barriers in North Carolina yet discovered that 66.7% of providers lacked awareness about NHLBI SCD pain treatment recommendations. Providers demonstrated limited knowledge about NHLBI's treatment recommendations for SCD as 32.4% of them could not identify these guidelines.

Provider admissions revealed insufficient understanding of evidence-based SCD treatment approaches as the main reason they failed to provide successful treatment (Linton et al., 2020). Cabana et al. (2019) examined which elements influenced the application of hydroxyurea counseling guidelines and transcranial Doppler stroke screening protocols for Pediatric patients by clinicians working in SCD. Study results showed physicians were conscious of the up-to-date NHLBI standards for SCD tests together with hydroxyurea counseling yet failed to uphold these guidelines. Patients would follow the guidelines during their care of SCD patients according to the stated reason.

Research by various authors has shown physicians do not follow guideline procedures during treatment of Sickle Cell Disease patients. A multiyear research examined SCD children who visited seven Emergency departments throughout the USA from January 1, 2016 to December 31, 2018. The research assessed the observation of NHLBI guidelines in both the beginning opioid dosage as well as the duration between the first and second opioid doses. Brousseau et al. (2020) published findings showing that patient receipt of the initial opioid dose occurred within one hour of arrival by 48% of subjects while 15% received their second dose within thirty minutes of the initial medication (Brousseau et al., 2020) demonstrating substandard practice. The study results showed that different locations followed their own adherence patterns. Rees et al. (2022) from Unites of States America studied 20 emergency paediatric departments and identified comparable results to those of the original research. Research data showed 48% of patients received their analgesic medicines when staff initiated therapy between triage and registration time. As Martin et al. (2020) studied at Riley Hospital for Children in India they discovered providers failed to use the guidelines when caring for patients. The study discovered that 75% of participants were unknown about what SCD pain management guidelines existed.

Consistent with other findings, Krüger et al. (2017) in a study done Namibia, Kenya, Tanzania, and Uganda on adherence to Integrated Management of Childhood Illnesses guideline use in sub-Saharan African countries also observed similar findings of low guideline use In Nigeria Wilchet (2018) found that 29% of health professionals often use guidelines when managing patients with SCD, furthermore 47.8% were not aware of the availability of guidelines and 34.8% did not have a copy of the guidelines for management of SCD.

The studies conducted by Kayambankadzanja (2020) in Malawi observed weak availability of emergency guidelines since the median emergency guideline availability score was measured at 33.3%. Guideline utilization rates and accessibility remain low among all middle-income and low-income areas according to combined research findings.

2.5 Quality Care

Health policy concepts particularize Quality of Care as an essential element which gets frequently emphasized. WHO (2018) reports that national policymakers currently show high interest in this subject. Different perspectives describe quality care as a process of attaining outstanding healthcare standards. WHO (2006) explains quality care as the extent that health

services delivered to people and patient groups help achieve their desired health results. According to OIM (2001) the quality of care stands as the proper alignment between health services that optimize desired health outcomes for populations and individuals with current professional medical knowledge. Donabedian (2003) described quality care through medical science and technology which enhances health benefit with no additional risks. Quality care requires a production of desired outcomes according to all definitions. The quality assurance approach depends on patients receiving necessary healthcare while the provided services demonstrate clear benefits for them.

In the definition by the Institute of Medicine "current professional knowledge" stands as the essential concept because it promotes evidence-based care. The assessment of care depends strictly on existing scientific knowledge because this concept of quality remains continuously evolving. According to Busse et al. (2019) the same service can be deemed "good quality" at present yet evolve to "poor quality" in the future. Clinical practice evaluation stands as an undeniable truth regarding this matter. The institute of medicine's quality care definition functions as an essential tool among other criteria to evaluate health care standards in institutional settings.

A positive health outcome requires health services to be accessible to those who need it and provided in a timely fashion and with equity and efficiency alongside patient-centered delivery according to the WHO definition. The evaluation of healthcare service effectiveness for children in SCC requires these specific dimensions as assessment criteria. Protecting patients from all types of injuries and medical mistakes constitutes the main concept of patient safety. The patients develop confidence about receiving top-quality healthcare when they visit these facilities. The delivery of services must represent scientific evidence to be considered effective. The basis which enables evaluations of healthcare quality stands important. Treatment according to patient-centered care requires healthcare professionals to both show respect and maintain the dignity of their patients. As medical field customers' patients require preservation of their rights alongside a steady safeguarding of their dignity. Care timeliness refers to immediate service provision which helps stop morbidity and mortality risks caused by diseases. The concept of efficiency focuses on removing all types of resource waste during care delivery processes and equipment utilization and supply usage and energy consumption. The provision of healthcare at equal standards should be free from variations that stem from individual patient

characteristics. Children requiring care for SCC need this attribute of quality care to enhance their life quality.

Measuring Quality of Care

The measurement of quality stands as an essential aspect for any health care system through its necessary provision of information for enhancing service delivery (Oyeku & Faro, 2017). The evaluation process examines different healthcare aspects to verify standard compliance and promote better patient results. Various assessment methods enable health care facilities to measure their care quality standards. Measuring quality looks at clinical indicators and protocol adherence consistent with Keiffer (2015) standards and it considers Donabedian's (1988) framework of assessing structure, process and outcomes of care, as well as other methods.

The first set of quality-of-care indicators regarding SCD treatment of children in both ambulatory and inpatient settings including sub-acute and acute care was published by Wang et al (2011). The indicators centered on two main areas including sickle cell pain management and fever assessment together with complete planning and prophylactic treatment with penicillin and transfusions and adult care preparation. The quality assessment system for SCD care started from this point. Clinical practice guidelines (CPG) as defined by WHO serve as documents which offer healthcare workers guidelines for making suitable healthcare decisions related to particular medical conditions (Brouwers et al., 2019). The guidelines serve to minimize differences between medical care approaches performed by various healthcare providers (Kredo et al., 2016). NHLBI established CPGs for SCD treatment including SCC management (National, Heart, Lung and Blood Institute, 2014).

Quality of care evaluates based on structure, process and outcome dimensions per Donabedian model (1988). Quality healthcare depends on the presence of monitoring systems to track recommended procedures combined with staff understanding of organizational responsibilities. The protocols concerning common childhood illnesses management in Malawi contain implementations from international guidelines. Specifically in SCC treatment requires both supplemental oxygen therapy and fluid therapy with proper pain management protocols. The guidelines lead to delivering superior care for children who are hospitalized in SCC.

2.6 Conceptual Framework

The conceptual framework consists of connected concepts and images which form an extensive understanding of multiple phenomena (Gray & Grove, 2020). When applied to research it helps to define variables while recommending study methods and enabling trustworthy interpretation of findings and study integration (Polit & Beck, 2018).

The research used the Donabedian model of quality care to direct its framework. The model utilizes a components approach as a quality care evaluation system that centers on structure process and outcome components which interact with each other as described by Donabedian (2005). The development of quality care inferences becomes possible after this stage. These three components maintain a linking relationship according to Donabedian because a refined structure boosts process quality and process quality produces better outcomes (Ayanian & Markel, 2016). The three components function together to form the basis for effective quality measurement designs.

This framework was selected because it provides extensive details on how the evaluation of quality care depends on the relationship between structure, process, and outcome. The study's objectives highly depended on this finding since it proved critical to the research. Through quality assessment healthcare performance improves and researchers can identify additional research topics.

2.6.1 Structure

According to Donabedian structure designates the features that form the setting for healthcare delivery. Quality care provision depends on both material and human resources whose structure should be well-organized (Donabedian, 1988). Physical and human resources belong to the all-encompassing set of healthcare resources needed for service delivery. As an example the healthcare facilities need to provide adequate equipment and qualified staff members with suitable medications. The evaluation process of structural assessment examines where healthcare services occur alongside their delivery approach. Structural features express both subtler ways to judge care quality and noticeable signs which hint at potential substandard quality levels (Donabedian, 1988).

2.6.2 Process

Processes represent caregiving elements which describe the actions that occur in care delivery and receipt according to Donabedian (1988). The caregiving process involves both patient engagement in care acquisition and care delivery actions by medical staff for providing services. Medical professionals perform all required clinical activities which start with obtaining patient history and physical assessment followed by diagnosis and establishment of appropriate treatment to restore health. Process assessment determines whether patients receive healthcare of high quality. The assessment of patient-care exposure relies on medical intervention experiences while linking process care to treatment results (Donabedian, 1988). Process measurement enables a vital contribution to quality-of-care assessment because these indicators both detect care deficiencies and indicate upcoming actions.

2.6.3 Outcome

The delivered care generates both beneficial and detrimental consequences that can be linked to the care delivery (Donabedian 1988). Good structure combined with proper process leads to good outcome according to the Donabedian quality care framework. Donabedian separated outcomes into technical outcomes that cover physical aspects of care such as complication prevention and disease disability and death reduction and interpersonal outcomes which measure patient care satisfaction and personal life quality based on their perception.

The Donabedian framework proves useful for multiple healthcare settings in research studies and serves this present research effectively. The framework enables researchers to understand how healthcare systems' structures affect care delivery processes while connecting to the obtained outcomes. The framework serves to reveal SCC care deficiencies and point out areas where healthcare delivery can improve and determines how successfully interventions work. Quality indicators supplied by SCD were incorporated into the model for comprehensive assessment of quality care.

2.7 Application of the Conceptual Framework

In this study, the structure component was assessed in terms of human resource which is the number of healthcare personnel working in Paediatric ward (doctors, clinicians, and nurses), and their qualifications including their clinical work experience. This was necessary because the availability of health care workers is central to the provision of quality care. Their clinical

experience of working in a Paediatric ward improves competence in providing care hence preventing delay in providing care.

Furthermore, the structure was assessed in terms of the availability of guidelines for management of SCC. These guidelines were developed by the NHLBI, WHO and protocols for the management of common childhood conditions in Malawi. This was important because in the provision of evidence-based care, it would be anticipated that the quality of care would be higher. The availability of pain assessment tool was also necessary in assessing the intensity of pain that would assist in providing the appropriate pain relief medication.

In this study, the availability of material resources that were deemed necessary in the provision of quality care included vital sign monitoring tools, oxygen concentrators, intravenous fluids, and drugs such as pain relief medication and antibiotics. During SCC, provision of quality care include effective pain management, administration of supplemental oxygen therapy, and intravenous fluids to expand the vascular volume thereby reversing the sickling process. These are critical determinants of quality care in management of SCC.

The process examined activities involved in providing quality care by health care professionals in line with WHO, NHLBI and Queens Pediatric Guidelines for the management of SCD. Such processes included reviewing patient's charts to determine whether a comprehensive assessment on admission was done and determine if appropriate treatment was initiated in line with the guidelines. It also encompasses comprehensive assessment that includes appropriate history taking and complete physical examination with appropriate laboratory investigations. This was necessary to reach the correct diagnosis and treatment. Furthermore, process examined the type of care that was given to the child in crisis, in particular is pain management, adequate hydration and administration of oxygen therapy. It also included appropriate documentation as lack of adequate records is not incompatible with good quality practice. Medical records are essential tools to measure and evaluate care and have proven useful for quality improvement (Rios-Zertuche et al., 2019).

In this study, the outcome was not assessed because it was outside the scope of the study.

2.8 Conclusion

The chronic nature of SCD requires children to undergo many hospital stays for managing their critical medical situations. To achieve successful hospitalisations children require quality care which will boost their quality of life and avoid premature death. Health care systems need quality measurements to verify the standard of provided services. Multiple factors impact the delivery of quality care services. The evidence shows that high-quality care delivery for SCD children in SCC depends on the skill level of healthcare staff along with the availability of medical supplies and resources and standard guideline adoption within systems.

Acute care hospitalisations lead to increased healthcare expenses which burden the existing health system resources. Studies prove that low resource settings lack sufficient management resources (Kruk et al., 2018b). The current condition of SCD becomes more challenging to handle. Research shows that SCD resource management facilities display major availability inequalities especially in low-resource areas. The combination of scarce hospital resources and heavy workload creates delays in patient care which drives the increase of both patient sickness and death rates.

Medical literature shows that treatment methods for SCD do not properly manage pain among patients with this condition. The primary obstacles to proper treatment involve health provider education deficiencies and scarce medical resources such as pain medicine and measurement instruments and professional standard protocols in patient care.

The majority of investigations about SCD child care occurred in American and Indian healthcare systems along with research sites in five African nations including Nigeria, DRC, Ghana and Kenya and Tanzania. Few studies addressed quality of care measures for children suffering from Sickle Cell Crisis throughout Malawi. This study aimed to fill the existing gap in knowing how hospitalised children receive care in selected medical facilities of Northern Malawi.

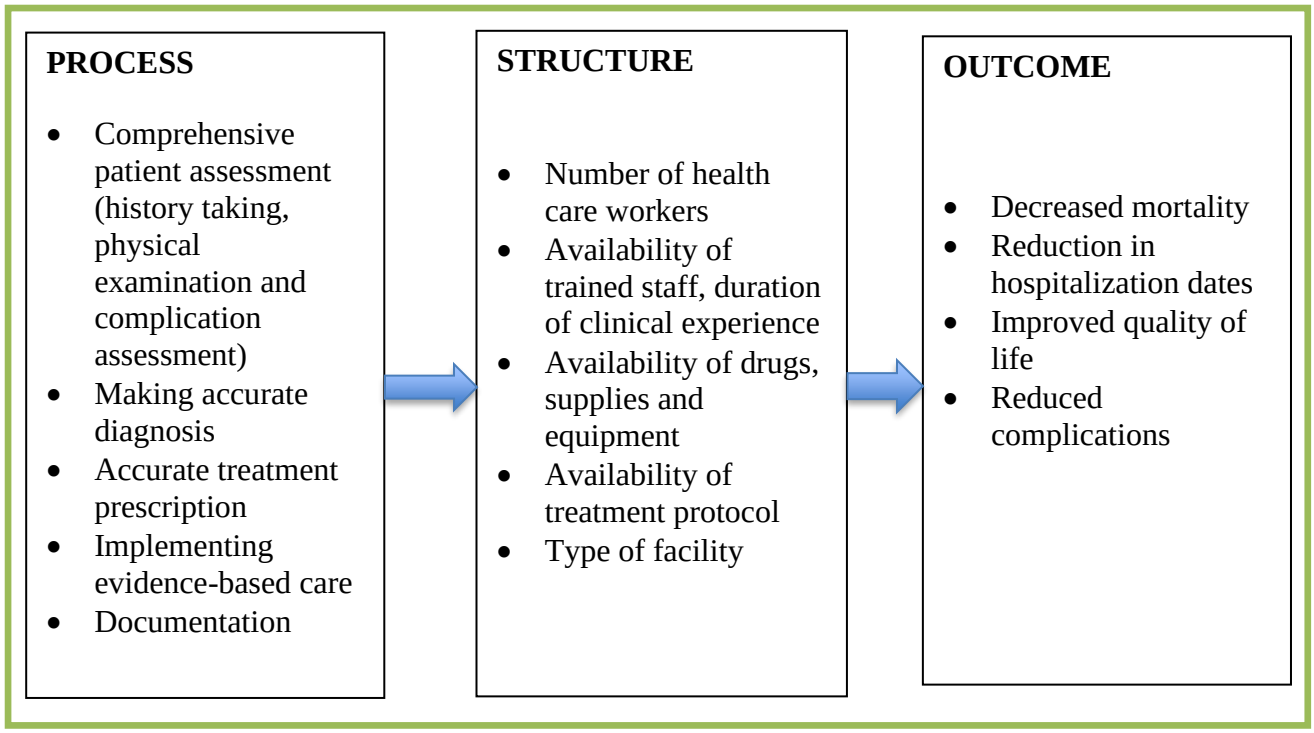


Figure 1: Conceptual framework of quality of care model (Adapted from Donabedian 1988).

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter defines the methodological technique that was used to assess the quality of care provided to children during SCC among the three selected hospitals in Northern Malawi. The research approach integrates the methodological design with a specific study location and population and its sampling procedures and criteria in addition to data collection tools alongside their use protocols. Moreover, data analysis methods are described alongside ethical considerations in this section.

3.1 Study Design

A study design represents the comprehensive strategy to find responses for research inquiries. As a fundamental part of research, it allows both an ethical investigation with sound methodology and accurate data production leading to meaningful additions to field knowledge and other requirements (Polit & Beck, 2018). The research utilized the positivist paradigm because it accepts the existence of external reality which can be studied and made publicly known. The research reality becomes objectively observable after empirically confirmed data analysis designed to achieve study findings' generalizability. The reality under investigation consisted of how well children were cared for during their admission period due to SCC. The study adopted a descriptive cross-sectional design which followed a quantitative approach to explore its research questions.

3.1.1 Quantitative Approach

Quantitative research is an approach for testing objective theories by examining the relationship among variables (Creswell & Creswell, 2018). These variables can, in turn, be measured, typically on instruments, so that numbered data can be analysed using statistical procedures. A quantitative approach was preferred in this study because of its ability to produce reliable results as it is more objective in generating the evidence, and assists in making comparisons. In this case, comparing the care provided to children in crisis benchmarked with the available evidence-based guidelines.

3.1.2 Cross-sectional Study

The study employed a cross-sectional approach to collect and analyze data regarding its population of interest at one approximate time (Houser, 2016). Cross-sectional studies mainly address clinical disease prevalence but their findings help design other research investigations about phenomena of interest. The study approach provided researchers with a current state assessment to identify critical aspects affecting quality child care using SCC services and their connections to theoretical input and process models for healthcare quality (Polit & Beck, 2018). The study required completion in order to perform an effective time-sensitive assessment of present care practices.

3.1.3 Descriptive Study

This study employed a descriptive design. The design was deemed appropriate for this study because there was limited information regarding quality of care that health care workers provide to children in SCC during acute stage, from Malawian perspective. As such, it allowed the researcher to gain rich knowledge enabling the identification of areas for improvement in practice (Gray & Grove 2020). Again, the descriptive study here in helped to discover a baseline performance level in order to determine the desirability of a new service (Houser, 2016). The new service being referred to here is any improvement in the care in order to promote the quality of life among children with SCD. Therefore, it was necessary to use the descriptive study design.

3.2 Study Site

Researchers conducted their investigation by selecting three healthcare facilities; Mzuzu Central Hospital and Rumphi District Hospital corresponded to public facilities and Ekwendeni Mission Hospital received support through Christian Health Association of Malawi (CHAM). The healthcare facilities are found within the Northern Region of Malawi. They serve as teaching facilities for health care training institutions together with Nursing Colleges which makes them suitable subjects for research inclusion.

Mzuzu Central Hospital occupies its position in Mzuzu City at the M1 Road address. It has a bed capacity of 400. The hospital maintains a wide range of specialized departments and delivers tertiary medical services throughout the entire 2,468,702-person population in Northern Malawi (National Statistics Office (NSO) (2018). Besides its primary and secondary

service offering the hospital also provides tertiary care. The establishment offers both Paediatric Ward services along with functional Emergency Triage Assessment and Treatment (ETAT) services. The healthcare facility acts as a referral center where it was predicted to receive an increased number of patients including SCC subjects warranting study inclusion.

Northern Malawi contains five district hospitals including Chitipa District Hospital together with Karonga District Hospital and Mzimba South District Hospital and Nkhata Bay District Hospital and Rumphi District Hospital. The 4,769 km² service area of Rumphi District Hospital maintains care for 128 360 residents. The facility maintains 220 beds for treating primary and secondary healthcare needs of patients. The medical facility was selected because of the substantial number of consanguineous marriages which results in numerous SCD patients.

Ekwendeni Mission Hospital maintains its position within Ekwendeni Area of Mzimba District. This facility can be found along the M1 Road at a distance of 20 km from Mzuzu City. It has a bed capacity of 250. The healthcare services run by CHAM cover 30% of the population of Malawi (HSSP III 2023-2030), so the study required afacility under their management. Mission hospitals in the northern region consist of Kaseye and Livingstonia and two more hospitals located at Ekwendeni and St Jons and Embangweni. Ekwendeni Hospital and St Johns provide similar service volumes while Ekwendeni maintains a location outside Mzuzu city which influenced the selection decision for studying this hospital separately.

3.3 Target Population

The entire collection of research subjects forms the study population (Polit & Beck, 2018). The determination of study population establishes both the collection group as well as the generalization category after data analysis. This research analyzed children from 12 years old or younger who were hosptitalised due to SCC between 2019 and 2021 while also examining the pediatric ward health care workers including doctors, nurses, and clinical officers. The Malawian Paediatric ward accepts patients below 12 years of age and served as the set cutoff for child participants. Their case files were the evidence of care provided during hospitalisation hence good source of data.

According to this study's specifications the HCW's studied included Medical Doctors along with Clinical Officers, Clinical Technicians and Registered Nurse/Midwives and Nurse Midwife Technicians who worked in the Paediatric Ward and ETAT department with three

years-mind minimum experience within Paediatric practice. The desired group of healthcare workers was chosen because they reached the third stage of clinical competency theory according to Benner who states working for three years leads to competency achievement (Benner et al. 2009). The staff members allocated to child patient care recognized themselves as qualified providers of outstanding hospital-based care for sick children.

3.4 Sampling

Selecting particular members from the total population to determine population characteristics makes up the sampling process (Polit & Beck, 2017). The study employed probability sampling. According to Houser (2016) this sampling procedure allows for equal opportunities among population subjects to obtain selection for the sample. The sampling method helps to obtain a representative group that mirrors the broader population. Selection bias will reduce to a minimum while findings gain both reliability and reliable application to the population through this approach. Systematic random sampling was the selection method for children's case files in this study. At present the approach was chosen because it provided consistent population coverage when dealing with extensive sample sizes. An examination was conducted to obtain complete pediatric case files which served patients hospitalised in the Paediatric Ward during 2019 through 2021 at each medical center. This served as a sampling frame for children's case files.

Furthermore, an actual population size of 515 was established where Mzuzu Central Hospital contained 312 case files and Rumphi District Hospital possessed 145 case files and Ekwendeni Mission Hospital had 58 case files.

The researchers selected and sorted files reporting children who received admissions for SCC (vaso occlusive crisis) to build sampling frames for each facility. There were 87 patients from Mzuzu Central Hospital, 28 patients from Rumphi District Hospital and 9 patients from Ekwendeni Mission Hospital in the study sample.

The sampling interval was then calculated by dividing the population size for each hospital by the sample size.

kth value = N/n

Where: N = Total population size

n = Desired sample size

For Mzuzu Central Hospital =312/87 = 3.5 = 4

For Rumphi District Hospital =145/28 = 5.1 = 5

For Ekwendeni Mission Hospital = 58/9 =6.4 = 6

The kth value appeared as the 4th entry within Mzuzu Central Hospital files yet it was located at position 5 within Rumphi District Hospital files. Ekwendeni Mission Hospital contained the kth value within the 7th file. The 7th file at Ekwendeni Mission Hospital fulfilled the designation of kth value for the study. The first step involved arranging all patient files exhibiting SCC before selecting samples from this list at each hospital. The investigators randomly chose their first selection from the sorted list between the numbers one through k. When the first file was chosen the subsequent kth files in the collection were included in the study one by one.

Healthcare workers were chosen through a basic random sampling procedure. The ward in charge collaborated to establish a sampling frame that contained complete lists of all nurses, doctors, and clinical staff who worked at the Paediatric Ward of each hospital. A computer selected random numbers according to the required sample sizes at each healthcare facility from numbered lists of healthcare practitioner names. The study invited those whose numbers drew through the random selection process to join the investigation.

3.5 Sample Size Calculation

Houser (2016) defines a sample size as a carefully selected subset of the population that reflects the composition of that population. Having a correct sample size was necessary to ensure correct representation of the population under study. This will enhance the accuracy and reliability of research results. In this study, Probability Proportional to Size sampling method was used to determine the sample size from the three hospitals. Data from the admission register for Paediatric ward in all the study sites was used to come up with the sample size.

The available data for admissions due to SCC in the year 2020 for Mzuzu Central Hospital was 127, Rumphi District Hospital 42, and Ekwendeni Mission Hospital 12. Therefore, the summation of children in all the facilities was 181 cases. The proportion represented by these

children per facility was 70% for Mzuzu Central Hospital, 23% for Rumphi District Hospital, and 7% for Ekwendeni Mission Hospital. Similarly, the current total number of doctors, clinicians and nurses working in the Paediatric ward at Mzuzu Central Hospital was 41, Rumphi District Hospital 13, and Ekwendeni Mission Hospital 7. The proportion represented by health care providers was 67% for Mzuzu Central Hospital, 21% for Rumphi District Hospital, and 12% for Ekwendeni Mission Hospital.

The sample size for the mean population for this study was estimated using Yamane's formula for calculating sample size with a finite population as follows;

$$n = \frac{N}{1 + N(e)^2}$$

Where

n = Desired sample size

N = Total population = 181 children and 61 healthcare providers

e = margin of error = 5%

$$n = \frac{181}{1+181(0.05^2)} = \frac{181}{1.4525} = 124$$

Proportions of children's case files

Mzuzu Central Hospital = $\frac{127x100}{181}$ = 70%

Rumphi District Hospital = $\frac{42x100}{181}$ = 23%

Ekwendeni Mission Hospital = $\frac{12x100}{}$ = 7%

181

Therefore, the sample size for children per facility

Mzuzu Central Hospital	=	70% of 124	=	87
Rumphi District Hospital	=	23% of 124	=	28
Ekwendeni Mission Hospital	=	7% of 124	=	9

The sample size for healthcare providers

$$n = \frac{61}{1+61(0.05^2)} = \frac{61}{1.1525} = 53$$

$$\text{Mzuzu Central Hospital} = \frac{41x100}{61} = 67\%$$

$$\text{Rumphi District Hospital} = \frac{13x100}{61} = 21\ \%$$

$$\text{Ekwendeni Mission Hospital} = \frac{7x100}{61} = 12\%$$

Therefore, the sample size for healthcare providers per facility was:

Mzuzu Central Hospital	=	67% of 53	=	36
Rumphi District Hospital	=	21% of 53	=	11
Ekwendeni Mission Hospital	=	12% of 53	=	6

The researchers calculated sample size using the population representation proportion as a basis. Children's case files were selected from Mzuzu Central Hospital at 87 files while Rumphi District Hospital provided 28 files and Ekwendeni Mission Hospital had 9 files available for

review. The research involved 36 respondents from Mzuzu Central Hospital and 11 from Rumphi District Hospital while Ekwendeni Mission Hospital had 6 participants.

The researchers selected 53 participants as determined by Yamane formula to represent the population of 61 HCWs. Central limit theorem establishes that a behavioral study requires sample sizes between 30 to 500 to be suitable.

Table 1: Sample Size

	Sample Size	
Hospital	**Case File Reviews**	**Health Care Workers**
Mzuzu Central Hospital	87	36
Rumphi District Hospital	28	11
Ekwendeni Mission Hospital	9	6
Total	**124**	**53**

3.6 Inclusion and exclusion criteria

Health care workers

The research included healthcare workers employed in Paediatric Ward service longer than two years. The two-year work experience was selected because Malawian healthcare facilities experience regular staff rotations at the ward level stemming from a lack of healthcare personnel. Through time spent at the ward the nurse will develop clinical expertise while better comprehending both general patient care needs and SCC-specific practices. Benner et al. (2009) defines HCWs with competent and proficient qualities as those working for longer than three years. Healthcare workers who have accumulated experience demonstrate higher abilities in delivering quality healthcare services to patients. Healthcare workers between 2 and 3 years of experience in the Paediatric Ward and health staff in other wards and departments were excluded from the study. Healthcare staff such as nutritionists together with physiotherapists comprise this selection criterion.

Case file reviews

The research involved case file reviews of 12-year-old and younger SCC patients treated within the 2019 to 2021 period. Children who suffered from Vaso-occlusive crisis or acute painful crisis received admission at the facility. The research excluded children with SCD who were between one and twelve years old but received hospital care for illnesses apart from SCC as well as patients who lacked SCD diagnosis.

3.7 Data Collection and Management

Data collection in this research involved using both checklist and structured questionnaire methods. Data regarding documented care services to hospitalized children at SCC was obtained through the checklist assessment. The questionnaire evaluated resources needed for quality care delivery as well as challenges faced by service providers during child-oriented treatment.

3.7.1 Data collection tools

Data collection for key informants consisting of doctors, nurses, and clinicians took place through structured questionnaires written in English (See Appendix 3). Self-administered questionnaires were provided to participants for their independent responses at any convenient moment. The questionnaire acquired information from health care workers by dividing its sections into three parts. Section A obtained demographic information about healthcare workers through questions about their age along with occupation and years of experience at the Paediatric Ward and their specialty and training in SCD management and comfort level when caring for children during crises. Section B presented information about necessary resources healthcare professionals need to deliver outstanding care to children affected by SCC. Every respondent indicated availability or unavailability of each input by choosing from provided selection boxes. The necessary resources for care included vital signs monitoring equipment combined with oxygen therapy items and thermometers alongside intravenous fluids and SCD management guidelines along with pain assessment tools and medications including analgesics and antibiotics and testing laboratories and blood supply at the hospital. Management of SCC demands these resources in particular. The first objective "Assess the availability of inputs that enable the provision of quality care of children in Sickle Cell Crisis in the selected hospitals" obtained information through this questionnaire.

Section C focused on obtaining information about challenges which affect the delivery of quality care to children during Sickle Cell Crisis. The respondents reviewed the presented statements through a Likert scale that used a five-point scale to indicate their agreement or disagreement with each statement. The numeric system from 1 to 5 let respondents express their agreement levels beginning with strong disagreement at level 1 and ending with strong agreement at level 5. Specicically 1 meant strongly disagree, 2 disagree, 3neither disagree or agree, 4 agree and 5 strongly agree. The research data helped achieve the third goal which aimed to determine hospital staff challenges during quality SCC care delivery for children within selected medical facilities.

The evaluation of children's files (chart review) relied on a research tool using a checklist format. The researcher created the checklist based on guidelines from three sources including WHO management of SCD in 1991 and NHLBI evidence-based management of sickle cell disease in 2014 and Queens Paediatric Guidelines for the management of common childhood illnesses in Malawi in 2018. The designed checklist served to gather documented health care management practices found in patient medical records (Appendix 2). The document included data regarding the provider performance in care. A patient assessment with history taking along with physical examination and proper investigations marked the beginning before delivering essential care to children undergoing SCC. The nursing care plan includes providing oxygen to patients while administering the right pain medication together with fluid delivery. Supportive care includes the administration of blood transfusions if low Hb level, antibiotics administration and continuous patient observation. The researcher analyzed the case files to score the care quality through noting if the documented evidence showed that the care was provided. The research approach involved examining previously obtained data points from 2019 until 2021 thus indicating a retrospective design. The collected information served to fulfill the goal of assessing SCC care practices against hospital standards in the selected health facilities.

3.7.2 Validity

Validity is defined as the degree to which an assessment measures what it is supposed to measure (Gray & Grove, 2020). In the context of this research, it was very important that the data collection tools provided a valid assessment of the type of care provided to children in SCC. The types of validation used for the instruments were face and content validity, which

entails the evaluation of a predesigned questionnaire and checklist by professionals who have expertise in the field of the research itself.

Content Validity

The researcher first examined relevant literature about SCD care treatment both in and during crisis situations to understand the necessary care standards which formed an appropriate content foundation for designing the assessment tools. The required data was enriched through utilizing firsthand clinical area experiences of the investigator as well as expert opinions obtained from Paediatric Ward personnel. The research supervisors and pediatric care specialists evaluated the developed tools (checklist and questionnaire) to confirm their relevant content and appropriate items. This process helped ensure content validity. The evaluation tools originated from WHO guidelines connected to NHLBI evidence-based management of sickle cell disease and Open Guidelines protocols for the management of common childhood illnesses in Malawi along with a validated Donabedian instrument on quality care.

Face Validity

To ensure face validity, the tools incorporated all the objectives of the study. The concepts therein were also reviewed by research supervisors to ensure they contained the required study concepts that would establish quality of care for children in SCC. Feedback received from the evaluators of the data collection tools was used to enhance the quality and clarity of its content.

3.7.3 Reliability

The reliability of the of the questionnaire was ensured by verifying the challenges aspect using Cronbach's alpha value which was 0.87. This is an acceptable value for the reliability of the instrument indicating good internal consistency (Tuber, 2018).

3.7.4 Data Collection Process

The researcher collected data at all three hospitals beginning with Ekwendeni Mission, Rumphi District and concluding with Mzuzu Central Hospitals throughout the period of 24th April to 13th June 2023. The researcher approached hospital research coordinators following the successful acquisition of approval letters to conduct the study. Obtaining the required guidance and direction for data collection was the reason behind this step. The researcher started data collection by obtaining written permission from site authorities and subsequently approached

health care staff (nurses, doctors and clinicians) based in Paediatric Wards throughout all the facilities and Emergency Triage Assessment and Treatment staff (ETAT) at Mzuzu Central hospital. The researcher described the study aims to each participant before supplying detailed consent forms which contained necessary information for participation decisions. The researcher received a written consent from all participants to act as approval for their study involvement after the study explanation (Appendix 1). The entire recruitment sequence results in a formal agreement. The study utilized numerical code numbers instead of participant names for maintaining participant anonymity and protecting their confidentiality rights. Each participant received a self-administered questionnaire which they were allowed to complete according to their convenience while performing their duties. The researcher scheduled a meeting for collecting the completed questionnaires from all participants. The researcher secured the completed questionnaires inside a lockable drawer that could only be accessed by themselves for maintaining data confidentiality.

The researchers obtained 9 files of children's cases as well as 28 files and 87 files from the storage area of Ekwendeni Mission Hospital and Rumphi District Hospital and Mzuzu Central Hospital respectively. Each hospital allocated specific rooms to the researcher for stringently conducting the review session without interruptions. File code numbers took the place of real names for keeping the information confidential. The researcher inspected all files in the provided order while examining their accompanying documents. The evaluation covered admission notes together with medical and nursing progress notes as well as treatment charts and laboratory investigation results and vital sign monitoring charts whenever present. Evidence of delivered medical and nursing care depended on these documents. The researcher used the checklist to verify that the documented evidence matched the provided care. A lockable drawer exclusively accessible to the researcher ensured patients' case file confidentiality during data collection. The researcher restored all collected children's files into their designated storage space. The research data was placed into envelopes while electronic data underwent password-protected file storage that only the researcher knew. The research data will be eliminated through shredding after five years have passed since publication.

3.8 Data Analysis

Analysis represents "the method of categorising, ordering, manipulating and summarising of data reduced to intelligible form" according to Gray & Grove (2020). The purpose of research

problem analysis enables testing relationships between variables while studying the researched problem. Data accuracy was tested before entering and cleaning it in an Excel spreadsheet package for ultimate analysis. A research analysis was done with the Statistical Package for the Social Science (SPSS) version 26 software. The program SPSS was used to input data from demographic variables and resources regarding child care in SCC and care methods and health worker challenges.

The researchers employed descriptive statistics including mean scores together with standard deviations and percentage distributions to present data about sample specifics. A table displayed the hospital-specific demographic information through frequency-based formatting. The analysis of resource availability for SCC management used descriptive statistics to report each hospital's resources as percentages through bar graph representation. Inferential statistics defined a method to evaluate quality of care disparities between different healthcare centers. The research used Analysis of Variance (ANOVA) to evaluate mean variations among groups which resulted in identifying meaningful healthcare quality differences between hospitals. The results from the chi-square test enabled researchers to analyze categorical variable relationships specifically to identify areas of quality care delivery in each hospital. These statistical approaches led to an extensive and solid assessment of healthcare service quality.

3.9 Ethical consideration

Ethics serves as a moral value system which evaluates research procedures to determine how they fulfill the professional standards alongside legal and social obligations of participants (Polit & Beck, 2018). Nursing research follows all other scholarly fields in demanding expertise together with diligence yet mostly demands honesty and integrity. The researcher gained approval through MZUNIREC/DOR/23/14 REF NO: MZUNIREC as identity for approval (Appendix 6) from Mzuzu University Research and Ethics Committee (MZUNIREC). The researcher attained official permission after clearing from authorities of the three participating hospitals to conduct their study. These permissions are included in (Appendix 5).

3.9.1 Respect for Autonomy

In research, individuals should be treated as autonomous beings who are capable of making their own decisions (Gray & Grove, 2020). Participants were informed of their right to participate, withdraw at any stage of data collection or refuse to participate, and that doing so

would result in no penalties. This was necessary to respect their individual rights and respect to autonomy in research. Thereafter, a consent form was provided and participants were asked to read and understand the purpose of the study to consent or decline participation voluntarily (Appendix 1). Finally, participants were asked to sign a written Informed Consent Form in agreement with their willingness to participate.

3.9.2 Confidentiality and Anonymity

The project administrators reassured participants about complete confidentiality of their shared information. Code systems replaced names as a method to protect participant and patient information confidentiality and anonymity. Only the researcher-maintained control over the gathered data which was safely stored in a lockable drawer.

3.9.3 Avoiding Harm

Participants were assured that in this study there were no risks or harm or discomfort associated with participation.

3.9.4 Dissemination of Findings

The research study results will be distributed to MZUNIREC together with Mzuzu Central Hospital and Rumphi District Hospital and Ekwendeni Mission Hospital followed by submission to the Ministry of Health Headquarters. Both management teams and healthcare staff at study locations will receive local dissemination through meetings that will present the research results. The study findings will be distributed through MZUNIREC and Mzuzu Central Hospital and Rumphi District Hospital as well as Ekwendeni Mission Hospital and the Ministry of Health Headquarters. Additionally, the research team will disseminate findings at Malawi's professional development sessions and conferences and forums. The research findings will be published in a peer-reviewed academic journal after completion of the report.

3.9.5 Justice

Justice incorporates participants' right to fair treatment and fairness in the distribution of benefits and burdens (Houser, 2016a). The selection of participants should be fair enough to ensure research credibility. In this study, participants were informed that taking part in the study would not result in any financial or other benefits, but the information provided would be used to improve the standard of care for children in SCC.

3.10 Study Limitations

In this study, as anticipated the retrospective nature of data collection posed challenges in ensuring consistency. Variability in record-keeping and gaps in documentation were observed across all hospitals necessitating cautious assumptions where data for measured variables were absent. As such adherence to the data collection tool was maintained in all hospitals. Furthermore, achieving the required sample size for healthcare workers (HCWs) with a minimum of three years of experience in the Pediatric Ward which was considered to be having adequate experience was challenging. This was due to frequent staff rotations, typically occurring every two years. To address this, the inclusion criteria were adjusted to consider HCWs with at least two years of experience in the Pediatric Ward, ensuring adequate representation across facilities while maintaining the study's rigor.

3.11 Conclusion

The research design selected a quantitative descriptive cross-sectional method to gather data for health worker assessments and children's file investigations in all three hospitals located in the Northern Malawi region. The study relied on simple random sampling for Health Care Workers while Systemic random sampling served to obtain children's case files. The researchers conducted file reviews involving 87 cases, 28 cases, and 9 cases for children admitted to Mzuzu Central and Rumphi District and Ekwendeni Mission Hospitals. The sample collection for healthcare workers examined 36 cases, 11 cases, and 6 cases at those same facilities. The research depended on the percentage of hospital patients who belonged to the studied population.

The research included participants who were nurses along with clinicians and doctors who provided care at pediatric wards where they met both working for minimum two years. The analyzed case files should contain records of children who received care at these facilities during the period from 2019 through 2021 in SCC. The researcher utilized self-administered questionnaires together with checklists for data collection purposes. The research instruments underwent approval from research supervisors alongside Paediatric care specialists who verified their suitability and suitable content validity of individual items. Statistical data processing occurred with SPSS version 26. All ethical aspects related to the research study were discussed together with plans for communicating research findings.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.0 Introduction

The results of this study are imposed to evaluate hospitalised child care quality in SCC throughout Mzuzu Central along with Rumphi District and Ekwendeni Mission hospitals from Northern Malawi. The study results trace three distinct objectives starting with assessing inputs for high-quality child SCC care and moving to standard guideline assessment against existing practices and finishing with characterizing health worker challenges in hospital SCC facilities.

This chapter begins with results that describe the characteristics of the study participants. The second essential element is having access to all required care inputs to deliver quality services. The research finds out about the challenges that health care professionals face when delivering proper hospital care for children with SCC at specific hospital sites. This section contains findings regarding existing practices involved in SCC medical care provision.

4.1 Demographic characteristics of participants

The research analyzes demographical information about healthcare workers (HCWs) through age and gender categories in addition to their working credentials and clinical experience at the Paediatric Ward and hospital responsibilities and specialization fields alongside training and management comfort for sickle cell disease patients.

The research at Mzuzu Central Hospital involved 36 (n=36) workers at the facility. A total of 24 participants matching the age range of 25-34 years made up 66.7% of the sample while females represented 69.4% of all respondents (n=35). The research at Rumphi District Hospital involved an eleven member staff survey (n=11). Results indicated 63.6% (n=7) of participants belonged to the 25-34 years age bracket and 54.5% (n=7) among them were men. Ekwendeni Mission Hospital enrolled a total of 6 healthcare workers as participants. Most interviewees at these medical facilities belonged to the 25–34-year age bracket and consisted primarily of females who made up 83.3% (n=5) of all participants. The Table 2 contains additional information which is accessible upon review.

Table 2**: Demographic Characteristics of Health Care Workers**

Variable		Mzuzu Central Hospital		Rumphi District Hospital		Ekwendeni Mission Hospital	
		N	%	n	%	n	%
Age	25-34	24	66.7%	7	63.6%	5	83.3%
	35-44	10	27.8%	3	27.3%	1	16.7%
	45-54	2	5.6%	0	0.0%	0	0.0%
	Above 55	0	0.0%	1	9.1%	0	0.0%
Gender	Male	11	30.6%	6	54.5%	1	16.7%
	Female	25	69.4%	5	45.5%	5	83.3%
Professional Qualification	Nurse Midwife Technician	14	38.9%	5	45.5%	2	33.3%
	Registered Nurse	14	38.9%	4	36.4%	3	50.0%
	Clinical Technician	2	5.6%	1	9.1%	1	16.7%
	Clinical Officer	5	13.9%	1	9.1%	0	0.0%
	Medical Doctor	1	2.8%				
Years of clinical work experience in	2-5 years	22	61.1%	8	72.7%	4	66.7%
Paediatric ward	6-10 years	8	22.2%	2	18.2%	1	16.7%
	More than 10 years	6	16.7%	1	9.1%	1	16.7%
Added responsibility at the hospital	Yes	4	11.1%	2	18.2%	1	16.7%
	No	32	88.9%	9	81.8%	5	83.3%
Specialized in any area	Yes	8	22.2%	1	9.1%	1	16.7%
	No	28	77.8%	10	90.9%	5	83.3%
Trained in management of SCD	Yes	19	52.8%	0	0.0%	2	33.3%
	No	17	47.2%	11	100.0%	4	66.7%
Are you comfortable to manage	Yes	35	97.2%	11	100.0%	7	100.0%
children in SCC	No	1	2.8%	0	0.0%	0	0.0%

The association of the demographic variables against HCWs comfortability to manage children in SCC at Mzuzu Central Hospital was tested using chi square test. The variables tested were age, professional qualification, years of clinical experience and whether trained in the management of SCD. The results were as follows; age (p = 0.733), clinical experience (p = 0.165), professional qualification (p = 0.806) and trained in the management of SCD (p = 0.286). At Rumphi District Hospital and Ekwendeni Mission Hospital this was not tested because the variable "comfortable to manage children with Sickle Cell Crisis" was constant. For more details refer to tables 3 and 4.

Table 3: Association between Demographic Characteristics and Comfortability to Manage SCC

		Value	Df	Asymp. Sig. (2-sided)
Age	Pearson Chi-Square	.514[a]	2	0.773
	Likelihood Ratio	0.825	2	0.662
	N of Valid Cases	36		
Professional qualification	Pearson Chi-Square	1.616[a]	4	0.806
	Likelihood Ratio	1.934	4	0.748
	Linear-by-Linear Association	0.846	1	0.358
	N of Valid Cases	36		
Years of Clinical Experience	Pearson Chi-Square	3.600[a]	2	0.165
	Likelihood Ratio	3.111	2	0.211
	Linear-by-Linear Association	0.34	1	0.56
	N of Valid Cases	36		

Table 4: Association between Training in the Management of SCC and Comfortability to Manage SCD

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.150[a]	1	.284		
Continuity Correction[b]	.003	1	.955		
Likelihood Ratio	1.533	1	.216		
Fisher's Exact Test				.472	.472
Linear-by-Linear Association	1.118	1	.290		
N of Valid Cases	36				

4.2 Availability of resources

The findings indicated 92.7% overall availability of resources for providing quality care for the management of SCC at Mzuzu Central Hospital. There was high availability on most of the resources. Others resources like antibiotics, laboratory examinations such as full blood count, malaria rapid diagnostic test (mRDT), or malaria microscopy and sickle cell test had 100% availability. Resources like thermometers had an 89.9% availability whereas blood culture had a 97.2% level of availability. For more details on the availability of other resources refer to Figure 2.

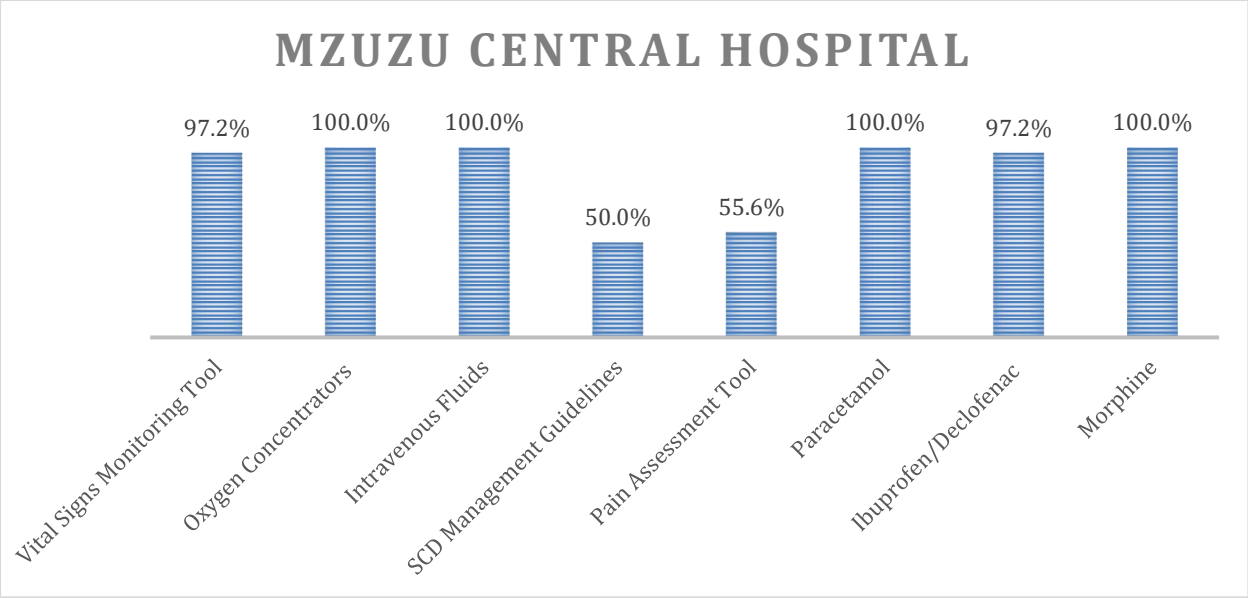


Figure 2: Availability of Resources for Treating SCD at Mzuzu Central Hospital

For Rumphi District Hospital, the findings indicated 89.2% overall availability of resources with majority of the resources being 100% available. Resources such as nasal prongs, thermometers, antibiotics, laboratory examinations such as full blood count, sickle cell test, and malaria rapid diagnostic test (mRDT) or malaria microscopy and blood all recorded 100% level of availability. For more details on the availability of other resources at the hospital refer to Figure 3.

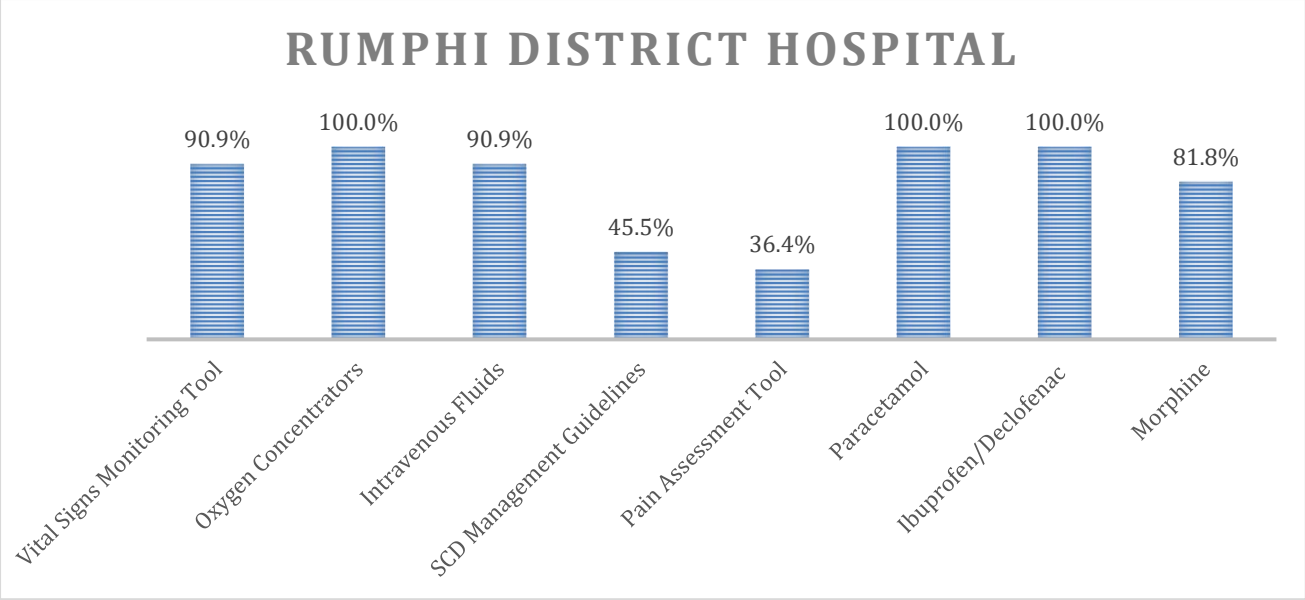


Figure 3: Availability of Resources for Treating SCC at Rumphi District Hospital The findings for

Ekwendeni Mission Hospital indicated 84.8% overall availability of resources at the facility. Resources such as nasal prongs, thermometers laboratory examinations such as full blood count, sickle cell test, and malaria rapid diagnostic test (mRDT) or malaria microscopy and blood were 100% available. However, morphine was not available. For more details on the availability of other resources in all hospitals refer to Figure 4.

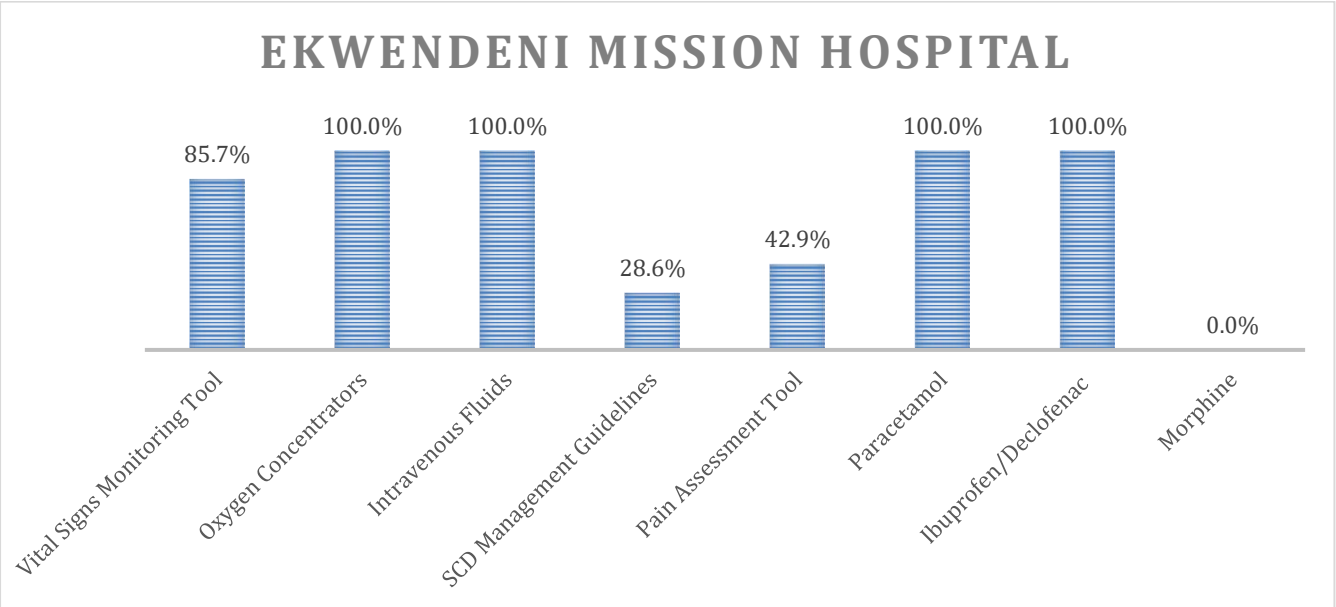


Figure 4: Availability of Resources for Treating SCD at Ekwendeni Mission Hospital

4.3 Challenges for delivery of quality care

The research sought to identify particular obstacles healthcare providers encounter during hospital child care services at SCC. A set of statements about potential difficulties in this context was developed with a rating scale based on five levels from (1= strongly disagree to 5= strongly agree). These statements included process elements from care delivery as well as factors that affect care quality. The healthcare workers evaluated the statements by selecting their agreement level among five options on the Likert scale. Standard deviations and mean and mode calculations allowed researchers to determine both the occurrence levels and the degree of difficulty faced by healthcare workers.

A statistical method called the analysis of variance (ANOVA) showed the presence of significant differences or not regarding the accessibility of essential SCC management inputs between Mzuzu Central Hospital and Rumphi District Hospital and Ekwendeni Mission Hospital.

4.3.1 Mzuzu Central Hospital

The findings were as follows; availability of clinical and nursing staff (mean = 3.11, SD= 1.369), availability of sufficient supplies (mean = 3.47, SD= 1.207) and, providers consistent use guidelines when managing children in SCC (mean = 3.72, SD= 1.085). For other details refer to Tables 5

Table 5: Challenges faced in the delivery of quality care at Mzuzu Central Hospital

	Mean	Mode	Std. Deviation
Availability of adequate clinical and nursing staff	3.11	2	1.369
Availability of guidelines for managing SCC	3.17	2	1.254
Availability of sufficient supplies	3.47	4	1.207
Availability of pain assessment tools	3.22	2	1.098
Regular assessment of pain using the pain assessment tool	3.58	4	1.052
Use of guidelines when managing patients with SCC	3.72	4	1.085
I am satisfied with the care provided to children	3.64	4	.931

However, oxygen concentrators (mean = 4.28, SD= 0.882) were readily available in the ward, providers were confident to manage children (mean = 4.14, SD= 0.723) and children were given adequate pain relief according to guidelines (mean = 4.00, SD= 0.926). Providers also make conscious efforts to improve knowledge and skills in practice (mean = 4.46, SD 0.657) and suggest improvements in the quality of care (mean = 4.31, SD 0.666). They document all the care in appropriate records (mean = 4.39, SD 0.494). They also expressed satisfaction with the care provided (mean = 4.39, SD 0.494). Furthermore, they get support from management (mean = 3.92, SD 0.931) and there are reports of good care at the hospital from children and their guardians with scores (mean = 3.94, SD= 0.715).

4.3.2 Rumphi District Hospital

The findings include a lack of pain assessment tools/charts (mean = 2.73, SD= .905), HCWs did not regularly assess pain nor use guidelines when managing children (mean = 3.27, SD= .905), and they do not usually get support from management when they have problems related to care of children with SCC (mean = 3.64, SD= 1.433). For other details refer to Tables 4

Table 6: Challenges faced in the delivery of quality care at Rumphi District Hospital

	Mean	Mode	Std. Deviation
Availability of adequate clinical and nursing staff	3.55	4	1.036
Availability of guidelines for managing SCC	2.91	2[a]	.831
Availability of pain assessment tools	2.73	3	.905
Regular assessment of pain using the pain assessment tool	3.27	4	.905
Use guidelines when managing patients with SCC	3.27	2	1.191
Availability of support from management when in problems related to care of SCC	3.64	4	1.433

The results showed that oxygen concentrators (mean = 4.45, SD 0.505) were readily available in the ward, there were enough supplies, and HCWs made conscious efforts to improve knowledge and skills in practice (mean = 4.18, SD= 0.603). They documented care in appropriate records (mean = 4.64, SD 0.5.05). HCWs also expressed satisfaction with the care provided, they suggest improvements in the quality of care, children receive pain relief medication according to guidelines, and there were reports of good care at the hospital from

children and their guardians with scores (mean = 4.00, SD= 0.775). In addition, providers were confident in managing children with SCC (mean = 4.27, SD= 0.4.67)

4.3.3 Ekwendeni Mission Hospital

Then results include; lack of guidelines (mean = 2.29, SD= 1.134), lack of pain assessment tools/charts (mean = 3.00, SD= 1.291), and providers do not regularly assess pain using pain assessment tools (mean = 3.43, SD= 1.134). For more details on other findings refer to Table 7

Table 7: Challenges faced in the delivery of quality care at Ekwendeni Mission Hospital

	Mean	Mode	Std. Deviation
Availability of adequate clinical and nursing staff	2.43	2	1.134
Availability of guidelines for managing SCC	2.29	2	1.254
Availability of sufficient supplies	3.14	4	1.464
Availability of pain assessment tools	3.00	2	1.291
Children who are in crisis are given pain relief medication according to guidelines	2.57	1[a]	1.512
Regular assessment of pain using pain assessment tool	3.43	4	1.134
Use guidelines when managing patients with SCC	2.86	2[a]	1.345
Availability of support from management when in problems related to the care of SCC	3.14	4	1.464

Oxygen concentrators were readily available in the ward, the providers were confident in managing children with SCC, and they made conscious efforts to improve their knowledge and skills in practice. They also suggested the implementation of patient care where necessary for improving the quality of care (mean = 4.71, SD 0.488). They also expressed confidence in providing care (mean = 4.43, SD 0.787). They document all the care in appropriate records, and children and their guardians report receiving good care at the hospital (mean = 4.00, SD 0.816). In addition, they expressed satisfaction with the care provided to children with SCC (mean = 3.71, SD 0.756).

The results on ANOVA indicated that most of the assessed factors on the availability of key inputs for the management of SCC do not significantly differ between the hospitals, except for

the availability of guidelines for the management of SCD (p = 0.042). The other inputs availability clinical and nursing staff (p = 0.208), medical supplies, (p = 0.152), oxygen concentrators (p = 0.380), and Pain Assessment Tools (p = 0.205) respectively. For other details refer to table 8

Table 8: Analysis of significant differences in the availability of key inputs for quality care

		Sum of Squares	df	Mean Square	F	Sig.
There is adequate clinical and nursing staff to take care of sickle cell patients	Between Groups	5.336	2	2.668	1.620	.208
	Within Groups	83.997	51	1.647		
	Total	89.333	53			
The hospital has guidelines to manage SCC	Between Groups	9.996	2	4.998	3.383	.042
	Within Groups	75.338	51	1.477		
	Total	85.333	53			
There are sufficient supplies to provide adequate service to sickle cell patients	Between Groups	4.766	2	2.383	1.959	.152
	Within Groups	62.049	51	1.217		
	Total	66.815	53			
Oxygen concentrator for oxygenation is available	Between Groups	1.215	2	.607	.987	.380
	Within Groups	31.378	51	.615		
	Total	32.593	53			
Pain assessment tools are available	Between Groups	4.022	2	2.011	1.635	.205
	Within Groups	62.737	51	1.230		
	Total	66.759	53			

4.4 Results on Quality Care

The third objective was to compare current practices for the management of SCC with the existing standard guidelines. To achieve this objective case files for children who were admitted with SCC from 2019 to 2021 were reviewed and benchmarked with the guidelines (Appendix 4). For all the hospitals, 124 patients' files were reviewed, 87, 28 and 9 for Mzuzu Central, Rumphi District and Ekwendeni Mission hospitals respectively. The review was based on the documented care that was provided.

4.4.1 Results for Patient Assessment

All hospitals collected recommended admission historic information for most pediatric patients. The assessment of previous blood transfusion history obtained only 57.1% (n=16) at

Rumphi District Hospital and 66.7% (n=6) at Ekwendeni Mission Hospital. Similarly, painful crises assessment also achieved 66.7% (n=6) only at Ekwendeni Mission Hospital. The hospitals collected different information about complication development and clinic reviews and treatment compliance since the admission chart did not apply to all children.

Physical examination for the children were performed on major medical areas including pallor, jaundice, chest evaluations and lung checks and splenomegaly assessment in all healthcare facilities. Frontal bossing assessment was the least performed examination at Mzuzu Central Hospital 97.7% (n= 85) and Rumphi District Hospital 89.3% (n=25) while Ekwendeni Mission Hospital completely omitted this evaluation. The healthcare staff did not measure bone tenderness in 24 patients at Mzuzu central and 2 patients at Ekwendeni Mission Hospital and 11 patients at Rumphi district hospital. The complete set of findings appears in Table 9 together with additional information.

Table 9: Patient Assessment

			Mzuzu Central		Rumphi District		Ekwendeni Mission	
	Variable	**Finding**	**n**	**%**	**n**	**%**	**n**	**%**
History Taking	Blood Transfusions	Yes	85	97.7	16	57.1	6	66.7
		No	2	2.3	12	42.9	3	33.3
	Painful crises	Yes	83	95.4	26	92.9	6	66.7
		No	4	4.6	2	7.1	3	33.3
	Infections and triggering events	Yes	85	97.7	25	89.3	9	100.0
		No	2	2.3	3	10.7	0	0.0
Physical Examination	Pallor	Yes	86	98.9	26	92.9	9	100.0
		No	1	1.1	2	7.1	0	0.0
	Jaundice	Yes	84	96.6	14	50.0	8	88.9
		No	3	3.4	14	50.0	1	11.1
	Chest and Lungs	Yes	87	100.0	28	100.0	9	100.0
		No	0	0.0	0	0.0	0	0.0
	Splenomegaly	Yes	86	98.9	27	96.4	6	66.7
		No	1	1.1	1	3.6	3	33.3
	Bone tenderness	Yes	63	72.4	17	60.7	7	77.8
		No	24	27.6	11	39.3	2	22.2
	Frontal Bossing	Yes	2	2.3	3	10.7	0	0.0
		No	85	97.7	25	89.3	9	100.0

The results on the laboratory investigation that were done indicated that the majority of the children in all hospitals had PCV, full blood count (FBC) malaria test (MPS/MRDT) checked. Blood culture was not done in the majority of children in almost all the hospitals. For more details on other findings refer to figure 5.

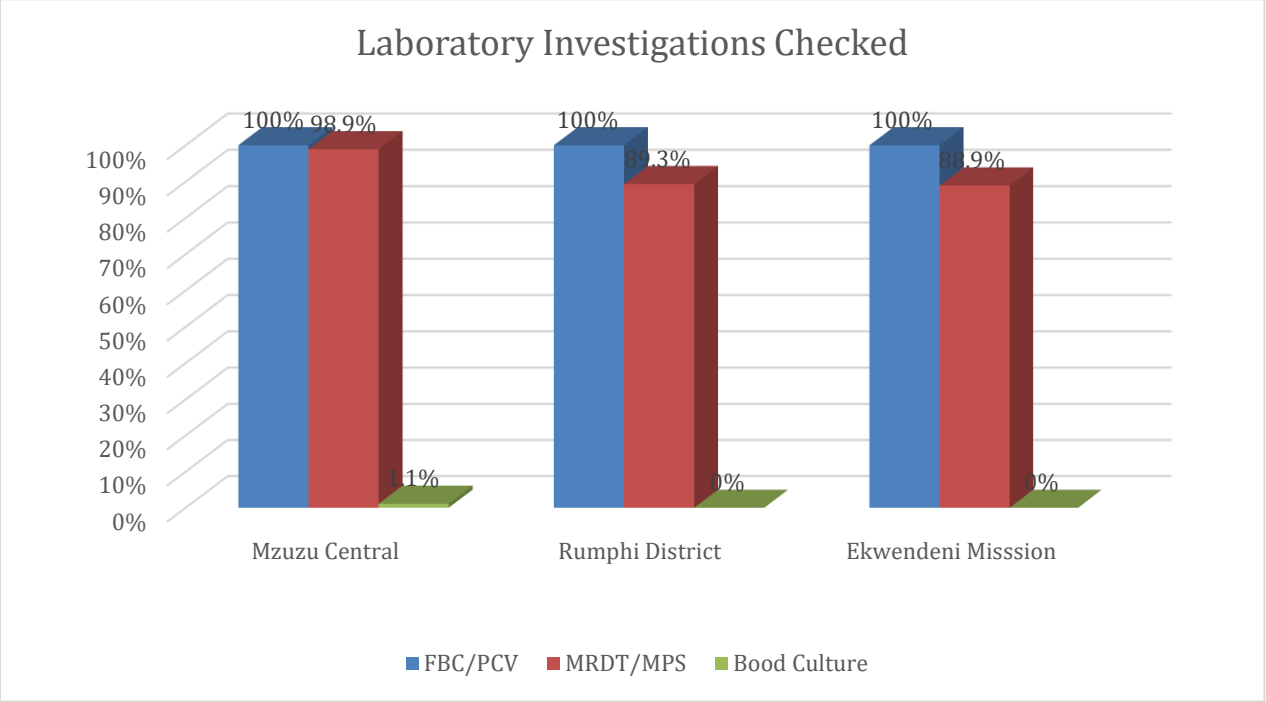


Figure 5: Results for laboratory investigations

4.4.2 Results for patient management

The majority of children missed out on oxygen therapy during their management at both Rumphi District and Mzuzu Central hospitals with 82.1% (n=23) and 56.3% (n=49). All children under treatment at Ekwendeni Mission Hospital failed to receive oxygen therapy. About 70.1% (n=61) of patients among Mzuzu Central Hospital and 42.9% (n=12) from the Rumphi District Hospital and 33.3% (n=3) from Ekwendeni Mission Hospital received intravenous fluids as part of their fluid management. Most patients who received intravenous fluids received an incorrect fluid volume determined by fluid calculators. Assessment of vital signs and work of breathing happened irregularly among most of the children. Read Table 7 to find more information about additional results.

Table 10: Patient Management

		Mzuzu Central		Rumphi District		Ekwendeni Mission	
Variable		**n**	**%**	**n**	**%**	**N**	**%**
Received Oxygen	Yes	38	43.7	5	17.9	0	0.0
	No	49	56.3	23	82.1	9	100.0
Pain relief medication administered	Morphine	22	25.3	6	21.4	1	11.1
	Diclofenac	14	16.1	3	10.7	0	0.0
	Paracetamol/Ibuprofen	51	58.6	19	67.9	8	88.9
Received intravenous fluids	Yes	61	70.1	12	42.9	3	33.3
	No	26	29.9	16	57.1	6	66.7
Received proper maintenance fluid	Yes	26	41.9	4	33.3	0	0.0
	No	36	58.1	8	66.7	3	100.0
Encouraged on oral fluids	Yes	29	33.3	4	14.3	1	11.1
	No	58	66.7	24	85.7	8	88.9
Regular assessment of vital signs, work of breathing, and oxygen saturation	Yes	14	16.1	1	3.6	1	11.1
	No	73	83.9	27	96.4	8	88.9
Received parenteral antibiotics	Ceftriaxone	62	71.3	8	28.6	6	66.7
	Benzyl Penicillin and Gentamycin	24	27.6	17	60.7	3	33.3
	Benzyl Penicillin	0	0.0	2	7.1	0	0.0
	None	1	1.1	1	3.6	0	0.0
Subsequent reviews by clinician	Yes	87	100.0	26	92.9	9	100.0
	No	0	0.0	2	7.1	0	0.0

Among patients at Mzuzu Central Hospital and Rumphi District Hospital and Ekwendeni Mission Hospital the percentages who received their pain relief medications within 15 – 30 minutes after hospital admission were 32.2% (n=28), 32.1% (n=9) and 33.3% (n=3) respectively. Most children's hospital files did not include the time when the initial pain medications were given to the patients. This figure displays the observations about when patients received pain relief medication.

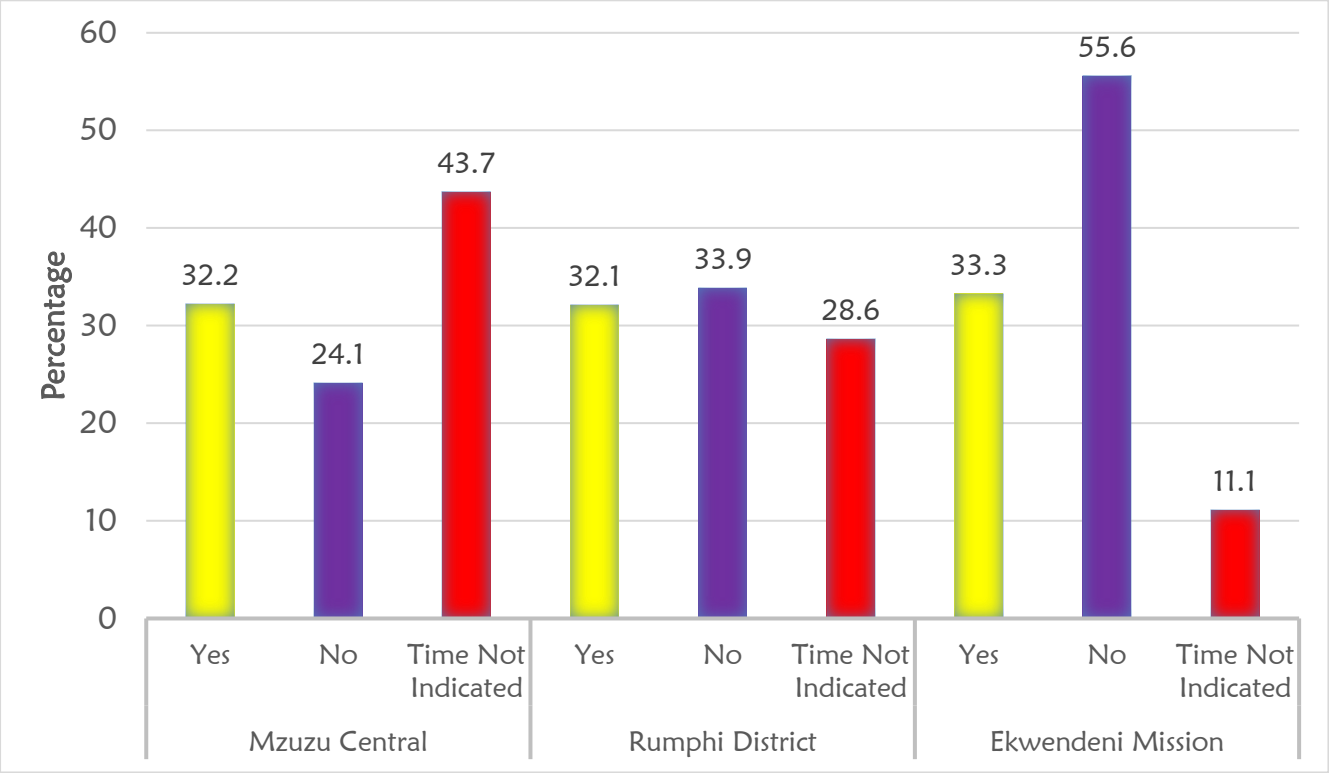


Figure 6: Results for pain relief medication within 30 minutes of triage and 60 minutes of admission to the hospital

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The research findings from this investigation are discussed in relation to the established investigation purposes. The research analyzed hospital SCC patient care standards at Mzuzu Central Hospital and Rumphi District Hospital together with Ekwendeni Mission Hospital. The research addresses demographic characteristics in addition to resource availability for delivering quality care for SCC along with quality care benchmarking against current standard guidelines and challenges in hospital-based SCC care.

5.1 Demographic Characteristics

Knowing demographic statistics with related factors remains essential because this knowledge determines what care gets delivered and shapes patient results.

Healthcare workers among Mzuzu Central Hospital, Rumphi District Hospital and Ekwendeni Mission Hospital chose 66.7% (n=24), 63.6% (n=7), and 83.3% (n=5) for the age group of 25-34 years with majority being female workers represented at 83.3% (n=5) and 69.4% (n=25) for Ekwendeni Mission Hospital and Mzuzu Central Hospital. The health profession workforce in Northern Malawi consists mainly of female workers who belong to the young adult to middle adult sections of the population. The demographic study by Smith & Sinkford (2022) reported women represent 70% of global health and social care professionals. Most healthcare delivery services came from female personnel.

The high number of female HCWs led to motherly care because female health care workers demonstrate natural empathy towards child care. The care that children with such needs require benefits from this approach. Research shows female healthcare companies give patients superior care standards because they follow clinical protocols at higher rates than male healthcare providers. Tsugawa et al, (2017) researched how physician sex connections impact mortality and readmission rates in their study. The research showed that women practicing medicine show higher rates of clinical practice guideline compliance and preventative care approaches to generate superior patient health results. Female health care workers excel at delivering patient education and preventive medicine which helps chronic disease management

as well as hospital admission reduction for cases of SCC. However, there was no association between age and comfortability to manage children in SCC which was hypothesized as being able to provide quality care. age ($p = 0.733$), clinical experience ($p = 0.165$), professional qualification ($p = 0.806$) and trained in the management of SCD ($p = 0.286$). Having most HCWs in the young to middle adult age group working in Paediatric Wards means that they are energetic enough and could deliver where possible. Young to middle aged healthcare workers have a lot of energy and passion to offer in their jobs. Research indicates that younger healthcare professionals are typically more flexible and receptive to new practice and technologies, which can improve the quality of care (Ruiz Morilla et al., 2017). Furthermore, this age group might offer new insights and creative methods to patient care, and they are more likely to accept evidence-based procedures and take part in ongoing education, all of which can enhance patient outcomes (Tawfik et al., 2019). On the other hand, younger healthcare workers may lack the experience that is crucial in making critical decisions regarding patient care (Schimpff, 2019). They may also be more susceptible to burnout due to high expectations, workload, and the emotional demands of caring for sick children (Dyrbye et al., 2017). This can negatively affect patient care thereby providing substandard care.

Although, in this study there was no association between age and comfortability to manage children in SCC ($p = 0.733$). one could conclude HCW of all age groups are competent of providing quality care. This argument could not be generalized because it was observed at only Mzuzu Central hospital.

The findings of the study revealed that a significant majority of participants across all hospitals -the three hospitals were Nurse Midwives. This is a noteworthy observation, considering that, according to the World Health Organization, nurses constitute approximately 59% of the global health workforce (WHO, 2020). This statistic highlights the critical role that nurses play in the healthcare system. Understanding the composition of the healthcare workforce is crucial for effective resource allocation, which in turn, can significantly enhance patient care. Nurses, as frontline care providers, are integral to the daily operations of healthcare facilities. They interact with patients more frequently and for longer durations compared to physicians and other healthcare professionals. Research supports this, indicating that nurses spend the most time with patients during their hospitalisation, playing a critical role in direct patient care and management (Kasa & Gedamu, 2019). Their responsibilities encompass a wide range of essential services around the clock, including patient assessment, administering nursing care,

continuous monitoring, and ensuring the continuity of care to evaluate the progress of treatment. These functions are fundamental to maintaining high standards of patient care and ensuring positive health outcomes. Therefore, the significance of their roles cannot be undermined, as they are central to the effective operation of healthcare systems and the overall quality of patient care.

Another significant finding was that at Mzuzu Central Hospital, 38.9% (n=14) of the HCWs comprised RNs, a percentage that matched with that of NMTs at 38.9% (n=14) as well. As a tertiary hospital that provides specialist health care services, this was crucial because it needed to have more professional and competent HCWs. Several studies have shown that the availability of higher levels of Registered Nurses has an impact on care delivery as it is associated with low mortality rate as compared to assistant nursing staff (Griffiths et al., 2019; Musy et al., 2021). Registered nurses are nursing professionals who have the skills to provide advanced and specialised nursing care in hospitals. They are more competent than NMTs in knowledge, reasoning, and skill performance and hence can effectively deliver quality care. Studies have shown that clinical competency is related to quality care (Stavropoulou et al., 2022). Several factors could explain the observation of having more registered nurses including that the government could have improved the deployment of registered nurses as a result of increased training of registered nurses and midwives. Furthermore, as a teaching hospital, there was need to have more professional nurses because they are involved in teaching and evaluation of students' learning.

Child Health Nursing and Paediatrics specialty qualifications existed in 5.6% (n=2), 9.1% (n=1), and 16.7% (n=1) health care workers at Mzuzu Central Hospital, Rumphi District Hospital, and Ekwendeni Mission Hospital respectively. Several HCWs were lacking necessary qualifications to meet quality care standards. Pediatric specialists possess sophisticated skills to handle healthcare issues which exclusively affect infants and children and teenagers. Specialised nursing knowledge allows healthcare providers to deliver treatments which precisely match developmental needs leading to quality improvements for children (Hockenberry et al., 2017). The knowledge about HCW professional specializations helps healthcare organizations understand and fill the treatment delivery gaps with a special focus on pediatric medicine. The scarcity of specialty care services for SCD patients observed in low-income countries matches the research findings of Lee et al. (2019). Higher service waiting times along with increased workloads for specialty health workers result in substandard patient

care. The study conducted in Malawi pointed out specialty absences in pediatric medicine as a factor preventing hospitals in Southern Malawi from delivering excellent care to newborns (Gondwe et al., 2022). Specialists effectively understand optimal child healthcare standards thus they significantly advance quality childcare delivery services. Hospitals need to request the Ministry of Health for recruiting Pediatric specialists and develop workplace retention strategies to keep their specialists.

The delivery of quality care was greatly affected by the absence of in-service training for healthcare providers who were responsible for sickle cell disease management. The researchers reached a similar conclusion as multiple other studies conducted previously. A study conducted in the Democratic Republic of Congo (DRC) showed that 46% of SCD patients received inadequate vaso-occlusive crisis management along with specific SCD training provided to just 1% of them (Mbiya et al., 2020). Research systems in Tanzanian confirmed that health care workers maintained only 25.1% awareness of SCD yet nurses possessed less knowledge than clinicians (Jonathan et al., 2022). Healthcare providers in United Kingdom demonstrated expertise with SCD management according to Smeltzer et al. (2021). Health care services operate dynamically as care stands against what is known in the current state. Healthcare services deliver services at different levels of quality throughout time (Busse et al., 2019). Organizing in-service programs for HCW staff at Pediatric points will enhance their competence as providers of full Pediatric healthcare services.

Although in this study specifically for Mzuzu Central hospital there no significant association between being trained in the management of SCD and comfortability to manage SCC ($p = 0.286$). this denotes to the strength of the curriculum for HCW such as nursing where the management of several conditions are covered during the pre-service training.

The findings of the study also showed that the majority of HCWs had 2-5 years of clinical experience working in a Paediatric Ward, thus; 61.1%, (n=22), 72.7%, n=8, and 66.7% (n=4) for Mzuzu Central Hospital, Rumphi District Hospital, and Ekwendeni Mission Hospital respectively. Understanding the level of experience was important for evaluating the quality of care as well as ensuring proper allocation of personnel. Clinical experience is associated with increased knowledge and helps to develop the competency and judgment necessary to provide quality care. Ozdemir (2019) and Jonathan et al. (2022) found a strong association between

years of practice and the level of knowledge in SCD such that HCW's of between 5 to 9 years clinical practice were more knowledgeable on SCD.

According to Benner et al. (2009), competent and proficient HCWs are individuals who have worked for more than three years. These individuals perform well without mistakes and take responsibilities alone effectively minimising delay in providing care which is a constituent of quality care. Although Berner (2009), asserts that competency is attained from three year of clinical work, in the current study 2 years of working in Paediatric Ward was equivalent to having experience. This was due to frequent rotations that happens in the hospitals. This means that participants in this study were experienced, and therefore, capable of providing quality care. However, despite good clinical experience, other strategies like continuous professional development sessions would enhance clinical skills and promote knowledge sharing. This type of knowledge sharing would, subsequently, prevent morbidity or mortality related to complications of SCC.

However, in this study clinical experience was not associated with comfortability to manage SCC ($p = 0.165$) from Mzuzu Central Hospital perspective.

It was also evident from the findings that the majority of health care workers in all hospitals were comfortable to manage children with SCC. This was similar to findings from hematologists and SCD specialists which showed higher comfort levels in prescribing opioids and managing care with hydroxyurea compared with non-hematology providers (Smeltzer et al., 2021). However, the findings from the case file reviews in the present study indicated that most children received substandard care in comparison to the guidelines. This clearly indicates a problem with transition of knowledge into practice which could be related to provider's attitude or knowledge gap on updated information.

5.2 Availability of Resources for the Management of SCC

The section outlines available resources used for quality healthcare delivery at each hospital. This category includes hospital equipment together with medical supplies in addition to healthcare staff provision and prescription drugs. olvable resources and their non-presence at the hospitals strongly affect the delivery of high-quality pediatric care in SCC.

The study findings from the HCW's, indicated high availability of resources/inputs in all hospitals representing 92.7%, overall score. The highest resource availability score was

recorded on oxygen concentrators, nasal prongs, intravenous fluids, medications, and laboratory resources. The findings provide evidence that these hospitals are well-equipped with resources indicating that patient management was likely to be good. This is commendable because the presence of resources prevents delay in initiating treatment which is a constituent of quality care (World Health Organization, 2018).

This study's discovery supports results found in Tanzania that Regional Referral Hospitals along with Muhimbili National Hospital offered their patients full access to point-of-care clinical resources including blood pressure machine, pulse oximeter, stethoscope, thermometer as well as medication for pain relief (Jonathan et al., 2022). The hospitals offered suitable treatment options to their hospitalized children. Research findings from this study differ from the previous Malawian study on emergency and critical care services presented by Kayambankadzanja (2020) due to his discovery of hospital resource deficits in emergency medicine. The scores for resource availability at hospitals stood at 51.6% throughout the facilities and smaller health facilities achieved just 37.5% indicating scarce resources were available.

The findings in the current study might be so because the study concentrated on specific resources for the management of SCD only and in selected hospitals while other studies focused on general resources for patient care and was conducted country wide. On the other hand, concentrating on specific resources allows for a detailed examination of such specialised resources that cannot be captured in the broader context. Again, by focusing on selected hospitals the study results might have introduced some elements of bias. Hospitals with more advanced or specialised facilities for SCD management might show different outcomes compared to those without such resources. This focus could result in findings that are not easily generalisable to hospitals with varying levels of resource availability. This highlights the need for complementary research on resource evaluations that could capture all hospitals in Malawi to form a complete picture.

In agreement to this, studies that have explored on the availability of resources for the care of SCD in middle and low-income countries indicate the widespread limitation of resources (Ally & Balandya, 2023). However, the present study specifically looked at resources for acute care while other studies focused on resources on a broader perspective ranging from newborn screening diagnosis and management with specific focus on disease modifying therapy.

All hospitals showed limited access to pain assessment tools together with guidelines which would enable complete patient pain examination to create successful pain management strategies. The healthcare quality for hospitalized children will improve due to this development. The assessment process provided insufficient attention to both the detection of pain and its magnitude levels. The examination suggests children did not receive suitable pain medication based on evidence-based guidelines so the standard of care may have deteriorated. A significant problem for quality care exists in this setting since hospitals need to improve their practices. The results in this study match the findings from Iqbal et al. (2023) who discovered that pain assessment tools were unavailable to 37.5% of healthcare staff which became a major obstacle in pain management practices.

Patient pain severity remained undocumented throughout most pediatric files thus confirming that proper pain assessments did not occur. The hospitals probably lack pain assessment tools combined with limited knowledge about child pain assessments among healthcare professionals. The pain severity of the child was determined by the assessment of the given pain relief medications. Children receiving paracetamol on its own or paracetamol plus Ibuprofen ormorphine received the assumption of mild, moderate and severe pain intensity respectively.

Research findings revealed that all medical institutions had suitable medications available for SCC treatment. The establishment of ready access to suitable medical care prompted satisfactory delivery of timely appropriate care to children. The Tanazanian research by Jonathan et al. (2022) discovered most hospitals had medicine options sufficient to treat SCD pain using paracetamol, Ibuprofen, Diclofenac and Morphine. Several African studies have revealed that medical facilities provide insufficient medication supplies to treat SCD patients. The investigations analyzed disease-modifying drugs including hydroxyurea as well as L-glutamine and crizanlizumab and voelotor because these treatments help prevent sickling of red blood cells and hospitalizations (Egesa et al., 2022). Acute crisis management was the focus of this particular research investigation. Two research reports identified subjective pain evaluation as one cause of opioid reluctance while another report pinpointed opioid pain management misconceptions and fear of negative effects and lack of knowledge about pain management (Abdo et al., 2019; Vasconez et al., 2020). The research conducted in DRC showed that morphine distribution is extremely restricted so healthcare providers depend on level 2 analgesics for pain control (Mbiya et al., 2020). The availability of morphine matches

the conditions at Ekwendeni Mission Hospital where no morphine was accessible. Morphine serves as the preferred medication for treating severe child pain (Wong et al., 2012) that exists in VOC cases because of its proven effectiveness combined with acceptable safety measures for pediatric use. Widespread severe pain among children at Ekwendeni Mission Hospital led to an improper administration of pain relief medications because alternative treatments were inadequate for such serious pain. If pain remains unresolved it extends the duration of painful periods until chronic pain develops thus slowing down recovery time (Hockenberry et al., 2017). A study from Malawi showed that patients between 8 and 17 years old with SCD had poor health-related life quality because of their pain symptoms (Wachepa et al., 2022). Research in Ghana demonstrated participants receiving morphine reported more rapid pain relief compared to participants taking pethidine according to the results of Opoku-Agyakwa et al. (2023).

5.3 Quality Care for Sickle Cell Crisis

A comparison of present sickle cell crisis management practices in three hospitals exists against accepted standards is provided in this section. The process evaluates delivered care quality through assessment of proper clinical care application. This section examines the patient assessment techniques alongside management practices which healthcare providers delivered according to documentation. The assessment focused on pain management methods and hydration therapy together with supplementary oxygen treatments as well as patient observational protocols and supportive maintenance delivered according to best standards.

Medical records in low and middle-income countries show weak maintenance practices which can lead to deviations between recorded and actual practice according to Hanefeld et al. (2017) yet Rios-Zertuche et al. (2019) demonstrate medical records serve as essential evaluation and quality enhancement tools. Plenty of participants agreed that patient files serve as a measurement tool for retrospective quality assessment.

Patient Assessment

The results of file reviews show multiple positive evaluation aspects for hospital assessments of children with SCC. The admission form for sick children showed proper usage for most child assessments during admissions. Healthcare providers apply structured guidelines properly when assessing patients for their first time in the system. Changes in assessment

protocols must be followed by healthcare providers since they deliver essential standards that lead to high-quality and uniform care.

Results from Keuning et al. (2024) study in Netherlands proved different from those obtained here. The purpose of this study was to assess how well healthcare providers in The Netherlands followed guidelines which covered child patients aged 0 - 16 years old throughout assessment and management tasks. Findings showed that 48% of patients experienced low adherence and these non-adherent patients received fewer urinalysis tests and bacterial culture examinations (blood, urine, and cerebral spinal fluid) and their care was incomplete with less empirical antibiotic treatment. Children undergoing assessment for illness doctors need to obtain three essential components which include their medical history regarding the current illness specifically focusing on pain from sickle cell crises and vital signs with a physical examination. The assessment process leads to better detection of issues which enables suitable management decisions. A structured admission form operates as a complete system to gather important information that directly reduces chances of essential child assessment data loss. Medical studies led by Opondo et al (2018) in Kenya discovered that better adherence to guidelines reduced the chances of patient mortality during Paediatric Admission Quality of Score assessments.

Standard laboratory test protocols for SCD children show that PCV (Packed Cell Volume), FBC (Full Blood Count) and Malaria Tests have been duly followed according to reviewed medical records. The blood lab exam PCV demonstrates how much red blood cells fill up the total blood volume. Monitoring PCV presents crucial importance in SCD since anemia can develop along with its complications which require transfusion during severe crises. The blood examination performed for Full Blood Count evaluates the percentages of platelets and white blood cells as well as the concentration of hemoglobin. The modification of these clinical measurements indicates different disease complications which include infection alongside anemia and bone marrow suppression with infections serving as the primary cause of SCC. The necessity for Malaria Test assessments exists because Malawi categorizes as a malaria endemic nation. Health facilities needed to perform malaria testing on patients with SCD because the disease could worsen their symptoms and generate complex management needs. Standard testing procedures allowed medical teams to track patient health initially and discover minor complications ahead of time that helped direct proper treatment choices. The data demonstrates

that healthcare providers maintain their dedication to thorough care provision that leads to enhanced patient results and better quality of life.

The admission form lacked necessary parameters to assess clinic reviews and treatment compliance by patients. The assessment team made an official statement that these particular areas did not receive evaluation. The assessment relied exclusively on the recorded information. Organizations trusted the recorded information because when care does not appear in documentation it remains undocumented. The monitoring process of clinic reviews proves essential for both children's overall health assessment and treatment assessment while identifying developing complications early on. The review includes symptom evaluations together with physical examinations as well as laboratory result analysis. The management of SCD heavily depends on patients following their treatment prescriptions for hydroxyurea and antibiotics and pain-relieving medications because non-adherent patients will experience worsened symptoms alongside expanded crisis occurrences.

The admission form lacked specified sections about clinic reviews and treatment compliance which meant that healthcare providers would not receive vital information regarding the child's recent clinical history and treatment following admission. Comprehensive care for children with SCC could be affected by the absence of these parameters in assessment procedures. The results from a research study in Ethiopia support that sick child assessments failed to meet the standards set by the Integrated Management of Childhood Illnesses (IMCI) guidelines (Getachew et al., 2020). This quality of care and patient outcome will improve by updating the admission form layout and implementing electronic health record integration. To provide a comprehensive overview of patient assessments doctors and clinicians should complete required information on different forms called progress sheets when assessment observations do not appear in admission notes. Studies show similar findings where extensive pre-admission assessments turn into poor documentation outcomes (Redley & Raggatt, 2017).

Administration Oxygen Therapy

Patients at Rumphi District and Mzuzu Central hospitals failed to receive oxygen therapy in their management with numbers amounting to 82.1% (n=23) and 56.3% (n=49). All children at Ekwendeni Mission Hospital received no application of oxygen therapy. Controlled oxygen therapy is not provided to most children due to a significant quality care gap. As a consequence

of tissue hypoxic effects these children experienced extended periods of severe pain (Adjepong et al, 2018; Borhade & Kondamudi, 2022).

Research conducted at a large London tertiary hospital showed that oxygen therapy was administered to VOC children in only a quarter of cases (Butt & Chakravorty, 2019). According to Fitzgerald et al. (2024) comprehensive research conducted at Malawian pediatric settings revealed parallel results in acute and inpatient care evaluation. A research was conducted to explain how process evaluation and quality improvement functions for Pediatric hospital admissions at Malawi's tertiary referral facility. Standards of care in Malawi indicated doctors placed oxygen therapy on 78% of Paediatric patients who displayed oxygen saturation below 90%. The findings show poor practice since healthcare providers failed to provide necessary oxygen therapy that improves tissue oxygenation to these patients.

The Malawi Paediatric Guidelines stipulates that every child experiencing VOC pain needs supplemental oxygen therapy to enhance oxygenation levels and decrease pain despite their current oxygen saturation numbers. The sickle cell disease pain mechanism can be stopped by oxygen delivery according to Omoigui (2021). Chronic haemolysis of red blood cells causes low haemoglobin levels thus reducing oxygen carrying capacity in most children with SCD (Borhade & Kondamudi, 2021; Darbari et al., 2020). Maximum oxygen delivery to tissues bound to haemoglobin occurs through supplemental oxygen treatment (Choudhury, 2018).

Please note that oxygen deficiency amplifies both physical discomfort along with extra medical problems. Oxygen therapy provision during care might be chosen by health care workers from various reasons including resource restrictions and lack of understanding current practice and non-compliance with guideline use. Many staff involved in direct patient care demonstrated good capabilities in managing children with SCD within the SCC while most hospitals also provided substantial resources for SCD management. Hospital facilities exhibited their greatest resource readiness through oxygen concentrators and nasal prongs combined with other equipment. Operational facilities required for oxygen therapy administration exist at complete levels in these medical institutions.

Provider knowledge and practice regarding SCD treatment seem to show inadequate alignment. Medical care practitioners in DRC demonstrated a lack of knowledge translation into real practice according to new research findings. The management of SCD revealed worse results among nursing staff in comparison to medical physicians. Better practice among nurses showed

a direct relationship with their acquired knowledge alongside their years of work experience (Ngonde et al., 2024). Medical personnel sometimes fail to remedy this situation because of negative provider-related attitudes. Data revealed resource availability exists but it is possible these resources did not provide adequate support to children in crisis situations. The data collection tool needs an assessment on resource adequacy to determine actual resource availability thus ensuring accurate data investigation. The study results may stem from insufficient guidelines because they were missing in most healthcare facilities. Kawaza et al. (2020) revealed unfunctioning oxygen concentrators at specific Malawian hospitals although they conducted a study that checked their performance. Healthcare personnel might provide oxygen therapy exclusively to critical cases only because conflicting research has shown that high oxygen doses could suppress erythropoiesis thus partial administration might explain why fewer patients received this therapy (Howard et al., 2019; Osunkwo et al., 2020).

The research indicates that 32.2% (n=28) of patients at Mzuzu Central Hospital received pain relief medication and 32.1% (n=9) at Rumphi District Hospital and 33.3% (n=3) at Ekwendeni mission hospital under the specified timeframes for triage or admission. Most children suffered from delayed pain relief resulting in diminished life quality following their hospital admission. This observation also became apparent across several other nations in addition to Malawi. The study led by Almuqamam and Diaz – Frias along with their team (2018) recorded delayed pain relief for Saudi Arabian children suffering from SCC. Research showed that patients received their analgesic medication within 63 minutes in New York according to Cacciotti et al. (2017) and Oshikoya et al. (2015) reported pain relief delays during emergency admissions in Nigeria.

Quality care provision requires timely pain management since it helps children experience better lives (Ballas et al., 2012). According to evidence-based NHLBI guidelines health care staff should start analgesic therapy no later than 30 minutes after triage and no later than 60 minutes of registration. Unmerited pain increases stress duration which creates adverse consequences in the patient's recovery process according to Darbari et al. (2020). Pain management goals are achieved more quickly through timely administration of pain relief medication as shown in literature (Seaser et al., 2022). Delayed management of acute pain adds to the risk of developing long-term pain syndromes which subsequently affects the ability of children to handle stress during adolescence. The research showed that medical facilities applied delayed approaches to handle patient pain effectively. Other responsibilities which require more time completion and knowledge deficits together with additional workload appear

to be main contributors to this delay. The scarcity of knowledge has emerged within Indian healthcare facilities because just 10% of medical staff showed awareness about appropriate pain relief medicine timeframes between triage and treatment (Martin et al., 2020).

Medical research indicates substantial progress has been made in SCC pain-relief practices. The available research demonstrates that faster administration of second opiate doses results in fewer patients being admitted to hospitals (Schefft et al., 2018). Hospitalisation rates for sickle cell pain crisis patients decrease as medical staff provide a follow-up (pain relief) opioid dose within thirty minutes of first opioid administration compared to waiting sixty minutes after patient hospital arrival according to Payne et al. (2018) and Muslu et al. (2020). Research data revealed that patients received their pain medication too late which deteriorated the quality of medical attention.

The research results demonstrated that intravenous fluids were provided to 70.1% (n=61) of hospitalized patients at Mzuzu Central Hospital. 32.9% (n=6) at Rumphi District and 33.3% (n=4) at Ekwendeni Mission hospitals received intravenous fluids according to the reviewed data. The analysis demonstrates that most children did not receive proper hydration at these medical facilities. According to a study at a Nigerian facility (Oshikoya et al., 2015), researchers discovered that intravenous fluids were given to 91.7% of patients managing VOC instead of simply measuring hydration status (Oshikoya et al., 2015). The results of this examination show children received insufficient hydration treatment. Blood viscosity increases because of dehydration thus leading to SCC episodes according to Carden et al., (2017). Hospital stays would become longer as the pain period stretched because of inadequate hydration (Haimed et al., 2024). Health institutions should make improvements within this aspect of practice since it received inadequate recommendations from research. Healthcare facilities should implement two strategies to improve patient care standards: reinforcing guidelines in care practices and conducting in-service educational programs for healthcare staff. Such measures allow hospitals to deliver appropriate fluids for children making their health conditions better and overall quality of life better.

Research showed that Mzuzu Central Hospital and Rumphi District Hospital properly maintained fluids in 41.9% (n=26) of cases and 33.3% (n=4) cases respectively. Most children who received intravenous fluids at these healthcare facilities received improper amount of medication because staff failed to perform fluid calculation for SCD treatment. The Queen

Paediatric guideline for management of common childhood Illnesses in Malawi states that total fluid calculation should be based on 1.5 times maintenance weight of each child. The situation was most critical at Ekwendeni Mission Hospital combined with Rumphi District Hospital. The treatment resulted in children being either dehydrated to the point of being dry or being hydrated to an excessive extent. The child's recovery process becomes delayed because respiration difficulties and kidney dysfunction result from excessive fluid accumulation. The research outcomes from Ghana matched the study results indicating substandard nursing practice in identifying correct fluid prescriptions for crisis patients (Korkortsi, 2021). This condition occurs in 21% of patients with SCD particularly during the first 24 hours when healthcare providers give excessive fluids (Gaartman et al., 2021; Gaut et al., 2020).

This study discovered that most children in Mzuzu Central Hospital and Rumphi District Hospital and Ekwendeni Mission Hospital received no encouragement for oral fluid consumption during their hospital stays with percentages of 66.7% (n=58), 85.7% (n=24), and 88.9% (n=8) respectively. Standard practice for hyperhydration treatment of children with SCC led to oral fluid recommendations according to Stewart et al, (2021) to help children become accustomed to oral hydration for home management.

The majority of children received no regular vital signs checks (temperature, pulse rate, respiration, blood pressure) together with work of breathing assessment and oxygen saturation monitoring during their hospital stay. The results of the chart assessment revealed that regular monitoring was absent in 83.9% (n=73) of Mzuzu Central Hospital patients and 96.4% (n=27) of the Rumphi District Hospital children and 88.9% (n=8) of Ekwendeni Mission Hospital patients. The assessment of patient progress requires patient monitoring because it shows both medical condition improvements and treatment methods. Such improper observation put these children at risk for medical complications. This care practice would result in unfavorable patient treatment results. Vital sign assessment and patient monitoring is an important nursing responsibility yet the children received assessments only once daily during clinician rounds.

There are two vital aspects regarding the admission of acutely unwell children: regular checks with a possible schedule of monitoring every 4 to 6 hours until their stability is reached. The practice of continuous vital signs evaluation together with documentation systems helps nurses identify patients in danger earlier (Smith et al 2017). Research studies across multiple studies confirm that clinicians frequently fail to monitor vital patient parameters during practice

(Kamio et al., 2018; Weenk et al., 2019). The outcomes from this study support the results of Fitzgerald et al. (2018) who conducted a mortality audit at Kamuzu Central Hospital in Malawi. The analysis showed vital signs documentation absence in 44% of Paediatric case files during the first twenty-four hours of admission and documentation insufficiencies occurred in 58% of clinical charts. The research produced identical results in both Kenya and Ghana according to Ogero et al. (2018) and Mugyenyi et al. (2021).

The examination results established that patient monitoring compliance remained low in these healthcare facilities. The assessment process for patients seems to present difficulties which results in compromised quality of nursing care. Several factors contribute to the inconsistent monitoring such as resource limitations, equipment shortages and equipment reliability status among other elements. Improving clinical outcomes requires examining interventions which could enhance patient monitoring adherence because this represents a critical quality improvement step. Documentations for nursing assessments alongside care/progress notes were absent from the files for almost all children.

5.4 Challenges for the delivery of quality care in SCC management

Healthcare providers encounter multiple difficulties when providing quality care to children throughout a Sudden Cardiac Collapse. Quality care enhancement strategies must first tackle identified healthcare provider challenges to become successful.

The present study faced challenges because of the limited number of guidelines available for medical treatment of SCD at the hospital level. The hospitals demonstrated this issue throughout all their facilities. The inadequate use of scientific evidence demonstrates that delivered care lacked proper basing. The hospitals demonstrated statistical variations ($p = 0.042$) regarding their guidelines for SCD management practices. Different hospitals demonstrate varying degrees of protocol development for SCC management because some medical facilities maintain solid protocols but others lack satisfactory procedures. Standards guidelines are essential to deliver high-quality care because they enable healthcare staff to practice their best treatment approaches when treating patients. These guidelines appear in the Queens Paediatric Handbook which serves as the reference document for managing typical childhood diseases in Malawi. Staff members might lack proper orientation about guidelines because these materials were not easily accessible when delivering care.

Organizations provide superior care when applying evidence-based guidelines (Keiffer, 2015). Guidelines help minimize practice variations which occur among health care service providers (Kredo et al., 2016). Evidence demonstrates that guidelines in numerous low and middle-income countries operate either without availability or exist in poorly enforced states (Hanefeld et al., 2017; Smeltzer et al., 2021). The research by Kayambankadzanja (2020) demonstrated that Malawian hospitals maintained poor levels of emergency guideline availability with an assessment score of 33.3%. This study shows similar findings to multiple African research which revealed treatment guidelines absence in numerous healthcare settings for SCD care (Egesa et al., 2022; Kambale-Kombi et al., 2021; Kaur et al., 2020; Wichelt, 2018). All Paediatric care points must have immediate access to guidelines because hospital management needs to make these documents accessible to their staff members. These research results show that obtaining and using guidelines for care delivery proves to be a significant challenge.

This result proves consistent with researcher observations that most children in this research did not obtain standard of care according to blueprints. The care process includes providing supplemental oxygen therapy and correct amounts of intravenous fluids together with oral fluid encouragement for patients. The literature and research by Cabana et al. (2019) and Martin et al. (2020b) indicate that health care workers did not follow official guidelines during SCD patient care. The research conducted at Namibia and in both Kenya and Tanzania and Uganda demonstrated weak adherence to guidelines in Sub-Saharan African disease management of children (Krüger et al., 2017). The absence of guidelines adherence in SCC treatment settings was explained by HCW knowledge deficits about SCC caregiving and the barrier of unavailable resources and the failure to apply existing knowledge to clinical practice (Linton et al., 2020). The required knowledge needs of HCWs can be met through refresher training programs and continuous professional development sessions (CPDs) which hospitals should establish.

According to HCWs working in these hospitals they failed to consistently use guidelines for treating patients with SCC. Quality care delivery faced a major obstacle because of this situation. Several other research studies have demonstrated that guidelines in numerous low and middle-income countries either lack availability or experience poor enforcement (Hanefeld et al., 2017b; Smeltzer et al., 2021). The research by Martin et al. (2020) throughout United States demonstrated that medical staff failed to follow established guidelines during SCD patient management. The use of guidelines in childhood illness management received poor

adherence in sub-Saharan African countries according to research conducted in Namibia Kenya Tanzania and Uganda (Krüger et al., 2017). Inservice training about SCD management remained insufficient according to most HCWs who reported they had not received training. The result was non-adherence to guidelines and use of care systems. The healthcare facilities should organize new training opportunities for their staff including Continuous Professional Development (CPD) sessions which would refresh HCW knowledge and boost their use of care guidelines.

Inadequate clinical and nursing personnel particularly affected Mzuzu Central and Ekwendeni Mission hospitals to provide quality care according to the findings. The test for clinical and nursing staff availability showed no variations between the three hospitals ($p = 0.208$). The comparable staffing numbers between these hospitals reveal insufficient staff who later affect patient care quality.

To achieve Universal Health Coverage along with quality care delivery the WHO recommends a minimum of 4.45 health workers per 1,000 people (World Health Organization, 2016). The current population to health worker ratio in Malawi reached 2.85 per 1,000 population while the WHO established the target at 4.45 per 1,000 population. Maximum vacancy rates exist for health care providers within the MOH with 63% for Clinical Officer/Technician and 40% for Nurse/Midwifery Officer and 54% for Nursing and Midwifery Technician (Health Sector Strategic Plan III, 2023-2030). The existing health care staff faces probable stress as a result which might negatively affect the delivery of quality care.

The study results validated earlier research indicating lack of qualified personnel acts as a challenge in delivering high-quality care in Malawi as documented in Gondwe et al. (2022) and (Msiska et al, 2018). The Nigerian research study discovered that lack of staff within primary health care (PHC) facilities presents a barrier to quality care delivery (Aluko et al., 2019). Resource-limited countries face a challenge because of the scarcity of healthcare workers. The health worker shortage in Malawi stems from limited funding for healthcare personnel development coupled with substandard working environments (Ministry of Health, 2023).

Malawi has committed resources to frontline healthcare worker training but face an excessive employment surplus of nurses and clinical staff. Hospital performance would improve when these employment-ready healthcare cadres take positions that currently lack sufficient staff

quantities. The country needs to invest more financial resources toward healthcare personnel employment in order to deploy trained medical staff including doctors and clinical officers and nurses which the government successfully educated but could not place in jobs.

Research indicates better patient results occur when nurses serve fewer patients because these situations lead to reduced mortality rates and fewer medical mistakes and shorter hospitals stays. The healthcare team relies on nurses for comprehensive patient assessment and care development and patient observation processes that result in direct improvements to recovery rates (Griffiths et al., 2019). Nurse predominance enables the healthcare system to provide prompt accessible care that constitutes part of quality care delivery. The requirement for extensive training programs persists because nurses need continuous updates about patient care practices to deliver superior quality health services.

It was unexpected to discover that Mzuzu Central Hospital faced challenges with insufficient supplies needed for quality care delivery. The increased patient numbers at the tertiary hospital may explain the problem which occurred. The hospital's operations attract additional patients due to its range of secondary and tertiary medical services and the district facility patients who refer cases to this hospital. All hospitals displayed identical availability levels of medical supplies according to the $p = 0.152$ results. Gondwe et al (2022) support this result alongside Kayambankadzanja et al. (2020) when they identified hospital difficulties in Malawi to secure supplies and drugs along with other resources because of inadequate funding. The execution of effective clinical results in SCD depends on having adequate resources for treating both hospital patients and outpatients (Ambrose et al., 2020). Literature reviews demonstrate that hospitals face buying resource challenges for patient care facilities because donor money has declined while government support fluctuates unpredictably (Masefield et al., 2020; Hanif & Musvoto, 2023).

5.5 Conclusion

Hospitalization figures of children with SCD become high because of the widespread occurrence of SCC as a complicating factor. The high mortality rate requires proper care because of this reason. Research investigated the standard of treatment delivered to hospitalized children who had SCC at hospitals located throughout northern Malawi. The researcher presents analysis of study data regarding SCC resource availability as well as assessment of present SCC care practices and descriptions of quality care delivery obstacles.

Research data indicated that selected hospitals in northern Malawi maintained substantial availability of SCC resource supplies including oxygen concentrators and nasal prongs together with intravenous fluids and medications and laboratory resources. The availability of resources ensured proper management of children in these hospitals because resources stand as essential elements for delivering quality care. Other essential resources including guidelines and pain assessment tools showed limited availability among participating hospitals although these facilities had marked differences concerning SCD management guidelines between facilities. Implementing evidence-based care would become more difficult due to these circumstances. The assessment of new patients included appropriate scrutiny of their admission form criteria according to current practice findings. All the hospitals provided standard care recommendations to their pediatric patients. According to the guidelines for care most children in this study failed to get procedure-based intravenous fluids together with supplemental oxygen therapy with pain medication treatment options within an initial thirty-minute period following admission. The institutions failed to monitor patient condition properly along with vital signs measurement. The study demonstrates that all hospitals failed to properly implement clinical guidelines in their work environment. The three main challenges that affect quality care delivery consist of healthcare staff shortages as well as inadequate resources alongside insufficient assessment guidelines and pain management instruments.

5.6 Recommendation

Hospitalised children in SSC require superior quality care because it leads to better quality of life together with enhanced patient treatment results. Healthcare quality for hospitalized children with SCC received examination in three Northern Malawian hospitals. Some new recommendations emerged from the research findings to enhance top-quality care delivery for children in SCC.

Clinical Practice

The study discoveries revealed inconsistent care practices for SCC management because HCWs administered varying amounts of supplemental oxygen therapy and intravenous fluids. Refresher programs and training about SCD management combined with regular CPD training should be implemented by the hospital management to enhance HCW understanding and collaborative practice.

- The absence of both SCD management protocols and pain evaluation methods existed across all healthcare institutions. Most participants recognized that SCC care providers worked without using evidence-based guidelines or pain assessment tools to address children. Staff members working with SCD could have faced challenges in obtaining access to guidelines for both SCD treatment and pain assessment tools. It is essential for both hospital management and ward in-charges to establish easy access to these guidelines at Paediatric care locations including ETAT Department together with Paediatric Wards to help guide clinical practice.
- The study discovered regular patient monitoring was insufficient especially through the insufficient documentation of nursing care. The unit matron or ward leader for Paediatric Wards needs to implement performance enhancement plans by increasing nurse supervision during care activities and proper documentation to confirm quality service delivery. The significance of documenting patient care during CPD sessions should be highlighted to all staff members.
- The healthcare organization should assign increased numbers of healthcare workers to Paediatric Wards to fill staffing shortages.

Nursing Education

According to the study data most children received care of inferior quality compared to guidance standards. Training institutions must enhance the clinical supervision together with teaching sessions which generate qualified nurses to provide competent SCC child care.

- Learning guides for SCD management should be available at training institutions and students must learn to use them in their patient care activities.
- Students undergoing nurse education must learn high quality evidence-based care delivery with a focus on patient care documentation through nurse educator instruction.

The Ministry of Health

Quality care delivery depends on adequate simultaneous availability of nursing staff and clinical professionals together with essential medical supplies as revealed by the study results. The Ministry of Health together with district councils must use additional medical staff including nurses, doctors, clinical officers and clinical technicians to build up their healthcare workforce.

Limitations of the study

Data was collected from three hospitals out of ten hospitals in the northern region potentially reducing the ability to apply the study's findings to all hospitals in Northern Malawi.

- The retrospective approach used for data collection affected data consistency since documented information formed the basis of assumptions.
- The final evaluation of care quality requires analyzing patient outcomes for assessing performance effectiveness. The researcher failed to mention whether the child maintained a good status upon leaving the hospital.

Areas of further study

This study revealed that hospitalised children in SCC receive inadequate quality of care. The obtained results offer guidance regarding future research investigations which can be carried out through these specific areas:

- No assessment exists in this study regarding caregiver opinions about the care quality delivered to their children. A comprehensive research initiative is required to investigate this field because clinical quality care depends on both patient satisfaction combined with the management procedures delivered to patients.
- The researcher observed inadequate nursing care documentation during retrospective chart review that raised concerns about the frequency of physician-driven records which requires investigation into documentation factors.
- Observing how medical teams deliver care to SCD patients during follow-up visits would be a worthwhile research subject to measure guideline conformity.

REFERENCES

Abazari, P., & Namnabati, M. (2017). Nurses' experiences from pain management in children in Iranian culture: A phenomenology study. *Journal of Education and Health Promotion, 6*.

Abdeldafie, S. Y., & Alaajmi, S. O. (2022). Knowledge and attitudes of nurses toward sickle cell disease patients in Jazan. *Journal of Family Medicine and Primary Care*, *11*(11), 6935–6943.

Abdel-Hadi, L., Carmenate, Y. V., Castillo-Aleman, Y. M., Sheikh, S., Zakaria, A. & Phillips, J. (2023). Treatment of sickle cell disease-options and perspective. *American Journal of Blood Research*, 13(2), 61.

Abdo, S., Nuseir, K. Q., Altarifi, A. A., Barqawi, M., Ayoub, N. M., & Mukkatash, T. L. (2019). Management of Sickle Cell Disease Pain among Adolescent and Pediatric Patients. *Brain Sciences*, *9*(8), 182.

Adegoke, S. A., Akinlosotu, M. A., Adediji, O. B., Oyelami, O. A., Adeodu, O. O., & Adekile, A. D. (2018). Sickle cell disease in southwestern Nigeria: Assessment of knowledge of primary health care workers and available facilities. *Transactions of The Royal Society of Tropical Medicine and Hygiene*, *112*(2), 81–87.

Adjepong, K. O., Otegbeye, F., & Adjepong, Y. A. (2018). Perioperative management of sickle cell disease. *Mediterranean Journal of Hematology and Infectious Diseases*, *10*(1), p. e2018032. doi: 10.4084/mjhid.2018.032.

Ally, M., & Balandya, E. (2023). *Current challenges and new approaches to implementing optimal management of sickle cell disease in sub-Saharan Africa*. Seminars in Hematology.

Almuqamam, M., Diaz – Frias, J., Malik, M., Suwaidan, A. A., & Sedrak, A. (2018). Emergency management of SCD pain crises: Current practices and playing variables. *Pediatric Hematology Oncology Journal*, *3*(2), 37–41. https://doi.org/10.1016/j.phoj.2018.06.002

Al-Otaibi, H. M. (2019). Current practice of prescription and administration of oxygen therapy: An observational study at a single teaching hospital. *Journal of Taibah University Medical Sciences*, *14*(4), 357–362.

Aluko, J. O., Anthea, R., & Modeste, R. R. M. (2019). Manpower capacity and reasons for staff shortage in primary health care maternity centres in Nigeria: A mixed-methods study. *BMC Health Services Research*, *19*. https://doi.org/10.1186/s12913-018-3819-x

Ambrose, E. E., Makani, J., Chami, N., Masoza, T., Kabyemera, R., Peck, R. N., Kamugisha, E., Manjurano, A., Kayange, N., & Smart, L. R. (2018b). High birth prevalence of sickle cell disease in Northwestern Tanzania. *Pediatric Blood & Cancer*, *65*(1). https://doi.org/10.1002/pbc.26735

Ayanian, J. Z., & Markel, H. (2016). Donabedian's lasting framework for health care quality. *The New England Journal of Medicine*, *375*(3), 205–207.

Ballas, S. K. (2015). Pathophysiology and principles of management of the many faces of the acute vaso-occlusive crisis in patients with sickle cell disease. *European Journal of Haematology*, *95*(2), 113–123.

Ballas, S. K., Gupta, K., & Adams-Graves, P. (2012). Sickle cell pain: A critical reappraisal. *Blood*, *120*(18), 3647–3656. https://doi.org/10.1182/blood-2012-04-383430

Benner, P. E., Tanner, C. A., & Chesla, C. A. (2009). *Expertise in nursing practice: Caring, clinical judgment, and ethics*. Springer Publishing Company.

Berwick, D., & Fox, D. M. (2016). "Evaluating the quality of medical care": Donabedian's classic article 50 years later. *The Milbank Quarterly*, *94*(2), 237.

Blinder, M. A., Duh, M. S., Sasane, M., Trahey, A., Paley, C., & Vekeman, F. (2015). Age-related emergency department reliance in patients with sickle cell disease. *The Journal of Emergency Medicine*, *49*(4), 513–522.

Borhade, M. B., & Kondamudi, N. P. (2021). SCC. In *StatPearls [Internet]*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK526064/

Borhade, M. B., & Kondamudi, N. P. (2022). *SCC* (30252320). StatPearls Publishing, Treasure Island (FL). http://europepmc.org/abstract/MED/30252320

Brand, K., & Al-Rais, A. (2019). Pain assessment in children. *Anaesthesia & Intensive Care Medicine*, *20*(6), 314–317. https://doi.org/10.1016/j.mpaic.2019.03.003

Brennan-Cook, J., Bonnabeau, E., Aponte, R., Augustin, C., & Tanabe, P. (2018). Barriers to Care for Persons with Sickle Cell Disease: The Case Manager's Opportunity to Improve Patient Outcomes. *Professional Case Management*, *23*(4), 213–219. https://doi.org/10.1097/NCM.0000000000000260

Brousseau, D. C., Alpern, E. R., Chamberlain, J. M., Ellison, A. M., Bajaj, L., Cohen, D. M., Hariharan, S., Cook, L. J., Harding, M., Panepinto, J., & Pediatric Emergency Care Applied Research Network (PECARN). (2020). A Multiyear Cross-sectional Study of Guideline Adherence for the Timeliness of Opioid Administration in Children With Sickle Cell Pain Crisis. *Annals of Emergency Medicine*, *76*(3S), S6–S11. https://doi.org/10.1016/j.annemergmed.2020.08.006

Brouwers, M. C., Florez, I. D., McNair, S. A., Vella, E. T., & Yao, X. (2019). Clinical Practice Guidelines: Tools to Support High Quality Patient Care. *Evidence Based Nuclear Medicine*, *49*(2), 145–152. https://doi.org/10.1053/j.semnuclmed.2018.11.001

Brugnara, C. (2018). Sickle cell dehydration: Pathophysiology and therapeutic applications. *Clinical Hemorheology and Microcirculation*, *68*(2–3), 187–204.

Busse, R., Panteli, D., & Quentin, W. (2019). An introduction to healthcare quality: Defining and explaining its role in health systems. *Improving Healthcare Quality in Europe*, 1.

Butt, Z., & Chakravorty, S. (2019). Use of Fluid and Oxygen Therapy in Normoaxaemic Paediatric Patients Presenting with Acute Sickle Vaso-Occlusive Episodes Requiring Hospital Admission and Analysis of Clinical Outcome. *Blood*, *134*, 4844.

Cabana, M. D., Kanter, J., Marsh, A. M., Treadwell, M. J., Rowland, M., Stemmler, P., & Bardach, N. S. (2019). Barriers to pediatric sickle cell disease guideline recommendations. *Global Pediatric Health*, *6*, 2333794X19847026.

Cacciotti, C., Vaiselbuh, S., & Romanos-Sirakis, E. (2017). Pain Management for Sickle Cell Disease in the Pediatric Emergency Department: Medications and Hospitalization Trends. *Clinical Pediatrics*, *56*(12), 1109–1114. https://doi.org/10.1177/0009922816674521

Carden, M. A., Fay, M. E., Lu, X., Mannino, R. G., Sakurai, Y., Ciciliano, J. C., Hansen, C. E., Chonat, S., Joiner, C. H., Wood, D. K., & Lam, W. A. (2017). Extracellular fluid tonicity impacts sickle red blood cell deformability and adhesion. *Blood*, *130*(24), 2654–2663. https://doi.org/10.1182/blood-2017-04-780635

Carden, M. A., & Little, J. (2019). Emerging disease-modifying therapies for sickle cell disease. *Haematologica*, *104*(9), 1710.

Chimbatata, C. S., Chisale, M. R., Kayira, A. B., Sinyiza, F. W., Mbakaya, B. C., Kaseka, P. U., Kamudumuli, P., & Wu, T.-S. J. (2021). Paediatric sickle cell disease at a tertiary hospital in Malawi: A retrospective cross-sectional study. *BMJ Paediatrics Open*, *5*(1), e001097. https://doi.org/10.1136/bmjpo-2021-001097

Chireshe, J., & Ocran, M. K. (2020). Financial development and health outcomes in sub-Saharan African countries. *Cogent Economics & Finance*, *8*(1). https://doi.org/10.1080/23322039.2020.1771878.

Chonat, S., & Quinn, C. T. (2017). Current Standards of Care and Long Term Outcomes for Thalassemia and Sickle Cell Disease. *Advances in Experimental Medicine and Biology*, *1013*, 59–87. https://doi.org/10.1007/978-1-4939-7299-9_3

Cordovil, K. (2018). Sickle Cell Disease: A Genetic Disorder of Beta-Globin. In *Thalassemia and Other Hemolytic Anemias*. IntechOpen. https://doi.org/10.5772/intechopen.74778

Creswell, J. W., & Creswell, J. D. (2018). *Research Design Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.) London. SAGE Publications, Inc.

Crossley, M., Christakopoulos, G. E. & Weiss, M. J. (2022). Effective therapies for sickle cell disease: Are we there yet? *Trends in Genetics*, *38*, 1284–1298. https://doi.org/10.1016/j.tig.2022.07.003

Darbari, D. S., Sheehan, V. A., & Ballas, S. K. (2020). The vaso-occlusive pain crisis in sickle cell disease: Definition, pathophysiology, and management. *European Journal of Haematology*, *105*(3), 237–246. https://doi.org/10.1111/ejh.13430

Donabedian, A. (1988). The quality of care: How can it be assessed? *Jama*, *260*(12), 1743–1748.

Donabedian, A. (2005). Evaluating the quality of medical care. *The Milbank Quarterly*, *83*(4), 691.

Dyrbye, L. N., Shanafelt, T. D., Sinsky, C. A., Cipriano, P. F., Bhatt, J., Ommaya, A., West, C. P., & Meyers, D. (2017). Burnout among health care professionals: A call to explore and address this underrecognized threat to safe, high-quality care. *NAM Perspectives*.

Egesa, W. I., Nakalema, G., Waibi, W. M., Turyasiima, M., Amuje, E., Kiconco, G., Odoch, S., Kumbakulu, P. K., Abdirashid, S., & Asiimwe, D. (2022). Sickle Cell Disease in Children and Adolescents: A Review of the Historical, Clinical, and Public Health Perspective of Sub-Saharan Africa and Beyond. *International Journal of Pediatrics*, *2022*(1), 3885979.

Esoh, K., Wonkam-Tingang, E., & Wonkam, A. (2021). Sickle cell disease in sub-Saharan Africa: transferable strategies for prevention and care. *The Lancet Haematology*, *8*(10), e744–e755. https://doi.org/10.1016/S2352-3026(21)00191-5

Fitzgerald, E., Ciccone, E. J., Mvalo, T., Chiume, M., Mgusha, Y., Mkaliainga, T. B., Tilly, A. E., Chen, J., Bell, G., & Crouse, H. (2024). Comprehensive assessment of pediatric acute and inpatient care at a tertiary referral hospital in Malawi: Opportunities for quality improvement. *BMJ Paediatrics Open*, *8*(1) e002404. https://doi.org/10.1136/bmjpo-2023-002404

Fitzgerald, E., Mlotha-Mitole, R., Ciccone, E. J., Tilly, A. E., Montijo, J. M., Lang, H.-J., & Eckerle, M. (2018). A pediatric death audit in a large referral hospital in Malawi. *BMC Pediatrics*, *18*(1), 75. https://doi.org/10.1186/s12887-018-1051-9

Gaartman, A., E., Sayedi, A., K., Gerritsma, J., J., de Back, T., R., Van Tuijn, C. F., Wai Tang, M., Heijboer, H., de Heer, K., Biemond, B., J., & Nur, E. (2021). Fluid overload due to

intravenous fluid therapy for vaso-occlusive crisis in sickle cell disease: Incidence and risk factors. *British Journal of Haematology Published by British Society forHaematology and John Wiley & Sons Ltd.*, *194*, 899–907. https://doi.org/doi: 10.1111/bjh.17696

Galadanci, N., Wudil, B. J., Balogun, T. M., Ogunrinde, G. O., Akinsulie, A., Hasan-Hanga, F., Mohammed, A. S., Kehinde, M. O., Olaniyi, J. A., Diaku-Akinwumi, I. N., Brown, B. J., Adeleke, S., Nnodu, O. E., Emodi, I., Ahmed, S., Osegbue, A. O., Akinola, N., Opara, H. I. O., Adegoke, S. A., … Adekile, A. D. (2014). Current sickle cell disease management practices in Nigeria. *International Health*, *6*(1), 23–28. https://doi.org/10.1093/inthealth/iht022

Gaut, D., Jones, J., Chen, C., Ghafouri, S., Leng, M., & Quinn, R. (2020). Outcomes related to intravenous fluid administration in sickle cell patients during vaso-occlusive crisis. *Annals of Hematology*, *99*(6), 1217–1223. https://doi.org/10.1007/s00277-020-04050-1

Gluckman, E., Cappelli, B., Bernaudin, F., Labopin, M., Volt, F., Carreras, J. (2017). Sickle cell disease: an international survey of results of HLA-identical sibling hematopoietic stem cell transplantation. *Blood, The Journal of the American Society of Hematology*, 129(11), 1548-1556. https://doi.org/10.1182/blood-2016-10-745711

Getachew, T., Abebe, S. M., Yitayal, M., Persson, L. Å., & Berhanu, D. (2020). Assessing the quality of care in sick child services at health facilities in Ethiopia. *BMC Health Services Research*, *20*, 1–12.

Gomes, L. M. X., Andrade Barbosa, T. L. de, Vieira, L. J. T., Castro, K. P. A. N., Caldeira, A. P., Torres, H. de C., & Viana, M. B. (2017). Effectiveness of an educational programme about sickle cell disease in the form of active methodologies among community health agents and nursing technicians of primary care in Minas Gerais, Brazil. *Paediatrics and International Child Health*, *37*(1), 56–62.

Gomes, L. M. X., Reis, T. C., Vieira, M. M., de Andrade-Barbosa, T. L., & Caldeira, A. P. (2011). Quality of assistance provided to children with sickle cell disease by primary

healthcare services. *Revista Brasileira De Hematologia E Hemoterapia*, *33*(4), 277–282. https://doi.org/10.5581/1516-8484.20110077

Gondwe, M. J., Desmond, N., Aminu, M., & Allen, S. (2022). Resource availability and barriers to delivering quality care for newborns in hospitals in the southern region of Malawi: A multisite observational study. *PLOS Global Public Health*, *2*(12), e0001333. https://doi.org/10.1371/journal.pgph.0001333

Gray, J. R., & Grove, S., K. (2020). *Burns & Grove's The Practice of Nursing Research: Appraisal, Synthesis, and Generation of Evidence.* (9th ed.) St Louis. Elsevier.

Griffiths, P., Maruotti, A., Saucedo, A. R., Redfern, O. C., Ball, J. E., Briggs, J., Dall'Ora, C., Schmidt, P. E., & Smith, G. B. (2019). Nurse staffing, nursing assistants and hospital mortality: Retrospective longitudinal cohort study. *BMJ Quality & Safety*, *28*(8), 609–617.

Grosse, S. D., Odame, I., Atrash, H. K., Amendah, D. D., Piel, F. B., & Williams, T. N. (2011). Sickle cell disease in Africa: A neglected cause of early childhood mortality. *American Journal of Preventive Medicine*, *41*(6 Suppl 4), S398-405. https://doi.org/10.1016/j.amepre.2011.09.013

Haimed, A., Weiss, R., Kwon, S., Bhat, R., & Badawy, S. M. (2024). Intravenous fluid therapy and hospital outcomes for vaso-occlusive episodes in children, adolescents, and young adults with sickle cell disease. *Pediatric Blood & Cancer*, *71*(2), e30781.

Hanefeld, J., Powell-Jackson, T., & Balabanova, D. (2017). Understanding and measuring quality of care: Dealing with complexity. *Bulletin of the World Health Organization*, *95*(5), 368–374. https://doi.org/10.2471/BLT.16.179309

Hanif, R., & Musvoto, W. S. (2023). An evaluation of funding challenges in the Malawian public healthcare delivery sector. *Africa's Public Service Delivery & Performance Review*, *11*(1), 8.

Hoban, M. D., Orkin, S. H., & Bauer, D. E. (2016). Genetic treatment of a molecular disorder: Gene therapy approaches to sickle cell disease. *Blood, The Journal of the American Society of Hematology*, *127*(7), Article 7.

Hockenberry, M., J., Wilson, D., & Rodgers, C. (2017). *Wong's Essentials of Pediatric Nursing* (10th ed.) St Louis. Elsevier.

Houser, J. (2016). *Nursing Research: Reading, Using and Creating Evidence: Reading, Using and Creating Evidence* (4th ed.). Jones & Bartlett Learning.

Howard, J., Lee, S. A., Inusa, B., Cheng, M. Y. E., Bavenjit, C., Reading, I. C., Wakeford, S. A., Gavlak, J. C., Murphy, P. B., & Hart, N. (2019). Prevention of Morbidity in Sickle Cell Disease (POMS2a)—Overnight auto-adjusting continuous positive airway pressure compared with nocturnal oxygen therapy: A randomised crossover pilot study examining patient preference and safety in adults and children. *Trials*, *20*, 1–15.

International Pain Summit of the International Association for the Study of Pain. (2010). Declaration of Montréal: Declaration That Access to Pain Management Is a Fundamental Human Right. *Journal of Pain & Palliative Care Pharmacotherapy*, *25*(1), 29–31. https://doi.org/10.3109/15360288.2010.547560

Iqbal, J., Al Shukhali, K., Sultan, A., Bibi, A., yar Khalid, A., Ishaq, M., Nashwan, A. J., Ali, N., & Hussian, H. A. (2023). PERCEIVED BARRIERS REGARDING PAIN MANAGEMENT AMONG HEALTHCARE PROFESSIONALS. *Journal of Population Therapeutics and Clinical Pharmacology*, *30*(17), 1779–1784.

Jang, T., Poplawska, M., Cimpeanu, E., Mo, G., Dutta, D., & Lim, S. H. (2021). Vaso-occlusive crisis in sickle cell disease: A vicious cycle of secondary events. *Journal of Translational Medicine*, *19*, 1–11.

Jonathan, A., Tutuba, H., Lloyd, W., Ndunguru, J., Makani, J., Ruggajo, P., Minja, I. K., & Balandya, E. (2022). Healthcare Workers' Knowledge and Resource Availability for Care of Sickle Cell Disease in Dar es Salaam, Tanzania. *Frontiers in Genetics*, *12*. https://www.frontiersin.org/article/10.3389/fgene.2021.773207

Joung, B., Miles, E., Al-Manaseer, F., Jeon, W. J., Wijaya, D., Moon, J. H., Han, P., Lee, J., Mehta, A., & Tseng, A. (2024). Early Administration of Intravenous Hydration and Opioid Analgesics Is Correlated with Decreased Admission Rates during Vaso-Occlusive Episodes in Sickle Cell Disease. *Journal of Clinical Medicine*, *13*(7), 1858.

Kahsay, D. T., & Pitkäjärvi, M. (2019). Emergency nurses knowledge, attitude and perceived barriers regarding pain Management in Resource-Limited Settings: Cross-sectional study. *BMC Nursing*, *18*, 1–13.

Kambale-Kombi, P., Marini Djang'eing'a, R., Alworong'a Opara, J.-P., Minon, J.-M., Boemer, F., Bours, V., Tonen-Wolyec, S., Kayembe Tshilumba, C., & Batina-Agasa, S. (2021). Management of sickle cell disease: Current practices and challenges in a northeastern region of the Democratic Republic of the Congo. *Hematology*, *26*(1), 199–205.

Kambasu, D. M., Rujumba, J., Lekuya, H. M., Munube, D., & Mupere, E. (2019). Health-related quality of life of adolescents with sickle cell disease in sub-Saharan Africa: A cross-sectional study. *BMC Hematology*, *19*, 1–9.

Kamio, T., Kajiwara, A., Iizuka, Y., Shiotsuka, J., & Sanui, M. (2018). Frequency of vital sign measurement among intubated patients in the general ward and nurses' attitudes toward vital sign measurement. *Journal of Multidisciplinary Healthcare*, *11*(null), 575–581. https://doi.org/10.2147/JMDH.S179033

Kato, G. J., Piel, F. B., Reid, C. D., Gaston, M. H., Ohene-Frempong, K., Krishnamurti, L., Smith, W. R., Panepinto, J. A., Weatherall, D. J., & Costa, F. F. (2018). Sickle cell disease. *Nature Reviews Disease Primers*, *4*(1), 1–22.

Kaur, M., Brown, M., Love, T. W., Thompson, A., Treadwell, M., & Smith-Whitley, K. (2020). Understanding sickle cell disease: Impact of surveillance and gaps in knowledge. *Blood Advances*, *4*(3), 496–498.

Kavanagh, P. L., & Hirshon, J. M. (2020). EDSC3: Working to improve emergency department care of individuals with sickle cell disease. *Annals of Emergency Medicine*, *76*(3), S80–S82.

Kawaza, K., Kinshella, M.-L. W., Hiwa, T., Njirammadzi, J., Banda, M., Vidler, M., Newberry, L., Nyondo-Mipando, A. L., Dube, Q., Molyneux, E., & Goldfarb, D. M. (2020). Assessing quality of newborn care at district facilities in Malawi. *BMC Health Services Research*, *20*(1), 227. https://doi.org/10.1186/s12913-020-5065-2

Kayambankadzanja, R. (2020). Emergency and critical care services in Malawi: Findings from a nationwide survey of health facilities. *Malawi Medical Journal*, *32*(1), 19–23. https://doi.org/10.4314/mmj.v32i1.5

Keiffer, M. R. (2015). Utilization of clinical practice guidelines: Barriers and facilitators. *The Nursing Clinics of North America*, *50*(2), 327–345. https://doi.org/10.1016/j.cnur.2015.03.007

Kemp, H., Bantel, C., Gordon, F., Brett, S., PLAN, SEARCH, Laycock, H., Bampoe, S., Bantel, C., & Gooneratne, M. (2017). Pain Assessment in INT ensive care (PAINT): An observational study of physician-documented pain assessment in 45 intensive care units in the United Kingdom. *Anaesthesia*, *72*(6), 737–748.

Kilonzi, M., Mlyuka, H. J., Felician, F. F., Mwakawanga, D. L., Chirande, L., Myemba, D. T., ... & Sirili, N. (2021). Barriers and facilitators of use of hydroxyurea among children with sickle cell disease: experiences of stakeholders in Tanzania. *Hemato*, *2*(4), 713-726.

Khuluza, F., & Haefele-Abah, C. (2019). The availability, prices and affordability of essential medicines in Malawi: A cross-sectional study. *PloS One*, *14*(2), e0212125. https://doi.org/10.1371/journal.pone.0212125

Korkortsi, R. E. K. (2021). Assessment of Quality of Care for Children with Sickle Cell Disease in the South Tongu District of Ghana: Nurses' Perspective. *Asian Journal of Research in Nursing and Health*, 58–74.

Kovacs, R., & Lagarde, M. (2022). Does high workload reduce the quality of healthcare? Evidence from rural Senegal. *Journal of Health Economics*, *82*, 102600.

Kredo, T., Bernhardsson, S., Machingaidze, S., Young, T., Louw, Q., Ochodo, E., & Grimmer, K. (2016). Guide to clinical practice guidelines: The current state of play. *International Journal for Quality in Health Care: Journal of the International Society for Quality in Health Care*, *28*(1), 122–128. https://doi.org/10.1093/intqhc/mzv115

Krüger, C., Heinzel-Gutenbrunner, M., & Ali, M. (2017). Adherence to the integrated management of childhood illness guidelines in Namibia, Kenya, Tanzania and Uganda:

Evidence from the national service provision assessment surveys. *BMC Health Services Research*, *17*(1), 1–12.

Kruk, M. E., Gage, A. D., Arsenault, C., Jordan, K., Leslie, H. H., Roder-DeWan, S., Adeyi, O., Barker, P., Daelmans, B., & Doubova, S. V. (2018). High-quality health systems in the Sustainable Development Goals era: Time for a revolution. *The Lancet Global Health*, *6*(11), e1196–e1252.

Lakkakula, B. V., Sahoo, R., Verma, H., & Lakkakula, S. (2018). Pain management issues as part of the comprehensive care of patients with sickle cell disease. *Pain Management Nursing*, *19*(6), 558–572.

Lee, L., Smith-Whitley, K., Banks, S., & Puckrein, G. (2019). Reducing Health Care Disparities in Sickle Cell Disease: A Review. *Public Health Reports (Washington, D.C.: 1974)*, *134*(6), 599–607. https://doi.org/10.1177/0033354919881438

Liguoro, I., Arigliani, M., Singh, B., Rees, D., Inusa, B. P., & Gupta, A. (2021). Long-term oxygen therapy in children with sickle cell disease and hypoxaemia. *Archives of Disease in Childhood*, *106*(3), 258–262.

Linhares, M. B. M., Oliveira, N. C., Doca, F. N., Martinez, F. E., Carlotti, A. P. P., & Finley, G. A. (2014). Assessment and management of pediatric pain based on the opinions of health professionals. *Psychology & Neuroscience*, *7*, 43–53.

Lunyera, J., Jonassaint, C., Jonassaint, J., & Shah, N. (2017). Attitudes of primary care physicians toward sickle cell disease care, guidelines, and comanaging hydroxyurea with a specialist. *Journal of Primary Care & Community Health*, *8*(1), 37–40.

Macharia, A. W., Mochamah, G., Uyoga, S., Ndila, C. M., Nyutu, G., Makale, J. (2018). The clinical epidemiology of sickle cell anemia in Africa. *American journal of Hematology*, 93(3), 363-370. https://doi.org/10.1002/ajh.24986.

Martin, O., Thompson, S., Carroll, A., & Jacob, S. (2020). Emergency Department Provider Survey Regarding Acute Sickle Cell Pain Management. *Journal of Pediatric Hematology/Oncology*, *42*(6), 375–380. https://doi.org/doi: 10.1097/MPH.0000000000001843.

Masefield, S. C., Msosa, A., & Grugel, J. (2020). Challenges to effective governance in a low income healthcare system: A qualitative study of stakeholder perceptions in Malawi. *BMC Health Services Research*, *20*(1), 1142. https://doi.org/10.1186/s12913-020-06002-x

Masese, R. V., Bulgin, D., Douglas, C., Shah, N., & Tanabe, P. (2019). Barriers and facilitators to care for individuals with sickle cell disease in central North Carolina: The emergency department providers' perspective. *PLoS One*, *14*(5), e0216414.

Mbiya, B. M., Disashi, G. T., & Gulbis, B. (2020). Sickle Cell Disease in the Democratic Republic of Congo: Assessing Physicians' Knowledge and Practices. *Tropical Medicine and Infectious Disease*, *5*(3), Article 3. https://doi.org/10.3390/tropicalmed5030127

McCance, K. L., & Huether, S. E. (2016). *Pathophysiology: The Biologic Basis for Disease in Adults and Children* (8th Ed.). Elsevier.

McGann, PT, Williams, AM, Ellis, G, McElhinney, KE, Romano, L, Woodall, J, et al. Prevalence of Inherited Blood Disorders and Associations with Malaria and Anemia in Malawian Children. Blood Adv (2018). 2:3035–44. doi:10.1182/ bloodadvances.2018023069

Ministry of Health. (2023). | *Malawi Health Sector Strategic Plan III 2023-2030* (1st ed.). Ministry of Health. Lilongwe

Ministry of Health and Population. (2018). *Malawi National Health Policy: Towards universal health coverage.* Government of Malawi.

Ministry of Health. (2021). *Malawi Child Health Strategy II.* Ministry of Health. Lilongwe.

Moeti, M. R., Brango, P., Nabyonga-Orem, J., & Impouma, B. (2023). Ending the burden of sickle cell disease in Africa. *The Lancet Haematology*, 10(8), e567-e569. https://doi.org/10.1016/S2352-3026(23)00120-5.

Mokhtar, K. M. (2019). Nurses Knowledge Regarding Sickle Cell Disease among Children-National Ribat University Hospital 2018. *Nursing & Healthcare International Journal*, *3*(5). https://doi.org/10.23880/NHIJ-16000202

Mpaata, K. A., Lubogoyi, B., & Okiria, J. C. (2017). *Resources Availability and Quality of Patient Care Services in Public Hospitals in Uganda:"Expert Patients" Perspectives*.

Msiska, G., Simwaka, A., Munkhondya, B., Kabuluzi, E., & Munkhandya, T. (2018). Factors Militating against the Delivery of Compassionate Care: A Malawian Perspective. *Open Journal of Nursing*, *12*(8), 889–904. https://doi.org/doi: 10.4236/ojn.2018.812067.

Mugyenyi, G. R., Ngonzi, J., Wylie, B. J., Haberer, J. E., & Boatin, A. A. (2021). Quality of vital sign monitoring during obstetric hospitalizations at a regional referral and teaching hospital in Uganda: An opportunity for improvement. *Pan African Medical Journal*, *38*(1).

Muslu, C. S., Kopetsky, M., Nimmer, M., Visotcky, A., Fraser, R., & Brousseau, D. C. (2020). The association between timely opioid administration and hospitalization in children with sickle cell disease presenting to the emergency department in acute pain. *Pediatric Blood & Cancer*, *67*(9), e28268.

Musy, S. N., Endrich, O., Leichtle, A. B., Griffiths, P., Nakas, C. T., & Simon, M. (2021). The association between nurse staffing and inpatient mortality: A shift-level retrospective longitudinal study. *International Journal of Nursing Studies*, *120*, 103950.

National, Heart, Lung and Blood Institute. (2014). *Evidence-Based Management of Sickle Cell Disease Expert Panel Report, 2014*. http://www.nhlbi.nih.gov/guidelines

National Statistical Office (NSO) 2024). *Malawi Demographic and Health Survey 2024* Zomba, Malawi, and Rockville, Maryland, USA.

Ngonde, A.-C. M., Fina, J.-P. L., Burgueno, E., & Lukanu, P. N. (2024). Knowledge and practices of sickle cell disease among healthcare providers in Kinshasa, Democratic Republic of the Congo. *African Journal of Primary Health Care & Family Medicine*, *16*(1), 3631.

Ogamba, C. F., Akinsete, A. M., Mbaso, H. S. & Adesina, O. A. (2020). Health insurance and the financial implications of sickle cell disease among parents of affected children attending a tertiary facility in Lagos, south-west Nigeria. *Pan African Medical Journal*, 36(1). https://doi.org/10.11604/pamj.2020.36.227.24636.

Ogero, M., Ayieko, P., Makone, B., Julius, T., Malla, L., Oliwa, J., Irimu, G., English, M., & Group, on behalf of the C. I. N. author. (2018). An observational study of monitoring of vital signs in children admitted to Kenyan hospitals: An insight into the quality of nursing care? *Journal of Global Health*, *8*(1). https://doi.org/10.7189/jogh.08.010409

Ojo, A. S., Ojukwu, S., Asmare, W., Odipe, O., & Larbi, D. (2022). Intravenous Fluid Administration and the Risk of Adverse Outcomes in Sickle Cell Disease Patients Hospitalized for Vaso-Occlusive Crisis. *Journal of Hematology*, *11*(5), 159.

Oleribe, O. O., Momoh, J., Uzochukwu, B. C., Mbofana, F., Adebiyi, A., Barbera, T., Williams, W., & TaylorRobinson, S. D. (2019). Identifying Key Challenges Facing Healthcare Systems In Africa And Potential Solutions. *International Journal of General Medicine*, 395–403. https://doi.org/10.2147/IJGM.S223882

Olusesan, F. J., Simeon, O. O., Olatunde, O. E., Oludare, O. I., & Tolulope, A. O. (2017). Prescription audit in a paediatric sickle cell clinic in South-West Nigeria: A cross-sectional retrospective study. *Malawi Medical Journal: The Journal of Medical Association of Malawi*, *29*(4), 285–289. https://doi.org/10.4314/mmj.v29i4.1

Open Guidelines, (2018). Electronic protocols for the management of common childhood illnesses in Malawi. Available: https:// play. google. com/ store/ apps/ details? id= net. misssophie. www. openguidelines& hl= en& gl= US

Opoku-Agyakwa, M., Lawson, H. J., & Olayemi, E. (2023). Comparative analysis of opioid use in SCC in an urban facility in Ghana. *eJHaem*.

Opondo, C., Allen, E., Todd, J., & English, M. (2018). Association of the Paediatric Admission Quality of Care score with mortality in Kenyan hospitals: A validation study. *The Lancet Global Health*, *6*(2), e203–e210.

Oppong–Mensah, Y. G., Odoom, S. F., Nyanor, I., Amuzu, E. X., Yawnumah, S. A., Asafo-Adjei, E., Nguah, S. B., Ansong, D., Osei-Akoto, A., & Paintsil, V. (2023). Hospitalizations among children with sickle cell disease enrolled in the Kumasi Sickle Cell Pan African Consortium (SPARCo) database: A cross sectional study. *Health Science Reports*, *6*(9), e1534.

Oron, A. P., Chao, D. L., Ezeanolue, E. E., Ezenwa, L. N., Piel, F. B., Ojogun, O. T., Uyoga, S., Williams, T. N., & Nnodu, O. E. (2020). Caring for Africa's sickle cell children: Will we rise to the challenge? *BMC Medicine*, *18*(1), 1–8.

Oshikoya, K., A., Edun, B., & Oreagba, I., A. (2015). Acute pain management in children with sickle cell anaemia during emergency admission to a teaching hospital in Lagos, Nigeria. *South African Journal of Child Health*, *9*(4), 119–123. https://doi.org/DOI:10.7196/SAJCH.2015.v9i4.968

Osunkwo, I., O'Connor, H. F., & Saah, E. (2020). Optimizing the management of chronic pain in sickle cell disease. *Hematology 2014, the American Society of Hematology Education Program Book*, *2020*(1), 562–569.

Oyeku, S. O., & Faro, E., Z. (2017). Rigorous and practical quality indicators in sickle cell disease care. *Hematology Am Soc Hematol Educ Program*, *2017*(1), 418-422. https://doi.org/10.1182/asheducation-2017.1.418

Ozdemir, N. G. (2019). The development of nurses' individualized care perceptions and practices: Benner's novice to expert model perspective. *International Journal of Caring Sciences*, *12*(2), 1279–1285.

Paquin, H., D. Trottier, E., Robitaille, N., Pastore, Y., Dore Bergeron, M.-J., & Bailey, B. (2019). Oral morphine protocol evaluation for the treatment of vaso-occlusive crisis in paediatric sickle cell patients. *Paediatrics & Child Health*, *24*(1), e45–e50. https://doi.org/10.1093/pch/pxy074

Piel, F. B., Hay, S. I., Gupta, S., Weatherall, D. J., & Williams, T. N. (2013). Global burden of sickle cell anaemia in children under five, 2010-2050: Modelling based on demographics, excess mortality, and interventions. *PLoS Medicine*, *10*(7), e1001484. https://doi.org/10.1371/journal.pmed.1001484

Polit, D., & Beck, C. (2018). *Essentials of Nursing Research: Appraising Evidence for Nursing Practice* (9th ed) Philadelphia. Lippincott Williams & Wilkins.

Polit, D., F., & Beck, C., T. (2017). *Nursing Research: Generating and Assessing Evidence for Nursing Practice.* (10th ed.) Philadelphia. Wolters Kluwer Health.

Rai, P., & Ataga, K. I. (2023). Using disease-modifying therapies in sickle cell disease. *Hematology*, *2023*(1), 519–531.

Ranque, B., Kitenge, R., Ndiaye, D. D., Ba, M. D., Adjoumani, L., Traore, H., ... & Diagne, I. (2022). Estimating the risk of child mortality attributable to sickle cell anaemia in sub-Saharan Africa: a retrospective, multicentre, case-control study. *The Lancet Haematology*, *9*(3), e208-e216.

Redley, B., & Raggatt, M. (2017). Use of standard risk screening and assessment forms to prevent harm to older people in Australian hospitals: A mixed methods study. *BMJ Quality & Safety*, *26*(9), 704–713.

Rees, C. A., Brousseau, D. C., Ahmad, F. A., Bennett, J., Bhatt, S., Bogie, A., Brown, K. M., Casper, T. C., Chapman, L. L., & Chumpitazi, C. E. (2022). Adherence to NHLBI guidelines for the emergent management of vaso-occlusive episodes in children with sickle cell disease: A multicenter perspective. *American Journal of Hematology*, *97*(11), E412–E415.

Rios-Zertuche, D., Zúñiga-Brenes, P., Palmisano, E., Hernández, B., Schaefer, A., Johanns, C. K., Gonzalez-Marmol, A., Mokdad, A. H., & Iriarte, E. (2019). Methods to measure quality of care and quality indicators through health facility surveys in low- and middle-income countries. *International Journal for Quality in Health Care*, *31*(3), 183–190. https://doi.org/10.1093/intqhc/mzy136

Ruiz Morilla, M. D., Sans, M., Casasa, A., & Giménez, N. (2017). Implementing technology in healthcare: Insights from physicians. *BMC Medical Informatics and Decision Making*, *17*, 1–9.

Salinas Cisneros, G., & Thein, S. L. (2020). Recent advances in the treatment of sickle cell disease. *Frontiers in Physiology*, 11, 435. https://doi.org/10.3389/fphys.2020.00435

Sansone, L., Gentile, C., Grasso, E. A., Di Ludovico, A., La Bella, S., Chiarelli, F., & Breda, L. (2023). Pain evaluation and treatment in children: A practical approach. *Children*, *10*(7), 1212.

Serjeant, G. R., Chin, N., Asnani, M. R., Serjeant, B. E., Mason, K. P., Hambleton, I. R., et al. (2018). Causes of death and early life determinants of survival in homozygous sickle cell disease: the Jamaican cohort study from birth. *PLoS One*, 13:e0192710.

Schefft, M. R., Swaffar, C., Newlin, J., Noda, C., & Sisler, I. (2018). A novel approach to reducing admissions for children with sickle cell disease in pain crisis through individualization and standardization in the emergency department. *Pediatric Blood & Cancer*, *65*(10), e27274.

Schimpff, T. R. (2019). *Therapists' Experiences of Trauma, Compassion Fatigue, and Compassion Satisfaction: The Role of Post Traumatic Growth*.

Seaser, J., Thomson, J., Brunsman, A., & Patel, N. (2022). Evaluation of guideline-recommended pain management in acute SCC and its effect on patient outcomes. *Journal of Pain & Palliative Care Pharmacotherapy*, *36*(3), 152–158.

Shah, N., Bhor, M., Xie, L., Paulose, J., & Yuce, H. (2020). Medical resource use and costs of treating sickle cell-related vaso-occlusive crisis episodes: A retrospective claims study. *Journal of Health Economics and Outcomes Research*, *7*(1), 52.

Sinkala, D., 1 2 1 2, Fleming, LC, 1 2 1 2, J. K. H., & Silwimba F. (2018). Health Services Access for Young Children with Sickle Cell Anaemia in the Chilubi District of Zambia. *Medical Journal of Zambia*, *45*(3), 133–137.

Smart, L. R., Hernandez, A. G., & Ware, R. E. (2018). *Sickle cell disease: Translating clinical care to low-resource countries through international research collaborations*. *55*(2), 102–112.

Smeland, A. H., Twycross, A., Lundeberg, S., & Rustøen, T. (2018). Nurses' knowledge, attitudes and clinical practice in pediatric postoperative pain management. *Pain Management Nursing*, *19*(6), 585–598.

Smeltzer, M. P., Howell, K. E., Treadwell, M., Preiss, L., King, A. A., Glassberg, J. A., Tanabe, P., Badawy, S. M., DiMartino, L., Gibson, R., Kanter, J., Klesges, L. M., & Hankins, J. S. (2021). Identifying barriers to evidence-based care for sickle cell disease: Results from the Sickle Cell Disease Implementation Consortium cross-sectional survey of

healthcare providers in the USA. *BMJ Open*, *11*(11), e050880. https://doi.org/10.1136/bmjopen-2021-050880

Smith, S. G., & Sinkford, J. C. (2022). Gender equality in the 21st century: Overcoming barriers to women's leadership in global health. *Journal of Dental Education*, *86*(9), 1144–1173.

Stavropoulou, A., Rovithis, M., Kelesi, M., Vasilopoulos, G., Sigala, E., Papageorgiou, D., Moudatsou, M., & Koukouli, S. (2022). What Quality of Care Means? Exploring Clinical Nurses' Perceptions on the Concept of Quality Care: A Qualitative Study. *Clinics and Practice*, *12*(4), 468–481. https://doi.org/10.3390/clinpract12040051

Stewart, K. A., Parshad-Asnani, M., Wonkam, A., Bollinger, J., Bitoungui, V. N., Wonkam-Tingang, E., Powell, J., Desronvil, K., Benson, K. R., & Clark, A. (2021). "Pain is subjective": A mixed-methods study of provider attitudes and practices regarding pain management in sickle cell disease across three countries. *Journal of Pain and Symptom Management*, *61*(3), 474–487.

Taber, K.S. The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Res Sci Educ* **48**, 1273–1296 (2018). https://doi.org/10.1007/s11165-016-9602-2

Tanhehco, Y. C., Nathu, G., & Vasovic, L. V. (2022). Development of curative therapies for sickle cell disease. *Frontiers in Medicine*, *9*, 1055540.

Tawfik, D. S., Scheid, A., Profit, J., Shanafelt, T., Trockel, M., Adair, K. C., Sexton, J. B., & Ioannidis, J. P. (2019). Evidence relating health care provider burnout and quality of care: A systematic review and meta-analysis. *Annals of Internal Medicine*, *171*(8), 555–567.

Thomson, A. M., McHugh, T. A., Oron, A. P., Teply, C., Lonberg, N., Tella, V. V., Wilner, L. B., Fuller, K., Hagins, H., & Aboagye, R. G. (2023). Global, regional, and national prevalence and mortality burden of sickle cell disease, 2000–2021: A systematic analysis from the Global Burden of Disease Study 2021. *The Lancet Haematology*, *10*(8), e585–e599.

Tonin, F. S., Ginete, C., Ferreira, J., Delgadinho, M., Santos, B., Fernandez-Llimos, F., & Brito, M. (2023). Efficacy and safety of pharmacological interventions for managing sickle cell disease complications in children and adolescents: Systematic review with network meta-analysis. *Pediatric Blood & Cancer*, *70*(6), e30294.

Tsouana, E., Fathani, A., Tuffin, N., Fadheel, S., & Ominu-Evbota, K. (2021). 827 Observations, variations and challenges in managing continued opiate analgesia for children admitted with severe and persistent SCC pain. *Archives of Disease in Childhood*, *106*(Suppl 1), A128–A128. https://doi.org/10.1136/archdischild-2021-rcpch.221

Tsugawa, Y., Jena, A. B., Figueroa, J. F., Orav, E. J., Blumenthal, D. M., & Jha, A. K. (2017). Comparison of hospital mortality and readmission rates for Medicare patients treated by male vs female physicians. *JAMA Internal Medicine*, *177*(2), 206–213.

UNC. (2020). *Malawi-based team receives $500,000 to improve capacity for sickle cell care, research*. severe nursing shortages, gross lack of essential supplies and equipment

Uwaezuoke, S. N., Ayuk, A. C., Ndu, I. K., Eneh, C. I., Mbanefo, N. R., & Ezenwosu, O. U. (2018). Vaso-occlusive crisis in sickle cell disease: Current paradigm on pain management. *Journal of Pain Research*, *11*, 3141–3150. https://doi.org/10.2147/JPR.S185582

Vasconez, W. A., Aguilar-Velez, C., Matheus, C., Sosa, M. A., Diaz, Y., Narahari, P., Middleton, R. D., Sterling, S., Rogers, B., Plunkett, V., & Chavez, H. (2020). Optimizing Pain Management for Children with Sickle Cell Disease Vaso-Occlusive Crisis in the Emergency Department. *Blood*, *136*, 44. https://doi.org/10.1182/blood-2020-139909

Wachepa, S., Bvalani, R., Namubiru, T., Namugerwa, S., Kaudha, G., Mpasa, A., Munube, D., Rujumba, J., Ozuah, N., & Kiguli, S. (2022). Health-related quality of life of patients with sickle cell disease aged 8–17 years at Kamuzu Central Hospital, Malawi. *Pediatric Blood & Cancer*, *69*(10), e29876.

Wang, C. J., Kavanagh, P. L., Little, A. A., Holliman, J. B., & Sprinz, P. G. (2011b). Quality-of-care indicators for children with sickle cell disease. *Pediatrics*, *128*(3), 484–493. https://doi.org/10.1542/peds.2010-1791

Wichelt, N. (2018). *Health Professional Treatment Practices for Pediatric Sickle Cell Disease in Nigeria*.

Wong, C., Lau, E., Palozzi, L., & Campbel, F. (2012). Pain management in children: Part 2—A transition from codeine to morphine for moderate to severe pain in children. *Canadian Pharmacists Journal/Revue Des Pharmaciens Du Canada*, *145*(6), 276–279.

Wonkam, A., & Makani, J. (2019). Sickle cell disease in Africa: An urgent need for longitudinal cohort studies. *The Lancet. Global Health*, *7*(10), e1310–e1311. https://doi.org/10.1016/S2214-109X(19)30364-X

World Health Organization. (2016). *Global strategy on human resources for health: Workforce 2030*.

World Health Organization. (2018). *Delivering quality health services: A global imperative*. OECD Publishing.

World Health Organization, World Bank Group, & OECD. (2018). *Delivering Quality Health Services: A Global Imperative for Universal Health Coverage*. Geneva: World Health Organization. https://doi.org/10.1596/978-92-4-151390-6

Yacoub, M. I., Zaiton, H. I., Abdelghani, F. A., & Elshatarat, R. A. (2019). Effectiveness of an Educational Program on Nurses' Knowledge and Practice in the Management of Acute Painful Crises in Sickle Cell Disease. *Journal of Continuing Education in Nursing*, *50*(2), 87–95. https://doi.org/10.3928/00220124-20190115-08

Yawn, B. P., Buchanan, G. R., Afenyi-Annan, A. N., Ballas, S. K., Hassel, l K. I., James, A. H., Jordan, L., Lanzkron, S. M., Lottenberg, R., Savage, W. J., Tanabe, P. J., Ware, R. E., Murad, M. H., Goldsmith, J. C., Ortiz, E., Fulwood, R., Horton, A., & John-Sowah, J. (2014). Management of sickle cell disease: Summary of the 2014 evidence-based report by expert panel members. *JAMA*, *312*(10). https://doi.org/10.1001/jama.2014.10517

Zieliński, J., Morawska-Kochman, M., & Zatoński, T. (2020). Pain assessment and management in children in the postoperative period: A review of the most commonly used postoperative pain assessment tools, new diagnostic methods and the latest guidelines for postoperative pain therapy in children. *Adv Clin Exp Med*, *29*(3), 365–374.

APPENDICES

Appendix 1: CONSENT FORM

Mzuzu University Research Ethics Committee (MZUNIREC)

Informed Consent Form for Research in

Hospital – Based Quality of Care for Children with Sickle Cell Crisis in Northern Malawi.

Introduction

I am **Maria Kumwenda** from **Mzuzu University**. We are doing research on **Hospital – Based Quality of Care for Children with Sickle Cell Crisis in Northern Malawi.** This consent form may contain words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them of me or of another researcher.

Purpose of the research

This research aims to assess the quality of care provided to hospitalized children in Sickle Cell Crisis at MCH, RDH and Ekwendeni hospitals.

Type of Research Intervention

This research will involve your participation in a group discussion and/or individual interview.

Participant Selection

You are being invited to take part in this research because **you are one of the care providers to children who are in Sickle Cell Crisis**.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. If you choose not to participate nothing will change. You may skip any question and move on to the next question.

Duration

The research takes place for a period of **three months form data collection to reporting**.

Risks

You do not have to answer any question or take part in the discussion/interview/survey if you feel the question(s) are too personal or if talking about them makes you uncomfortable.)

Reimbursements

You will not be provided any incentive to take part in the research.

Sharing the Results

The knowledge that we get from this research will be shared with you and your community before it is made widely available to the public. Following, we will publish the results so other interested people may learn from the research.

Who to Contact

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact: Maria Kumwenda**,** Mzuzu University**,** P/Bag 201, Luwinga, Mzuzu 2, Phone : 0888507408/0998735048; Mrs. E Phiri**,** Mzuzu University**,** P/Bag 201, Luwinga, Mzuzu 2, Phone: 0999947828/0881305836; Dr. F. Mpasa, Mzuzu University, P/Bag 201, Luwinga, Mzuzu 2, Phone: 0888317160

This proposal has been reviewed and approved by Mzuzu University Research Ethics Committee (MZUNIREC) which is a committee whose task it is to make sure that research participants are protected from harm. If you wish to find about more about the Committee, contact Mr. Gift Mbwele, Mzuzu University Research Ethics Committee (MZUNIREC) Administrator, Mzuzu University, P/Bag 201, Luwinga, Mzuzu 2, Phone: 0999404008/0888641486

Do you have any questions?

Part II: Certificate of Consent

I have been invited to participate in research about **Hospital – Based Quality of Care for Children with Sickle Cell Crisis in Northern Malawi**.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

Print Name of Participant_____

Signature of Participant _____

Date _____

Day/month/year

If illiterate [1]

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that t ual has given consent freely.

Print name of witness_____ **Thumb print of participant**

[1] A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

Signature of witness _____

Date _____

Day/month/year

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands the research project. I confirm the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Signature of Researcher /person taking the consent_____

Date _____

Day/month/year

Appendix 2: CHECKLIST FOR CASE FILE REVIEWS

Name of Health Facility: _____

File Code Number: _____

Name of Reviewer: _____

Date of Review: _____

AREAS OF REVIEW	**YES** **1**	**NO** **2**
Initial Care During Crisis		
1. Thorough History Taking o Blood transfusions o Painful crises o Infections and triggering events o Complication development o Clinic reviews o Treatment adherence		
2. Review of previous records		
3. Complete physical examination and complication o Pallor o Jaundice o Chest and lungs o Splenomegaly o Bone tenderness o Frontal bossing		
4. Laboratory Investigations o PCV o MPs /MRDT o FBC+red cell morphology, reticulocytes o Blood culture – if fever < 38.5 ºC o Others guided by complaints e. g. X-ray, LP, urea, and electrolytes		

5. Supplemental oxygen even if saturations are normal		
6. Pain Management o Initial pain assessment using the pain assessment tool		
o Classify pain intensity accordingly		
o Provide pain relief medication within 30 minutes of triage and 60 minutes of admission		
o Appropriate pain relief medication administration • Severe pain: morphine + paracetamol +Ibuprofen or Diclofenac		
• Moderate pain: Codeine +Paracetamol + Ibuprofen or Diclofenac		
• Mild pain: Paracetamol / Ibuprofen		
• Initiate around-the-clock opioid administration by patient-controlled analgesia		
7. Fluid Management • Administer intravenous fluids normal saline and 5% dextrose in saline		
• Proper maintenance fluids calculation (1.5 x maintenance in 24 hours)		
• Encourage oral fluids		
General Supportive Care		
8. Blood Transfusion • Administers blood transfusion in acute chest syndrome, Hb < 5g/dL, aplastic crisis, acute splenic sequestration, severe cardiac failure		
• Administers correct volume of blood: 10ml/kg packed cells or 20mll/kg if whole blood		
9. Assessment of vital signs (temperature, pulse rate, respiration, and blood pressure), work of breathing, and oxygen saturation regularly		
10. Monitoring side effects of opioids (nausea, vomiting, pruritis, constipation, and urinary retention) after each pain relief medication		

11. Provide parenteral antibiotics(cephalosporins – ceftriaxone) against streptococcus pneumonia and gram-negative enteric organisms		
12. Monitoring renal function daily (including serum creatinine and fluid intake/output)		
13. Subsequent reviews by clinician/ doctor		

The Checklist has been developed from World Health Organization: Guidelines for Management of Sickle Cell Disease 1991, National Heart, Lung, and Blood Institute: Evidence-Based Management of Sickle Cell Disease Expert Panel Report, 2014, and Queens Pediatric Guidelines: Protocols for the Management of Common Childhood Illnesses in Malawi

Appendix 3: STRUCTURED QUESTIONNAIRE

HEALTH CARE PROVIDERS' QUESTIONNAIRE

Name of Health Facility: …….…….

Participant Code Number……..…

Date of Interview……..…

SECTION A: DEMOGRAPHIC DATA

Instruction: Tick against the appropriate response

1. Participant's Age Range:

   25 – 34 ❑

   35 – 44 ❑

   45 – 54 ❑

   Above 55 ❑

2. Gender:

   Male ❑

   Female ❑

3. Professional Qualification

   Medical Doctor ❑

   Clinical Office ❑

   Clinical Technician ❑

   Nurse Registered ❑

Nurse Midwife Technician ❑

4. Years of clinical work experience in Pediatric ward:

   2- 5 years ❑

   6- 10 years ❑

   More than 10years ❑

5. Do you have any added responsibility at the institution? Yes ❑ No ❑

   If yes specify ……

6. Have you specialized in any area? Yes ❑ No ❑

   If yes specify …….

7. Have you been trained in the management of sickle cell disease? Yes ❑ No ❑

   If yes when ……

8. Are you comfortable to manage children in SCC

   Yes ❑ No ❑

SECTION B: AVAILABILITY OF RESOURCES

Please kindly share your opinion about the availability of inputs and resources for quality SCC care at this hospital.

Please indicate by ticking if the following inputs are available or not available.

ITEMS	**RESPONSE**	
	Available	**Not Available**
	1	**2**

1.	Vital signs monitoring tool		
2.	Oxygen Concentrator		
3.	Nasal Prongs/ Face mask		
4.	Thermometers		
5.	Intravenous fluids Normal Saline		
6.	SCD management guidelines		
7.	Antibiotics		
8.	Pain assessment tool		
9.	Pain relief medication • Paracetamol • Ibuprofen/Diclofenac • Morphine		
10.	Laboratory facilities • FBC • Sickle Cell Test • Blood Culture • MPS/MRDT		
11.	• Availability of Blood		

SECTION C: CHALLENGES FOR DELIVERY OF QUALITY CARE FOR CHILDREN WITH SICKLE CELL CRISIS

Please kindly share your opinion about the availability of inputs and resources for quality Sickle Cell Crisis care at this hospital.

Please indicate by ticking the appropriate box the extent to which you agree or disagree with the statements below.

ITEMS	**RESPONSE**				
	Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**

	1	2	3	4	5
1. There is adequate clinical and nursing staff to provide patient care					
2. The hospital has guidelines for managing SCD					
3. There are sufficient supplies to provide service to children with Sickle Cell Crisis					
4. Oxygen concentrator for oxygenation is readily available					
5. Pain assessment tools/charts are available for assessing pain in the ward					
6. Children who are in crisis are given pain relief medication according to guidelines					
7. I regularly assess pain using pain assessment tools and give appropriate analgesics for pain relief					
8. I am confident in managing children with Sickle Cell Crisis					
9. I always use guidelines when managing patients with Sickle Cell Crisis					
10. I make conscious efforts to improve my knowledge and skills in my nursing practice					
11. I document all care provided to children with Sickle Cell Crisis in appropriate records					

12. I suggest the implementation of patient care where necessary for improving the quality of care rendered					
13. I am satisfied with the care provided to children with Sickle Cell Crisis at this hospital					
14. I usually get support from management when in problems related to care of a child with Sickle Cell Crisis					
15. Children and their guardians report of receiving good care at this hospital					
16. There is always adequate number of health care workers on duty to take care of children in Sickle Cell Crisis					

Thank you for your participation

Appendix 4: Sickle Cell Crisis MANAGEMENT GUIDELINES

Painful and vaso -oclussive crisis

Oxygen

- Oxygen stops the sickling of RBC's. all children presenting with SCC should be started on oxygen, even if saturations are normal

Fluids:

- Per 24 hours give 1.5 X maintenance fluids IV
- Encourage lots of oral hydration

Analgesia: Regular Medicine, not PRN

- Severe pain: morphine + paracetamol +Ibuprofen or Diclofenac
- Moderate pain: Codeine +Paracetamol + Ibuprofen or Diclofenac
- Mild pain: Paracetamol / Ibuprofen
- ONLY if no morphine available, give pethidine as an alternative

Infections and fever (functional asplenia from 6 months)

- Sepsis (usually S. pneumo): Ceftriaxone
- Meningitis (usually S. pneumo): Ceftriaxone for 2 weeks
- Acute chest syndrome: Ceftriaxone
- Salmonella Oesteomylitis: (IV antibiotics Ceftriaxone for 2 weeks) then consider change to oral antibiotics (Ciprofloxacin). Aim for total duration of antibiotics 4-6 weeks
- Always check for malaria parasites

Anaemia:

- Blood Transfusion
- Administers blood transfusion in acute chest syndrome, Hb < 5g/dL, aplastic crisis, acute splenic sequestration, severe cardiac failure
- Administers correct volume of blood: 10ml/kg packed cells or 20mll/kg if whole blood

Patient Monitoring

- Assessment of vital signs (temperature, pulse rate, respiration, and blood pressure), work of breathing, and oxygen saturation regularly
- Monitoring renal function daily (including serum creatinine and fluid intake/output)
- Subsequent reviews by clinician/ doctor

Guidelines for Management of Sickle Crisis, National Heart, Lung, and Blood Institute: Evidence-Based Management of Sickle Cell Disease Expert Panel Report, 2014, and Open Guidelines: Protocols for the Management of Common Childhood Illnesses in Malawi, 2018.

Appendix 5: LETTERS OF PERMISSION

LETTER OF PERMISSIOMN FROM Mzuzu Central Hospital

Telephone: 01320916/878
Fax: 320223/320973/878
Email:
mzuzucentraldirector@gmail.com

In reply please quote No. ....
The Hospital Director
Mzuzu Central Hospital
P/Bag 209
Luwinga
Mzuzu 2

25th April, 2023

Maria Kumwenda
Mzuzu University,
Private Bag 280
Mzuzu

Cell: +2658888507408
Email:

Dear Maria Kumwenda,

PERMISSION TO CONDUCT A RESEARCH STUDY AT MZUZU CENTRAL HOSPITAL

Reference is made to your email received on Wednesday 12 April, 2023 in which you are seeking permission to conduct a research study titled ***"Hospital-Based Quality of Care for Children with Sickle-Cell Crisis in Northern Region"*** at Mzuzu Central Hospital (MCH). MCH Research Committee has now reviewed your study protocol and I am pleased to inform you that permission has been granted. You can use this letter as evidence of support from an institution (MCH) when seeking ethical clearance from COMREC/NHSRC/NCST or any other recognized Institutional Review Board (IRB).

Note: Please take note that MCH policy requires that you pay a financial contribution to the institution which is pegged at 5% of your total research budget before you can start implementing your study at the facility. If the study will be implemented in multiple sites an appropriate amount shall be determined taking into account the number of sites in which the study is to be implemented. Payment is strictly through National Bank of Malawi, Mzuzu Central Hospital Research and Partnership Account, Current account number **1004797902**.

When you are ready for data collection at MCH you will be required to present this letter, ethical approval letter from a recognized ethical review body and evidence of payment of the stipulated fees to the Chairperson of MCH Research Committee before you can begin data collection. We trust that you shall strictly adhere to study procedures as outlined in your study protocol.

Dr. Ted Bandawe
HOSPITAL DIRECTOR

MZUZU CENTRAL HOSPITAL
25 APR 2023

LETTER OF PERMISSION FROM Rumphi District Hospital

Telephone: (265) 01 372222/ 287/ 212
Fax: (265) 01 372338
All communications should be addressed
The Director of Health and Social Services

In reply Please quote RDH/
Rumphi District Hospital
P.O. Box 225,
Rumphi

MALAWI

RUMPHI DIRECTORATE OF HEALTH AND SOCIAL SERVICES.

15th May, 2023

Mzuzu University
Private Bag 201
Luwinga, Mzuzu

Dear Mrs Maria Kumwenda,

Letter of Permission to Conduct Research in Rumphi District

We write on behalf of Rumphi Directorate of Health and Social Services in support of the proposed study titled **"Hospital Based Quality of Care for Children with Sickle Cell Crisis in Selected Hospitals of Northern Malawi"**. We are aware that the study is for academic purposes and we would like to assure you that we will support you throughout the study including any support for respondents that would need further understanding of the study.

Through this letter, we grant you permission to conduct research at Rumphi District Hospital, Paediatric department. We acknowledge specific roles and responsibilities that we will fulfill in this collaboration. Our main role that you conduct your study according to approved protocol and any deviation from it, the research committee has authority to stop the study. In addition, we also look forward to working with you on ensuring that no harm is done to study participants and that only those who have freely consented are the ones being studied.

We look forward to working together and to the dissemination of research results.

Yours Sincerely,

THE DIRECTOR OF HEALTH & SOCIAL SERVICES
2023

Dr. Westain Nyirenda
The DHSS
nyirendatizgo@gmail.com
0992452453

Dr. Henry T Mwakalinga
Research Coordinator
P.O. BOX 225, RUMPHI
hmwakalinga@gmail.com
0993106535/0888273503

Mrs. Zione M Mfune
Research Secretary
zionemangwivo@gmail.com
0881601882/0999926404

LETTER OF PERMISSION FROM Ekwendeni Mission Hospital

CHURCH OF CENTRAL AFRICA PRESBYTERIAN

SYNOD OF LIVINGSTONIA

EKWENDENI HOSPITAL
P.O. Box 19
Ekwendeni
MALAWI.

Telephone: (265) 01 339 222/246/281
Mobile : 0999491354

Email: ekwehealth@gmail.org.mw

17th March, 2023

To: Maria Kumwenda
Mzuzu University
P/Bag 201
LUWINGA
MZUZU 2

Dear, Madam,

RE: SUPPORT FOR A STUDY ENTITLED: HOSPTITAL –BASED QUALITY OF CARE FOR CHILDREN WITH SICKLE CELL CRISIS IN NORTHERN MALAWI

Ekwendeni Mission Hospital renders its support to the above mentioned study which is to be conducted by Madam Maria Kumwenda as part of her Master of Science Degree in Nursing Education studies.

We look forward to the findings of her study and hope that it will provide insight to guide future policy direction. Your usual cooperation in this regard is highly appreciated.

Yours sincerely,

CHIEF MEDICAL OFFICER
IN -
EKWENDENI MISSION HOSPITAL
2023 -03- 17
P.O. BOX 19, EKWENDENI

Dr. D. Twiche[illegible]ana
Dipl.(Biom.Sc), B.Sc.(Hons), MBChB, Grad.Diplo.(Surg),MPH,PhD
CHIEF MEDICAL OFFICER INCHARGE

Appendix 6: ETHICAL APPROVAL FROM MZUZU UNIVERSITY RESEARCH AND ETHICS COMMITTEE

MZUZU UNIVERSITY

DIRECTORATE OF RESEARCH

Mzuzu University
Private Bag 201
Luwinga
Mzuzu 2
MALAWI
TEL: 01 320 722
FAX: 01 320 648

MZUZU UNIVERSITY RESEARCH ETHICS COMMITTEE (MZUNIREC)

Ref No: MZUNIREC/DOR/23/14 **17/02/2023.**

Maria Kumwenda,
Mzuzu University,
P/Bag 201,
Luwinga,
Mzuzu 2.

kumwenda.maria@yahoo.com

Dear Maria,

RESEARCH ETHICS AND REGULATORY APPROVAL AND PERMIT FOR PROTOCOL REF NO: MZUNIREC/DOR/23/14: HOSPITAL – BASED QUALITY OF CARE FOR CHILDREN WITH SICKLE CELL CRISIS IN NORTHERN MALAWI.

Having satisfied all the relevant ethical and regulatory requirements, I am pleased to inform you that the above referred research protocol has officially been approved. You are now permitted to proceed with its implementation. Should there be any amendments to the approved protocol in the course of implementing it, you shall be required to seek approval of such amendments before implementation of the same.

This approval is valid for one year from the date of issuance of this approval. If the study goes beyond one year, an annual approval for continuation shall be required to be sought from the Mzuzu University Research Ethics Committee (MZUNIREC) in a format that is available at the Secretariat. Once the study is finalised, you are required to furnish the Committee with a final report of the study. The Committee reserves the right to carry out compliance inspection of this approved protocol at any time as may be deemed by it. As such, you are expected to properly maintain all study documents including consent forms.

Wishing you a successful implementation of your study.

Committee Address:
Secretariat, Mzuzu University Research Ethics Committee, P/Bag 201, Luwinga, Mzuzu 2; E-mail address: mzunirec@mzuni.ac.mw

Appendix 7: REVIEW REPORT FROM MZUZU UNIVERSITY RESEARCHAND ETHICS COMMITTEE

Review report

Proposals / Protocols that are submitted to MZUNIREC should be scientifically and ethically sound. Please respond to the questions below:

1: The Principal Investigator (s): Are they qualified for the study being proposed, if a student, are the supervisors well qualified for the work being proposed?

The candidate is under the supervision of capable supervisors to implement the project.

2: Title of Study: Is it concise and does it give an idea of what the study is all about?

The study is concise and is about Hospital – Based Quality of Care for Children with Sickle Cell Crisis in Northern Malawi.

3: Summary of the study: After reading the abstract, briefly summarize the proposed research, what is it about? How will it be done? Why is it important? Comment on strengths and weaknesses.

The project is about investigating the hospital Quality of Care for Children with Sickle Cell Crisis in Northern Malawi. It will employ a quantitative approach utilizing a cross-sectional design. The study will help in evaluating the quality of care for children with sickle cell disease. The major limitation is that the study will use records for data collection and there is an obvious risk that some critical information would be substantially missing. In this regard, candidate would add value to the data collection process if clients are observed in real time to obtain data on the quality of care received.

4: Review the objectives and design of the study, is the study design in line with the objectives and the research problem?

First and far most the introduction section should give the overall burden of the condition to build the case for the need of the project execution. Then the background briefly describing the condition and giving hospital quality care trends. The study population include children that were admitted due to SCC from the year 2019 to 2020 as well as nurses, medical doctors, and clinical officers who are working in pediatric wards. Case file is not a study population element but rather a data collection element depicting the participant (children with SCC), candidate should revise on this aspect. Candidate should use appropriate research action verb in specific

objective number 3 and not 'identify' *Otherwise, the approach has been specified; however, the design strategy just be cross sectional study design and the aspect of retrospective should appear under methods within data collection section.*

5: Assess the methods to address the objectives – Are the methods in line with the objectives? How is data being collected? Are the data collection tools collecting appropriate data on the variables that have been specified to achieve the objectives?

*The methods are to collect the data to the specified objectives and methods of data collection have been clearly stated (*review of case files*). The collection of data to the specified objectives, however, the candidate needed to come out clearly on what type of data will be gathered as regards, for instance, quality of care. The project should be able to speak to quality of care for children with SCC obtaining in selected hospitals in northern Malawi. With the risk of missing data in case files, the candidate would add value to the data by interviewing participants accessing care during the time of data collection.*

6: Data Analysis: Are the investigators using appropriate statistical methods in line with the study design, variables measured and type of data collected? Will the analysis give reliable results to make reasonable conclusions in line with the objectives?

The analysis plan has been provided. However, candidate has included an aspect of inferential data analysis depicting an analytical study design to be employed. This then has to be reflected in the study design as analytical cross-sectional design.

7: Ethical Considerations

This is a Low-risk study and issues regarding ethics have been addressed.

8: Budget

Budget is sufficient

9: Final Decision

Recommended for expedited review