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Clinical errors—the unclassified diagnosis; application of TeamSTEPPS tool to examine the impact of teamwork on clinical errors at Gulu Hospital.

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CLINICAL ERRORS – THE UNCLASSIFIED DIAGNOSIS; APPLICATION OF TeamSTEPPS TOOL TO EXAMINE THE IMPACT OF TEAMWORK ON CLINICAL ERRORS AT GULU HOSPITAL.

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Declarations

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

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Dedications

I dedicate this work to my beloved family; Susan, Consolate, Petrov, and Scholar for the plays, the encouragement, and the timeless support offered during each step of this journey.

For those who have always been at the forefront of enhancing better healthcare quality from academic to services, I stand with you all for making this meaningful intellectual journey to realizing a harm free healthcare setting especially for those in utmost needs.

Abstract

Clinical error continues to highlight the shortcomings of the healthcare system, particularly the Healthcare ergonomics and the human system. If it were to be a disease, it would rank the third-leading cause of deaths in the population. They are latent or active events that occur as a result of structural, process, or outcome-based actions ranging from failing of an action on intended objective to using erroneous policy, procedures, processes, and practices in patient care. Healthcare institutions are investing significant resources to reduce the incidence and severity of clinical errors in patients through collaborative team structures and effective communication in order to promotes safe, patient-centred, and equitable healthcare. However, in Uganda and elsewhere the notion of teamwork to reduce clinical error incidence and severity have been low due to poor safety culture, punitive leadership, poor communication ethics, and lack of mutual team support. This study aimed to examine how team structures, leadership and management, mutual support, and communication impacts on the incidence and severity of clinical errors at Gulu Hospital. The study was anchored on two theories and models: Human Error and system error theories and TeamSTEPPS Model and System Engineering Initiatives for Patient Safety (SEIPS). A mixed-method cross-sectional study design using structured and unstructured questionnaires developed from the Team Strategies and Tools to Enhance Performance and Patients Safety (TeamSTEPPS) framework were used to collect primary and secondary data. The collected data were analyzed using Spearman's Rank Correlation in SPSS Version 10. The result showed that conflict management and effective team communication significantly improves clinical error reporting, resolution, and deaths, however, no significant relationship with team structures, team leadership, and mutual team support. Furthermore, the findings showed clinical error deaths are not significantly related to the different teamwork themes studied except team conflict management. In conclusion, though clinical error is not a classified diagnosis by standard, the results indicate that teamwork may reduce the incidence and severity of clinical error at Gulu Hospital. The study recommends hospital, policy institutions, and healthcare providers to embrace teamwork as an innovative approach to strengthen team collaborations especially in promoting quality of care and patient safety culture in healthcare.

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Abbreviation and Acronyms

ADR	Adverse Drugs Reactions
AEFI	Adverse Events Following Immunisation
AHRQ	Agency for Healthcare Research and Quality
ANOVA	Analysis of Variance
ARVs	Anti-Retroviral
CPOE	Computerized Prescription Order Entry
DHIS2	District Health Information System
FACE-M	Functional Actions for Clinical Errors Management
FMEA	Failure Mode Effect Analysis
GRRH	Gulu Hospital
HEAPS	Human Error and Patient Safety
HEDIS	Healthcare Effectiveness Data and Information Set
HIV	Human Immune Virus
HMIS	Health Information Management System
ICD	International Classification of Diseases
IPD	In-Patient Department
MKP	Medical Knowledge Portal
MoH	Ministry of Health
NACOSTI	National Commission for Science, Technology, and Innovation
PPH	Post-Partum Haemorrhage
SEIPS	System Engineering Initiatives for Patient Safety
SDG	Sustainable Development Goals
SOPs	Standard Operating Procedures
SU-IREC	Strathmore University Institutional Research and Ethics Committee
TeamSTEPPS	Team Strategies and Tools to Enhance Performance and Patient Safety.
UHC	Universal Health Coverage
UHF	Uganda Healthcare Federation
WHO	World Health Organization

Definition of Terms

Terms	Definitions
Accident Causation Model	A model which proposed that clinical errors in the health system result from the interaction between latent pathology and human factors leading to active clinical errors
Adverse Events following Immunisation	an adverse or sentinel event that occurs following an immunization and can be linked to poor clinical practices
Clinical Errors	Mistakes of mishap due to human and system faults during patient care
Error of Commission	Overuse or using the wrong approach in patient care
Error of Omission	Underuse or lack of performing the required procedure in patient care
Heuristics	The grounded perception of experience that affects effective clinical decision process in the care of patients
Human Error Theory	The combination of factors that affects human interaction, engagement, and adaptation to their workplace
Human Factor Ergonomics	The system that is associated with the human interaction with their work environment and factors that affect their performance given data and information
Medical Knowledge Portal	A portal that enables the transfer of knowledge to enhance health workers' skills and knowledge in promoting quality patient care
Ockham Procedures	The act of using fixed heuristics in the achievement of a desired outcome for patients
Oslerian Principles	The act of using standard principles set out in SOPs to achieve the desired results during patients care
Teamwork	The act of collaborating with each other to achieve a shared objectives and goals in patient care
The Swiss Error Theory	The error model and theory states clinical error occur as a result of latent and active faults in the health system
The System Engineering Initiatives for Patient Safety	Models and methods of work system design need to be developed and implemented to advance research in and design for patient safety
The System Error Theory	The theory proposes that clinical errors do occur in a patient as a result of latent or active system faults.

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CHAPTER ONE
INTRODUCTION

1.0 Introduction.

This chapter introduces the concept, background of the study, definition of team and teamwork, the terms and the typology of clinical errors, the context where the study was conducted.

1.1.Background of the Study.

Every year, the US Health Statistics Department compiles death certificates without including clinical errors as a cause of death, despite the fact that clinical error would be the third most common cause of death if it were a disease(Makary & Daniel, 2016). Clinical error are any harmful or unfavourable events that occur to patients while they are receiving care, both active and latent(Rodziewicz et al., 2024). Used interchangeably with medical errors, clinical errors can result from structural, processes, or outcome-based actions ranging from failure to complete an action for an intended goal to the application of incorrect policy, procedures, processes, and practices in healthcare to achieve a desired clinical outcome(Elden & Ismail, 2015).

Based on the 2004 report on inpatient deaths, the Agency for Healthcare Quality and Research for Patient Safety estimated that 575,000 deaths resulted from medical errors between 2000 and 2002, or about 195,000 deaths per year. This report refutes the 1999 Institute of Medicine (IOM) Report "To Err is Human", which showed that only 140,400 deaths occur annually in the US due to medical errors. Further, the US Department for Human Health Services report that there is an error rate of 1.13% among Medicare beneficiaries. If this is used to calculate the rate of errors across all institutions registered in the US it translates to 800,000 deaths per year, a figure four times the IOM estimates(Makary & Daniel, 2016).

Preventable patient harm which includes clinical errors affect nearly 1/20 patients in healthcare setting(Panagioti et al., 2017). In essence, clinical error continues to highlight the shortcomings of the health system, particularly the ergonomics of the human system, due to five main causes, including: 1) observation error or projections of non-evidence; 2) attachment biases or avoidance of emotions; 3) the logic of presumption or extrapolation in the diagnosis process, including

assumptions, experiences, and an excessive reliance on false beliefs; and 4) the action of omission and commission without adherence to due diligence (Kothari, 2012).

Recent study in Kenya indicates clinical error resulting from wrong or inappropriate choice of medications among cardiovascular patient was high, 74/97 patients with drug-drug interactions (95.2%) the leading error and wrong choice (45.0%) of drug errors(Mwavu, 2021). This is similar to a study result in Uganda which showed that medication error (53.2%) were due to drug overdose (42.9%) and factors such as poor reporting, poor ethical leadership, and punitive measures to those who report or commit error were attributed(Mauti & Githae, 2019). However, from the positive development perspective on quality of care improvement, teamwork has been shown to enhance and reduce clinical error incidence and severity among patients in three hospitals in Kenya(Jepkosgei et al., 2022) though in another study teamwork was not significant in promoting team efficiency or reduction of clinical error incidence(Ntwiga et al., 2021). It must be noted these studies were not a representation of the whole situation in the country but can inform us that there are clinical errors occurring in healthcare setting and requires further attention from policy makers.

These gaps in Total Quality Management especially in healthcare system has prompted the researcher to conduct further enquiries to understand the influence of teamwork on the outcome of clinical errors specifically in Gulu Hospital Uganda.

1.1.1 Teamwork in the healthcare setting.

Teamwork is the ability and capacity to collaborate effectively with other members to reach a shared objective or goal. Teams are groups of people, whether professional or non-professional, who work together to achieve a common goal(Merriam-Webster, 2012). In the healthcare setting, teamwork plays a critical role in ensuring better performance and reduced incidence and severity of clinical errors (Rosen et al., 2018). For example, teamwork among healthcare teams during patient care can improve patient monitoring, drug management, and surgical procedures, and reduce workload burden which can result in stress and errors (Mujumdar & Santos, 2014). A report in 2002 by the UK National Confidential Enquiry into deaths due to clinical errors indicates that over 70% of deaths in the emergency department were attributable to poor teamwork such

as lack of effective communication, lack of shared responsibilities, consultations, and poor reviews of clinical care (Susan Mayor, 2002).

As diverse professionals work in different units and facilities yet handle the same patients within the healthcare setting, the concept of teamwork is less widely understood. For this it has been argued that teamwork needs to be understood from three angles; the temporal side of how teamwork emerges, should be sustained, and how does it affect clinical outcomes, secondly to understand how the context of operation of teams impacts on the overall shared goal, and lastly the understanding of the dynamic interaction among teams through communication, leadership, and mutual support in enhancing teamwork spirit(Anderson et al., 2021)

1.1.2 Clinical errors concept, causes, and categorization in healthcare setting.

Clinical errors are mistakes or careless acts, omissions and underuses, or commissions and overuses induced by deviations from ethical standards of practice. The practitioner's direct care responsibility must have been expected for a reasonable period of time. Medical errors are preventable unfavorable outcomes of medical care that occur before, during, or after an acceptable period of medical care. Both can harm the patient. Error in the medical field stems from the English law "tort" as outlined in the case of Donohogue vs Stevenson (1932) UKHL100, which established that one must have a legal duty to take reasonable care when relating to people likely to be affected by their actions; omission, breach, and neglect confer liability in the medical field (African Exponent, 2022).

Healthcare clinical errors can occur for a variety of reasons. The complexity of the system and its modern devices, the lack of a safety culture, the pressures of competing priorities like workload, staff inadequacy, and overambitious organizations, the inadequate application of evidence-based care, and the misalignment of goals, however, have been the most significant precipitating factors for error occurrence over the past 25 years. As an illustration, many firms continue to reward and offer performance based on output rather than outcome (Fain, B; Healey, M; Sudders, M; Palleschi, E; Campbell, 2019)

Two theories and models for clinical error occurrence in this study are; The Human Error theory which asserts that clinical error results from human cognitive or heuristic biases of availability,

representativeness, anchoring, and adjustment (Zulekha Saleem, 2014). The System theory states that errors can occur due to active or latent conditions in the patient-provider environment (Reason, 2000b). However, the two theories do not take into account the impact and relationship of teamwork on clinical care outcomes. The System Engineering Initiatives for Patient Safety (SEIPS) developed on the Donabedian- Structure- Process- Outcome foundation posit that clinical error do occurs due to array of factors within and outside the health team(Kwan et al., 2021).

However, to bridge the gap in clinical errors and healthcare teamwork, the Agency for Healthcare Research and Quality (AHRQ) and the Patient-Centred Medical Home care developed the Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) in 2008. The framework comprised of 5 domains Team structure, leadership and management, staff mutual support, situation monitoring, and communication do plays key role in improving providers practices especially within a team(King et al., 2008). Each of the five (05) domains are linked to different teamwork outcomes; that is appropriate team structures promotes responsible and accountable care by team members; ethical leadership and management enhances the use of standard operating procedures and promotes efficient operations; mutual support and situation monitoring reduces workload stress, conflicts during patient care, and promote feedback loop especially in vital signs monitoring of patients; and lastly effective communications during patients hands-off or inceptions are vital for reliable, adequate, and valid information sharing with teams all which are key to improving the healthcare team performance(Rosen et al., 2018). Since its development, the framework which uses a TeamSTEPPS Teamwork Perceptions analysis, has been a significant instrument in healthcare quality improvement and have offered vital evidence among teams in healthcare, notably in reducing clinical error incidences during the patient care continuum(Terregino et al., 2023).

Though clinical errors categorizations can take many forms, the commonly accepted nomenclature is presented in the table below.

Category of errors	Examples in the clinical settings
Diagnostics	Error of delay in diagnosis Failure to use indicated investigations

	Use of inappropriate investigations Failures to act on results of investigations
Treatment	Error in the performance of procedures Error in administering medication Error in the dose of drugs Avoidable delay in treatment
Preventive	Failure to provide prophylactic treatment Inadequate follow-up
Others	Failure of communications Equipment failure System failures

Advances in Psychiatric Treatment,(Oyebode, 2013a).

Table 1.1. Clinical error nomenclature in healthcare

1.1.3 Gulu Hospital.

Gulu Hospital is located in Gulu City one of the largest towns in the Acholi sub-region, located approximately 343 kilometres north of Kampala, Uganda's capital city on the coordinate's latitude: 20 46'28.45N; longitude: 320 17' 56.36E. It was built in 1934 as a provincial hospital, and later became a district hospital until 1999 when it was made a Regional Referral Hospital according to the MoH gazettement.

The hospital serves as the referral facility for the eight districts in the Acholi sub-region, with a projected catchment area population of 1,751,000 (Strategic Plan, F/Y 2019/20). As a teaching hospital, it is destined to become a National Referral Hospital by Act of Parliament of Uganda. It has all specialist departments with major specialists such as-Surgeons, Pharmacist, Orthopaedics, Psychiatrists, Physicians, Ophthalmologist, Pathologist, Oncologist, Paediatricians, Radiologists, MOs, Registered Nurses, Medical Clinical Officers, Allied Health Workers, and support staff.

Given that no such study of the impact of teamwork on the incidence and severity of clinical errors was done before in this hospital and this hospital being a teaching institution for both registered and non-registered medical and paramedical health workers, it would provide a good

learning environment and opportunity for both policy makers, students, workers, and the MoH in understanding the impact of teamwork in promoting quality of care and patient safety.

1.2 Problem statement

WHO's global report on patient safety showed clinical errors are becoming more prevalent. Every 4 out of 10 patients is affected and four times hospital deaths yet 80% of clinical error causes are preventable(Nandasoma, 2019). Clinical error can significantly influence healthcare cost and a complicated consequence. For instance, clinical error can reduce a person's life expectancy or hasten their demise.

Uganda has an 88.7% chance of clinical error in its healthcare setting(John, 2016). Few studies showed 58 and 53% are clinical errors due to diagnostics and medication errors(Anguyo et al., 2015). Lack of teamwork and effective communication, and poor reporting, among team contributes to this poor quality of care and patient safety(John, 2016). Yet good team composition of 4-5/1,000 patient reduces the incidence of clinical errors, insufficient team structure in Uganda 1-2/25,000 provider to patient, flawed system, processes, and events beyond healthcare provider's control have led to clinical errors and death which could have been prevented (Jane N et al., 2022).

Studies conducted in Uganda documented links between clinical errors incidence and mechanism of reporting, detection, and management; however, few have shown the impact of teamwork among medical and paramedical staff on the incidence and severity of clinical error. For example, Githae (2019), Anguyo (2015) both studied common mechanism of error reporting and prevention among nurses and physicians, Dorothy (2021) studied how policy and guidelines influence error occurrence, Balidawa (2016) showed that clinical error reporting and management were based on management rules. It is against this quality-of-care gap that the researcher is intending to determine the impact of teamwork on clinical error incidence and severity at Gulu Hospital, Uganda.

1.3 Research objectives

This section has outlined the general objectives and specific objectives that guide the overall study

1.3.1 General objective

The main objective of this study aimed to apply TeamSTEPPS tool to examine the impact of Teamwork among Medical and Paramedical health workers on the incidence and severity of clinical error at Gulu Hospital in Uganda.

1.3.2 Specific objectives

Specifically, the study aimed to:

1. Determine the effects of team structures on the incidence and severity of clinical errors.
2. Outline how team leadership affects clinical error incidence and severity.
3. Examine how patient situation monitoring and mutual support affects the incidence and severity of clinical error.
4. Determine the effects of team communication on the incidence and severity of clinical error.

1.4 Research questions

1. Do team structures affect clinical errors incidence and severity in the hospital?
2. What are the effects of team leadership on clinical error incidence and severity?
3. How do monitoring of patient situation and mutual team support affect clinical error incidence and severity?
4. How does effective team communication affect clinical error incidence and severity?

1.5 Scope of study

The study was limited only to Gulu teaching hospital, which may not show the exact magnitude of clinical errors in the region or the whole of Uganda. A descriptive mixed cross-sectional approach was used to study the impact of team structures, leadership, situation monitoring, mutual support, and team communication on the incidence and severity of clinical errors. Both qualitative and quantitative data for the period between November 2022 and October 2023 were collected using structured and unstructured questionnaires specifically to enable triangulation of the findings from both primary and secondary data.

1.6 Significance of study

This study would benefits student, healthcare workers, and patients. Specifically, it will be useful for bridging the theoretical knowledge gap of healthcare practitioners thereby promoting teamwork as a tool for reducing clinical error incidence among patients. Secondly, it would provide feasible recommendation to improve policy on quality of care through implementation of routine clinical error detection, reporting, and management in the hospital. Lastly, the study would improve patient safety culture and environment for healthcare practice in the hospital, region, and nationally given that patient safety is a global health topic of concern in most modern healthcare systems.

1.7 Chapter Summary

Clinical errors are mistakes or negligent act that arises from human factor ergonomics largely influenced by external and internal environment and can take the form of omission or commission in patient care leading to poor outcome. Several factors convergence results into this safety concern, however, theories of human error and system error highlight that poor decision process and faulty systems or latent pathology in system configuration are responsible even if teamwork is being practiced. Appropriate teamwork which is grounded in the idea that team composition and structure, leadership, mutual support and patient's situation monitoring, and effective communication should lead to better clinical care; hence it is vital for reducing clinical error incidence in the healthcare system.

CHAPTER TWO:
LITERATURE REVIEW

2.0 Introduction.

This chapter outlines the theories, models, and literatures reviewed in answering the study objectives and questions. The section further highlights empirical findings in the literature on some of the impacts of teamwork structures, leadership, mutual support and situation monitoring, and communication on the incidence and severity of clinical errors in the healthcare settings, the knowledge gaps which have enabled the development of this study goal and objectives is explored, and finally stating the conceptual framework for the study.

2.1 Theoretical reviews.

The study is underpinned by two theories and models; The Human Error theory, the System Error Theory, and the TeamSTEPPS Model, and SEIPS models for error occurrence.

2.1.1 Human error theory

This theory assert that clinical errors occur due to faulty human decision process. Humans are borne to commit cognitive pitfalls also called heuristic biases in the form of skill-based, rule-based, or knowledge-based biases. However, Dr. Russel Ferrell pointed that errors are due to result of multiple chains of factors that acts on human being in their workplace leading them to personalise work and to commit an error. Such factors includes workload, team incompatibility, and improper coordination of activities(Rowland & Adefuye, 2022). These factors affect individual cognitive power and lead to three biases in clinical decision-making; 1) availability biases- use of data that can easily be recalled, 2) representativeness biases-judging by similarity and experiences, and 3) anchoring and adjustment biases- the rigid mind (tunnel vision) that doesn't support teamwork and do not change with new data (Swaminath & Raguram, 2010)

Because medical practitioners are always faced with time constraints for effective communications and limited resources in healthcare provision, they are prone to working independently and apply heuristics more often than the gold standard of practices(Frimodig & Mcleod, 2022). This habit of heuristics affects teamwork and impairs their judgment in doing the right procedures and can lead to either omission or commission of standard policies, procedures,

processes, and practices when providing care. Clinician will tend to use the Ockham razor -tunnel vision or narrow reasoning to try to fit in everything in patient care.

Similarly, under this theory, lack of knowledge as a result of inadequate training can equally lead to human error. Lack of training can result in inadequate context generation, faulty synthesis of information, and prematurely closing cases before further investigations(Kothari, 2012). Additionally, ethical leadership is the cornerstone of any patient safety culture. It fosters efficient teamwork, reciprocal team support, and closed situation monitoring, all of which eventually improve team performance and result in better patient outcomes during clinical care.

2.1.2 System error theory

The System theory state that errors can occur due to active or latent conditions. The active forms are those errors committed by providers in direct contact with patients such as fumbles, procedural violations, and mistakes(Reason, 2000b). The latent form is that inevitable system pathogen arising from designers, builders, top management, and procedure writers. These conditions precipitate errors occurrence; for example, lack of teamwork, time pressure, fatigue, understaffing, and equipment; or they can create a long-lasting hole of untrustworthy alarms and indicators, design deficiencies, and unworkable procedures in the system. Unlike the active component of human error, the latent form of system error is easily detectable and can be managed before it can result in an adverse event(Kothari, 2012). Though recognized as one of the most missed in clinical error analysis, system errors are short-lived and have a low impact(Gluck, 2008).

We cannot change the condition of human beings but we can change their workplace conditions through better leadership and management. Under the system error theory, there is an inadequate recognition and response to a system command or total failure and violation of the system's procedural rules(Reason, 2000a). An example, faulty policies and processes, inadequate communication, and lack of clarity in roles. The theory argues that, though clinician always tries to practice the Oslerian principles (standards of care) in medical care, a system fault beyond their ability makes them end up committing errors(Kothari, 2012). System faults include the lack of audits sometimes due to poor leadership, communication, and situation monitoring which ultimately influences clinicians to wrong act and become error-prone (Carayon et al., 2014).

This concept is further supported by the Swiss theory of error trajectory or the Accident Causation Model proposed by Reason 2000 which states that when a system has a hole and these holes open up at the same time there is a likelihood of an error being transmitted to the whole system component- health workers, patients, structure and equipment(Reason, 2000b). The theory further argues that there is an inborn system fault that the frontline health workers are unaware of and only realize whenever errors have occurred. However, in between these there is the component of conditions ranging from ineffective system communication and lack of system configuration's which increases the likelihood of error among teams of healthcare providers(Garfield & Franklin, 2016). This is shown below.

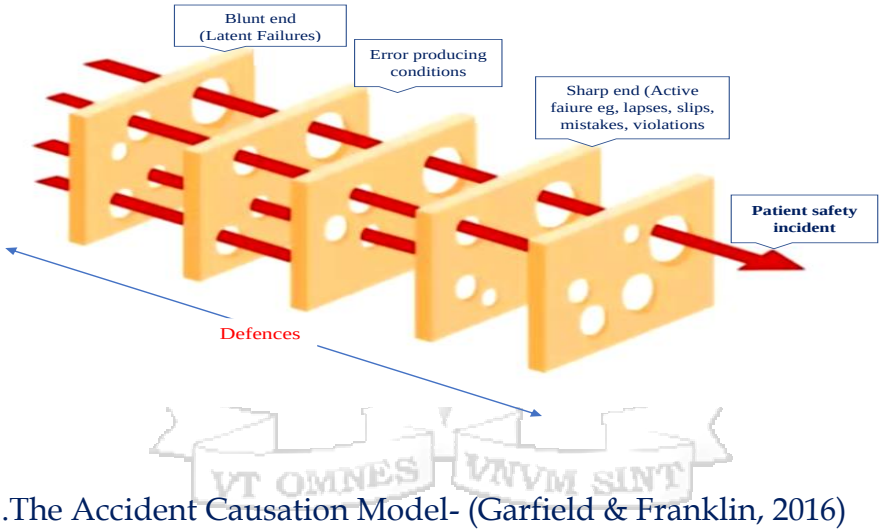

Figure 2.1.The Accident Causation Model- (Garfield & Franklin, 2016)

2.1.3 The TeamSTEPPS Model

The TeamSTEPPS model developed in 2006 by the AHRQ and DoD -US is an evidence-based collection of teamwork tools that promotes team performance at three levels: taught skills, existing mastery, and change development experience(Battles & King, 2010). It consists of five (05) domains closely related and linked to each other; team structure, leadership, mutual support, situation monitoring, and communications. The 5 domain of the model is connected to team performance outcomes and relies majorly on self-report measure other than direct observations of an individual while performing task during patient care.

Analysing this further; The TeamSTEPPS tool team structure component is directly linked to appropriate accountability and responsible care while promoting goal awareness; leadership and management are directly related to efficient operations management of the team through open door policy to inputs from staff in decision process; situation monitoring and mutual support are linked to conflicts management, feedback, mutual support of each other on workload, decisions, and procedures during care; and lastly team communication which may involves patient hands-off requires adequate, reliable, and valid information sharing between patients and staff shifts to reduce any gap that may lead to error in clinical care of every patients(King et al., 2008).

This optimization approach to team performance reduces clinical error specifically by promoting closed-loop of process, procedures, actions, and information's while being supported by health facility policy as a safety culture foundation. The TeamSTEPPS model in a 3X3 matrix is shown below with orange colour depicting attribute of clinical team that enhance positive outcome of care, the dark blue is team structure which is an embedded foundation on which mix of skills and expertise give rise to ethical leadership who communicates effectively, while providing close situation monitoring and mutual team support during every patient care. The green box is result of the either a low clinical error and high positive patient outcome emanating from such closed-loop interaction among the different component of the TeamSTEPPS tool. the colour illustration is used for the purpose of clear understanding only, it has no any standardisation bases.

Performance (adaptability, accuracy, Productivity, Efficiency, and Safety)	**Leadership & Mgt-** articulate clear goals through huddles, debriefs, and briefs.	Positive patient Outcome
Situation Monitoring- ensure team are on the same page every time	**Team Structure**	**Mutual Support-** ask for and provide team support
Low clinical error incidence	**Communication**-clarity, validity, adequacy, during hand-off in patient care	**Knowledge & Attitudes** (Trust, orientation, shared mental models)

Figure 2.2. The TeamSTEPPS Model adopted and modified from the AHRQ, 2008.

2.1.4 The System Engineering Initiative for Patient Safety (SEIPS) Model

The System Engineering Initiative for Patient Safety (SEIPS) is a five-domain model of organization, persons, tasks, technologies and tools, and environment that has gained much attention in improving the quality of healthcare outcomes in recent years(Carayon et al., 2014).

Developed on the foundation of the Donabedian 1978-Structure Process and Outcome of healthcare Model, the SEIPS model further expands the concept of SPO to include what is called the Human Factor and Ergonomics (HFE). Because quality of healthcare occurs in an array of factors associated in human being and system ergonomics, the model explores three novel teamwork concepts; 1) The configuration, 2) the engagement, and 3) the adaptation concepts in the quality of healthcare service delivery. The configuration concept emphasizes the interaction of the sociotechnical system during healthcare delivery, the engagement concept refers to how teams and individuals can collaborate to perform healthcare functions without harm to patients, while the concept of adaptation is about how feedback impacts both planned and unplanned actions within the healthcare team (Holden et al., 2013). This demonstrate how teamwork is necessary in the delivery of quality healthcare without patient harm.

Similar to Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) that was developed by the Agency for Healthcare Research and Quality in 2008, this model advocate for the building of team structures, leadership, situation monitoring, mutual support, and communication to enhance the performance of healthcare team which ultimately leads to the achievement of reduced clinical errors in patient care (Battles & King, 2010; Carayon et al., 2014; Kwan et al., 2021).

The relationship between the different components of this model is shown below.

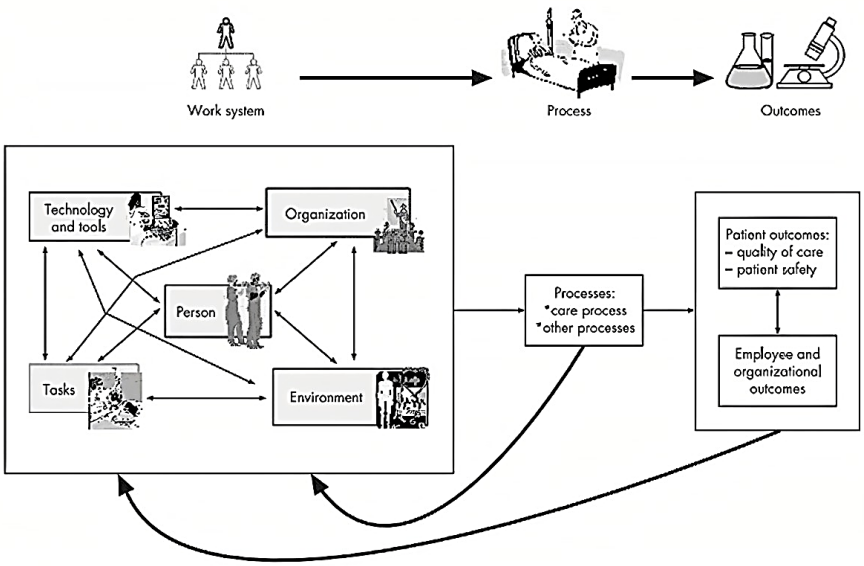

Figure 2.3. The SEIPS Model of teamwork in patient care(Kwan et al., 2021)

2.2 Empirical review.

The empirical review concepts have been stated under the four basic foundational concept that affects clinical error occurrence whether in an individual or team setting with the most recent findings and conclusion drawn as described below.

2.2.1 Impact of teamwork structures on clinical error incidence and severity.

Quality of care is multifaceted teamwork that aims at the reduction of clinical errors and all adverse events as a major objective. Even though working in healthcare environments presents a significant challenge, the team's success depends on each member performing efficiently(Mann et al., 2020). The effectiveness of a team is determined by its structure, which is a combination of size and skill levels. While it is true that team members can operate autonomously while providing care for patients, there are also circumstances in which teams must join together, communicate with one another, and strive for successful patient outcomes(Hwang & Ahn, 2015).

The WHO advocates for two systems for clinical error reporting; Mandatory and Voluntary mechanisms. Mandatory accountability reporting is a system function that is restricted to serious sentinel events occurring such as deaths, adverse drug reactions, and transfusion reactions while

giving care whereas the voluntary reporting system is that which allows for hazards and error detection to investigate the system failure which poses risk to patients(WHO, 2020). However, in a study at two hospitals in Kisubi and Entebbe in Uganda, the voluntary system of error reporting was found non-functional due to the fear of anticipated punitive actions from the health institutions(Mauti & Githae, 2019).

In the healthcare setting whenever mistakes or an error has occurred, providers on duty are required to report it and seek management redress of the event to minimize its impact; however, in most cases, providers shy away from taking responsibility for the duty of care(Zulekha Saleem, 2014). This act of negligence which affects effective patient-care relationship is critical for healthcare quality where once a deviation from its compliance has occurred, there will be an increased likelihood of adverse effects and higher costs of care(Toyin, 2022).

The modern healthcare system has evolved so much that its effective delivery depends on a multidisciplinary team structure that communicates and collaborates effectively to achieve a desired goal- safe and quality healthcare for all patients. Despite continuous harm 61% of most sentinel events occurs to patient resulting due to lack of teamwork, studies and literature have made plausible recommendations and advocacies for teamwork through for example closed loop communications, mutual respect, and trust(Weller et al., 2014).

In one study conducted among 2000 emergency care practitioners in a pre-hospital setting in South Africa, it was found that ineffective teamwork can influence patient safety outcomes. Though not significantly related to clinical error occurrence and incidence, factors that influence teamwork such as effective communications, collaboration, team leadership, and situation monitoring and reporting were significantly linked to a reduced error occurrence among patients (Rowland & Adefuye, 2022)

Effective teamwork supported by routine training and learning on the job can enhance the safety and outcome of patients. In Tanzania where simulation exercises were used to train a total of 42 health workers on post-partum haemorrhage (PPH), the results of the simulation showed that before the training health workers were lacking teamwork and debriefing- verbal handover or information sharing regarding the situation at hand, however, after the training health workers

were able to emphasize the importance of teamwork in promoting best patient outcome. The findings further indicate improved confidence, shared responsibility, and understanding, and reduced stress during increased workload(Egenberg et al., 2017).

Some proponents of medical science argue that dealing with the clinical error process is one of the most difficult tasks given error occurrence is not seen. For example, an error due to a knowledge gap is only noted at end of procedures, errors due to memory are only noted as misapplied rules in procedures, and so on. This calls for a clear differentiation of team structures and definition of errors' root causes and assigning or designing the correct measures for improvement. For example, mistakes can be corrected using rules improvement, memory errors can be improved through automation and checklists, and knowledge-based errors can be improved through training because training is one of the key foundations to improving both human and system faults that can precipitate errors(Aronson, 2009).

2.2.2 Teamwork leadership and clinical errors incidence and severity.

Over the past decades, health scientists have struggled to develop a tool for managing wrong or unsafe acts in clinical settings. With the advent of high-end technology in healthcare, proponents are becoming concerned about how to develop a high quality reliable, and resilient system for the detection, reporting, and management of clinical errors. Just like medicine knows the disease conditions a resilient safety health system should know its pathogens and act to remedy them by being highly "reliable and non-event related". A health safety system should be made dynamic and reliable to detect and alert providers of impending events that may cause harm to patient outcomes(Carayon et al., 2014).

Leadership is an important component of delivering goals and driving the vision of an organisation. Its about guiding and impacting outcomes, through someone but without using exertion or direct exercise of power(Merriam-Webster, 2012). In healthcare setting leadership plays a key role in enhancing quality of care right from the planning task, executing, supervising, and evaluating(Christie, 2020)

The use of leadership has been emphasized in many studies and specifically in the tool developed by the Agency for Healthcare Research and Quality (AHRQ) in 2008, and that of the SEIPS

developed in 2006 by Carayon and colleagues. This tool emphasized the need for an inclusive team structure, better leadership, effective situation monitoring, mutual support to team members while providing patient care, and ensuring an effective closed-loop communication; that which is back and forth to promote accountable procedures to all patient at the clinical care point(Carayon et al., 2014; Kwan et al., 2021).

Clinical errors management requires a holistic approach spanning from communication and documentation, the chain of command, the culture of practices, and methods of communications and discoverability, the procedures and guidelines for clinical error reporting to promote awareness of adverse events and incident management. Root(2020) argued that simple rules or procedures such as incident reporting, a chain of command for reporting incidences, and methods of communication including text, phones, and reporting are vital for error detection, reporting, and management(Root, 2020).

According to Simon the founder of rationality theory, problem-solving should be bound to rational assumptions given the information available and which in turn influences the error management approach. However, due to the shortest time needed in the clinical care decision process, providers erred in heuristics than the algorithm approach(Frimodig & Mcleod, 2022).

However, a study done to ascertain the impact of leadership on clinical errors among nurses in a Korean hospital indicates that there are hinderance to reporting or identification of clinical errors due to factors such as types of leadership, tone and communication from leaders to staff and mutual support provided by leaders towards the staff that erred in providing care(Hwang & Ahn, 2015).

This is similar to findings from study done in Uganda which showed that mere enforcement of policies in hospital on clinical error management is not enough because a breach of confidentiality in reporting errors and the fear of intimidation, legal consequences, losing a job, and punishment would still debar health providers from reporting errors. Therefore, advocating for a blame-free working environment would enhance clinical error reporting and effective management of the risk and hazards that are potential enough in causing error(Mauti & Githae, 2019).

Similarly, the action of team leadership in encouraging team learning and situation monitoring in complex medical care can reduce the incidence and severity of clinical error events if they are to occur (Rosen et al., 2018).

2.2.3 Teamwork situation monitoring and mutual support and clinical error incidence and severity.

According to Merriam-Webster's Dictionary of English, 11th Edition a process is a series of operations or actions conducted leading to an end. It is a result of both intentional and unintentional steps of action to yield a particular result. This definition shed light on the idea of how clinical practices are provided given the educational background and foundation which entail patients are to be managed through a critical step that leads to their outcome- discharge or death. These steps for example include history taking, physical examinations, laboratory investigations, X-Rays, Ultrasonography, admissions, pre-operative care, operations, drug administration, review in the wards, ordering investigations, reviews, discharges alive or as dead body (last office) and or referral for further management.

Process in patient care requires critical thinking and a better teamwork climate to allow holistic management and care of all patients. According to the SEIPS model which aims to improve the thought process in patient care, it has been found that both preventable and avoidable clinical errors such as wrong site surgery, wrong medications, and misdiagnosis can be prevented by the application of the SEIPS. The application of this model as a process analyser enables coordination, collaboration, and effective communication which are key to patient care. For example, in one study it was found that on average 53% of staffs report situation to their line supervisors or colleagues during critical care of patients(Hwang & Ahn, 2015), and 88.7% of sentinel events have ever occurred to patients due to lack of situation monitoring of vital signs and vital reviews in time schedule(John, 2016).

The US Joint Commission for Patient Safety objectives are to ensure no harm or sentinel events occurs in patient care continuum. The Commission advocates for creating such redundancies for patient safety nets and which promotes error reduction in process of care. These actions include for example a clinician prescribing medications, the clerk checking and transcribing the order, the nurse confirming the order, the pharmacist preparing the medicines, and the nurses again

confirming that the pharmacist are dispensing the medication correctly. This strategy of a continual process of quality improvement based on situation monitoring with multiple lines of checks and confirmation is recommended in teamwork(Rodziewicz et al., 2024).

The Pharmacovigilance Report 2016 under the Uganda National Drugs Authority still indicates that between July 2015-June and 2016, there was a higher incidence of drugs related errors, especially ARVs 139/174 (79.9%) reported events, followed by antibiotics adverse events 14/174. However, there were practices of detection, reporting, and management of clinical errors encountered based on WHO (2015) Guidelines on Pharmacovigilance including practices such as the use of chart reviews, e-Reporting, and training of health practitioners on sentinel events reporting and management(MoH, Uganda, 2015). This report shows how clinical error are still prevalent and occurring in healthcare setting in the country.

Due to the negligent act of having an individual Ockham practice, a study in Uganda where a cervical cancer patient missed being diagnosed with metastasis due to a mass at the breast died subsequently. Pathologists at the time of study did not take into consideration that a squamous cell carcinoma from the cervix can metastasize to other parts of the body and led the team to order tests such as oestrogen level tests because of the prior easily recalled data on breast mass and missed the diagnosis that this patient had initially been found to have cervical cancer and was only lost to follow up some 6 months ago before presenting with the cervical bleeding in the same unit(Saywon & Mulamira, 2021). This is how the lack of teamwork among medical teams can leads to a heuristic anchoring and judgment bias to close out cases that cost patients in accessing care.

Studies on high-reliability institutions especially the aircraft, engineering, and manufacturing industries have so far shed light on their success in the quality of services provisions. Though not directly linked to human teamwork in healthcare, such cultural practices can be borrowed and reconfigured to fit healthcare settings. Based on two approaches of human and system management seen in the SEIPS model, health institutions whose goal is to make healthcare safer have embarked on a system approach though expensive compared to the human system approach. Having highlighted this as the gold standard for clinical error management and is an

algorithm, not heuristics, error-prone acts and event-based actions of misses, lapses, mistakes, and fallacies can be easily managed(Carayon et al., 2014).

In the current era of healthcare quality, IT use in the medical field has gained attention especially in promoting precision and increasing accuracy and reducing the turnaround time required for decision processes. However, proponents of clinical and medical error management assert that the adoption of such high-reliability equipment and devices to improve the clinical situation management should rely on some basic foundation; 1) the adoption should understand the process of drugs management, 2) know where most of the error in medication happens, 3) appropriate safety points place for patient care, and 4) a plan for educating patient and providers alike on medication safety(California Healthcare Foundation, 2001; Rodziewicz et al., 2024). This concept is similarly built around the formation of effective teamwork which subsequently reduces clinical error incidence and severity among patients seeking care.

A study in Uganda among health workers in one hospital showed that 84.8% of respondents agreed to use error reporting for quality improvement, while only 1 in 5 reported themselves for having committed an error, and 2/3 of health practitioners valued patient involvement in medical error reporting(Kiguba et al., 2015). Bringing both patients and providers in an inclusive network of collaborators in the management of clinical care is important in this aspect as it would ultimately lead to better situation monitoring as a result of effective communication among teams and hence a reduced or low impact of clinical error incidence and severity among patients(Omona, 2015). This provides the evidence that mutual support for both staffs, patients, and their caretaker is critical in achieving the best outcomes for patient while receiving care within the healthcare setting.

2.2.4 Impact of teamwork communication on clinical error incidence and severity.

In the US Clinical error has been recognized as a public health concern for over 25 years ago following a tragic event when Betsy Lehman a Boston Globe renowned columnist died on Dec 3rd, 1994 due to a medication overdose, a medication error only discovered two months after her demise when she was undergoing chemotherapy treatment for breast cancer at the Dana-Farber Cancer Institute. This study showed how practices for clinical error communications, reporting,

and management have been neglected in the healthcare environment(Fain, B; Healey, M; Sudders, M; Palleschi, E; Campbell, 2019).

80% of clinical errors occur due to miscommunications among healthcare team(Mujumdar & Santos, 2014). It is unformidable that teamwork can lead to a better quality of care for patients. Several studies and literature have pointed out that effective teamwork and practices enable better healthcare deliveries. For example, a team that is communicating and coordinating work within the technological and social environment would inevitably promote better outcomes for patients(Rosen et al., 2018).

Similarly, the patient bill of rights to safe and dignified healthcare is enshrined in General Comment No. 14, UNHR, 2000 which guides healthcare providers to ensure a good end for every patient. Good ends through being beneficence, benevolent, non-maleficent, and not harm but do good. However, the question has been, is there an ethical requirement for healthcare providers to stand by these articles and support the law on human rights? As shown in one study, health providers are caught in a dilemma when it comes to patients' right- to disclose or not to disclose especially errors that they presumed they have committed to patients(Zulekha Saleem, 2014).
It has been argued that effective clinical error reporting as a team practice is necessary for both risk management and quality management. Healthcare leaders and managers should communicate and partner with the Office of Human Resource Department to promote the training of staff to enable hazard and risk identification which ultimately improves error detection, reporting, and management(Mauti & Githae, 2019). In a study by Rodziewicz, they suggest advocating for reporting error-prone systems and taking an action to modify the system functions which would lead to a reduced effect and impact of the impending events (Rodziewicz et al., 2024). However, most institutions which do not believe to err is human, have criminalized and convicted health workers through punitive measures and the court of law, which have increased individual negligence to identify, report, and manage any error-prone process or system(Oyebode, 2013b).

One common practice in the precipitation of errors is a communication moment which is called Patient Hands-off. This is the period when a clinician or nurses are handing over patients to the next providers, however, they have handed over information about a patient inaccurately or

inadequately and thus leading to error of any nature. For example, wrong names and IDs can lead to wrong medication alterations. This situation puts the patient in the shadow of their awareness in the decision process(Rodziewicz et al., 2024).

Modern medicine is advancing its healthcare horizon in the probity of health system weakness. If the healthcare system is to advance its accuracy in diagnosis and treatment without advancing its system for managing error is worth nothing of progress. For example, in most of the current practices for a physician not to be convicted for wrong acts (commission) or negligence (omission) they have reverted to another form of practice in the medical field called defensive medicine- where a clinician or doctor would orders as many tests and treatment as much as possible in the event of uncertainty to help curb or cushion possible future legal consequences should errors that might result to legal penalties from patients in critical care or poor prognostic state arise(Miziara & Miziara, 2022).

2.3 Summary of knowledge gap.

According to the quality-of-care guidelines and literature, clinical errors and all its effect needs to be managed at all time. This is not only important for the client and patients but because some of the most notable health outcomes such as the SDG, 3 and the UHC impacts on population health outcomes are vividly anchored on the quality of care(UHC, 2018).

Healthcare settings are increasingly becoming unsafe for patient care and this is evident from a study in Uganda which showed that clinical errors due to lack of teamwork do occur in hospitals and worst is that systems and regulation for their detection, reporting, and management does not exist(Mauti & Githae, 2019).

The summary of the knowledge gap is shown in Table 2.1 and relationship in Figure 2.4.

Authors	Findings	Gaps	Study impact on the gaps
(Hwang & Ahn, 2015)	Effective teamwork communication reduces error occurrence	How teamwork reduces incidents and severity of the clinical error.	Strengthening teamwork for best patient outcomes

(Johnson et al., 2020)	Incivility contributes to negative patient care and probable clinical error among patients receiving care	No documented impact of teamwork structures on clinical error occurrence.	Establishment of functional teamwork among healthcare providers
(Dorothy et al., 2021)	Medication errors (prescription) were high among cancer patients	Manual prescriptions, no Computerized Prescription Order Entry (CPOE) to reduces human error	Recommends use of IT to improve precision medicine and reduce team burn out in heavy work shift.
(John, 2016)	High medication error (under and over-dosing) due to knowledge gaps.	Inadequate policy, SOPs, and practices on safety culture	Operationalise blame free system of clinical error management
(Weller et al., 2014)	Individual and organizational factors contribute to the lack of effective team communications	Lack of team communication increases likelihood of clinical error occurrence among patients.	Propose establishment of effective and reliable channel for communication among health workers.
(Zulekha Saleem, 2014)	Clinical errors are inevitable but should be disclosed to the patient as an ethical principle	No patient centred care to enhance inclusive decision which reduce error chances.	Patient-centred care to be emphasized.

Table 2.1 Summary of knowledge gap in clinical errors concepts and management

2.4 Conceptual Framework.

The conceptual framework illustrates how team structures, leadership, situation monitoring, mutual support, and communication as an independent variable can influence clinical error occurrence and subsequently affects the management of clinical errors in the healthcare setting. The framework is based on the integration of Human Factors Ergonomics (HFE) as drivers of both human and system error and the TeamSTEPPS and SEIPS models for clinical care in the healthcare setting.

The relationship between the teamwork influence on clinical error occurrence and its severity is shown below.

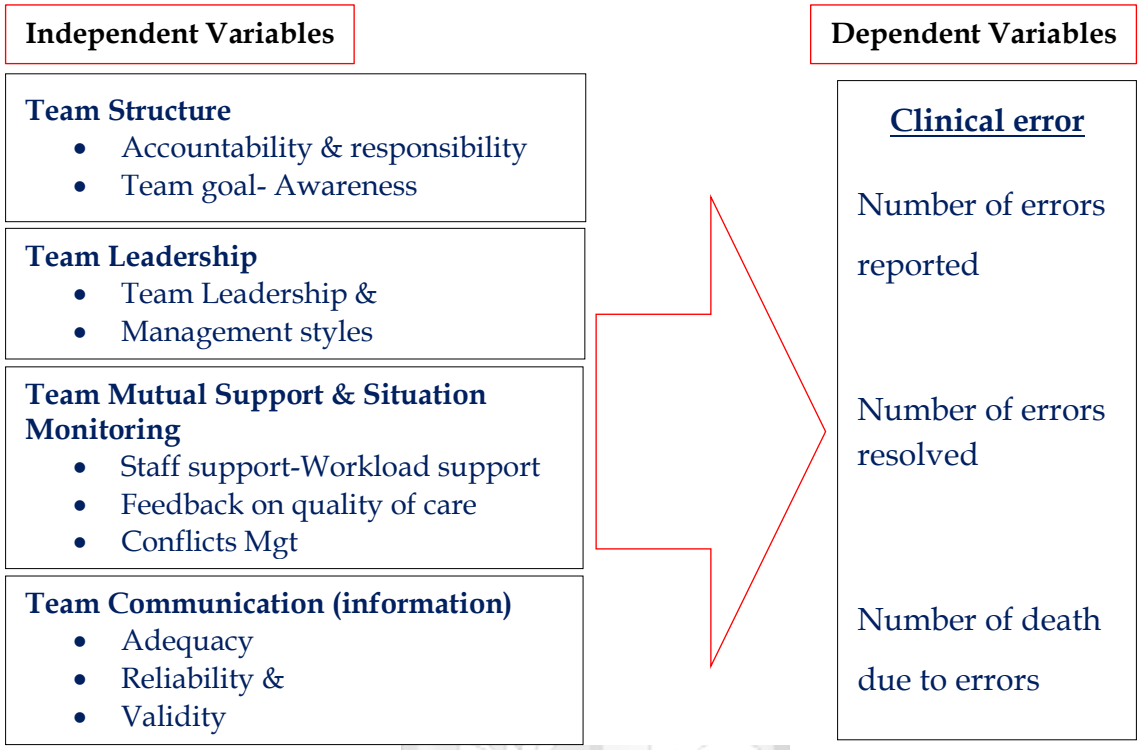

Figure 2.4. The Conceptual Framework for Clinical error occurrence in the healthcare setting.

2.5 Chapter Summary

In this chapter the researcher had discussed the theories and model underpinning the study, human error and system error theory, the TeamSTEPPS, and SEIPS models and further explained the relevant literatures reviewed in the global, regional, and local perspective in relation to clinical error occurrence in the healthcare settings. The researcher further analysed the potential knowledge gaps in the literatures reviewed on how team structures, leadership, mutual support, situation monitoring, and team communication impacts clinical errors incidence and severity. The chapter concluded with a conceptual framework for which this study sought to answer in the research questions.

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction.

This chapter outlines the research design, data collection method, the method of analysis, and the procedures in data quality process. It further stated how the data collected was presented, interpreted, and discussed. The research quality from the perspective of reliability and validity were also presented in this section

3.1 Research philosophy

The study is based on the philosophy of deductive epistemological reasoning that clinical errors have a relationship with knowledge, practices, and environment but we have not known how for example some of the practices within the healthcare setting can impact the incidence and severity of clinical error. The researcher is aware that there is probably natural reason for errors to occurs, but as well there could be other reason such as proposed in the models of TeamSTEPPS and SEIPS which can give rise to clinical error occurrence. Therefore, a deductive reasoning to understand how teamwork as a practice in healthcare impacts on the occurrence of clinical error at Gulu Hospital was utilised.

3.2 Research design

The study was a mixed cross-sectional method in which both structured and unstructured questions were used to collect qualitative and quantitative data including a secondary document review. A cross-sectional approach was used because it provided a comprehensive snapshot of the general situation which was used to plausibly explain hypothesis or theory behind the study, so it was chosen as the preferred method for this study. The design also allowed the researcher to establish a relationship between variables operationalized in the study. But most importantly it was selected because it enabled a hypothetical conclusion on the impact of teamwork on clinical errors incidence and severity in healthcare setting

3.3 Study area

This study was conducted at Gulu Hospital, located in Gulu City, the largest town in the Acholi sub-region, located approximately 343 kilometres north of Kampala, Uganda's capital city on the

coordinate's latitude: 20 46'28.45N; longitude: 320 17' 56.36E. The hospital serves as the referral facility and a teaching hospital for the current Gulu University School of Medicine and has approximately all specialist departments such as IPD, TB, Nutrition's, Ophthalmology, Dental, Oncology, Internal medicine, Pathology, Public health, and Psychiatry Departments.

3.4 Study populations

The study population comprised of 308 health staff both registered and non-registered targeted across the various departments (Hospital Strategic Plan 2021). Patient care is a multidisciplinary teamwork and for this matter, the selection of those to participate in the study was based on the patient-provider direct and indirect relationships for a better response rate and representation of the various opinion on the impact of teamwork on the incidence and severity of clinical errors at this teaching facility. The study did not interview support staffs as they are not directly involved in patient clinical care.

3.5 Sampling design

Based on revised Taro Yamane 1967 formula for a finite population size, the sample size was calculated as shown below(Adam, 2020).

$$\text{Sample size (n)} = \frac{\mathbf{N}}{\mathbf{1+Ne^2}}$$

Where; ***n***= Sample size,

N= the population, and

e= the acceptable sampling error (CI of 95%)

From the estimated population of the health staff at the hospital, the sample size **(*n*)**was as shown below.

$$\frac{308}{(1+300*.05*.05)} \qquad \frac{308}{(1+0.75)}$$

176 Health Workers

3.5.1 Sampling frame

The different categories of cadres in the sample size are represented in the sampling frame below.

Cadres/ Health workers	Populations (N)	Sample size (n)
Consultants/Specialist	24	12
Doctors	32	16
Registered Nurses	97	63
Medical Clinical Officers	65	36
Lab Technologists	33	18
Pharmacist	21	13
Other allied health staff	36	18
Total	308	176

Table 3.1.Sampling Frame of Health workers in the study.

3.5.2 Sampling procedure

The study utilized non-probability sampling in the form of quota and convenience sampling. This is because non-probability sampling enabled easy access to the sample frames, especially for health workers who were working in shifts and may not be easily reached during working hours. The quota sampling technique had enhanced data reliability and validity of data collected from the different cadres of staff at the hospital while convenience sampling was used to enable the selection of readily available samples for the response hence keeping time management.

3.6 Data collection

Participants provided consent (Appendix. I) and were enrolled in the study. Both quantitative and qualitative data were collected (Appendix. II). Primary data were collected using structured self-administered questionnaires dispensed to selected health workers while interviews to key informant such as departmental in-charges was also conducted to collect meaningful construct of qualitative information that was used to further provide better data triangulation of the data collected. Using structured questionnaires allowed for the testing of relationship between teamwork and clinical error occurrence as a quality-of-care measure. The questionnaire which

comprised of three sections; the demographic section, the Teamwork section, and the clinical error incidence section were dropped and picked by the research assistants at the end of a seven (07) days interval from respondents at the hospital. The questions were developed from TeamSTEPPS, SEIPS(Kwan et al., 2021), and Clinical Incident Management Toolkit 2016(Department of Health. Western Australia., 2015) Quality of care Framework and guidelines. Questions on team structures, leadership, mutual support, communication, and patient situation monitoring were modified to suit the research objectives and study questions and finally the section on Clinical error incidence that have ever occurred and documented in the last 12 months at the teaching hospital were recorded.

A Likert Scale questionnaire (Appendix. II) was adopted and used in section two because the research objectives intend to understand from the Human Factors Ergonomics (HFE) perspective how health workers' attitudes affect teamwork and as well try to establish the factor relationship between the various teamwork components and clinical error incidence and severity. The Likert scale questionnaires was suitable because it offered a very simple and easy way of understanding context-based questions and responses hence detailing or predicting if a relationship exists positively, negatively, or not between two different qualitative variables(Joshi et al., 2015). Five levels of the guided objective questions on team structures, leadership, mutual supports and patient situation monitoring, and communications was used.

In the last section of the questionnaire's physical counts or review of records of documented clinical error were cross-checked from the individual respondents and confirmed with records from the quality assurance department. Each conclusive question was qualitative in nature which sought opinions of participants especially management leaders to understand deeper about possible clinical errors in each of the department and to further understands on the effects of teamwork based on their individual experience in influencing clinical error outcomes.

3.6.1 Research quality

The research quality was measured through reliability and validity of the instruments.

3.6.2 Reliability

The reliability of the study instrument was tested during a pilot in which 12 randomly selected participants were given the tool and the result of the pilot study was use to further refine the tool.

research assistants who were enrolled and trained on the tool distributed the questionnaires to the facility staff and this had enhanced the quality of information they were collecting during the study. Results of the pilot study had also informed the researcher of the reliability of the instrument because following an SPSS analysis, the data had a Cronbach Alpha value above 0.7 hence, the instrument was reliable (Bonett & Wright, 2015).

3.6.3 Validity of study

The extent to which a measure can adequately represent the construct that it is supposed to measure is called validity(Ahmed & Ishtiaq, 2021). The instrument was reviewed by the supervisor and based on the acceptable construct as indicated and adapted from the TeamSTEPPS framework, following a pilot test, the validity of the data collection tool and its proposed variables were found to be acceptable.

3.7 Data analysis

The data analysis process used were cleaning, classification, coding, and tabulation so that they are amenable and easy to analyze. Both Descriptive Statistics and correlations analysis were preferred and used to enable the computation and analysis of mean, standard deviation, and proportions. The use of Spearman's Correlation Model was preferred in Analyzing the data as opposed to ANOVA. This is because Spearman's correlation works well with ranked categorical variables such as structures, leadership, mutual support, situation monitoring, and communication in teamwork structures on the incidence and severity of clinical errors. A two-regression model analysis was used; one to test the relationship between teamwork and clinical error occurrence and reporting, and the second to test the relationship between teamwork with clinical error severity found in the Referral hospital.

Operationalization of the study variables are as shown below.

Variables	**Indicators**	**Measures**	**Data Analysis**	**Source**
Team Structures	Team Numbers Composition of teams	5 Points rating 1-Strongly Disagree 5- Strongly Agree	Descriptive and inferential	TeamSTEPPS

Team leadership	Leadership styles Mgt styles	5 Points rating 1-Strongly Disagree 5- Strongly Agree	Descriptive and inferential	TeamSTEPPS
Team Mutual Support	Staff support Feedback Conflicts Mgt	5 Points rating 1-Strongly Disagree 5- Strongly Agree	Descriptive and inferential	TeamSTEPPS
Communic-ation	Adequacy Reliability &Validity	5 Points rating 1-Strongly Disagree 5- Strongly Agree	Descriptive and inferential	TeamSTEPPS
Clinical errors	No. of errors reported No. of errors resolved No. of death due to errors	Alternatives & Options	Descriptive and inferential	Ten Tools, HSOP

Table 3.2. Operationalization of Variables in the proposed study

3.8 Ethical considerations

Ethical review and approval were sought from Strathmore University Institutional Research and Ethics Committee (SU-IREC) and NACOSTI for licensure to proceed with this study. Further permission to conduct the study at GRRH was obtained from Gulu University Research Ethics Committee (GUREC), and the administration of the hospital. Respondents were informed in ample time and the goal and purpose of the study was shared with participants who voluntarily could accept to opt-in or opt-out. However, due to privacy of personal data, every personal information discussed were kept confidential to enable the protection of rights and minimize any risk associated with data breach during the study.

3.9 Chapter Summary

In this chapter the research philosophy, the study design, area, and the study population as well the exclusion and inclusion criteria were discussed. The chapter further outlined the sampling procedure and the sample frame based on Yemane formula. Data collection, analysis, and management were discussed. Lastly, ethical considerations taken during the study process and dissemination plan were stated.

CHAPTER FOUR

PRESENTATION AND INTEPRETATION OF RESULTS

4.0 Introduction.

This section includes the study's findings, the interpretations, and a summary of the findings respectively. The study focused on how TeamSTEPPS approach in clinical care can improve the impact of teamwork on clinical error occurrence and severity at Gulu Hospital. Drop-and-pick study questionnaires were used, and the diverse replies to the Likert scale-based study questions were evaluated using a thematic method based on the research objectives. The various outcomes of the study data were reviewed and presented in the following tables and charts.

4.1 The Response rates.

The initial study target was 176 healthcare workers, however, due to factors beyond the researcher's control, specifically about 11 were for annual leave, 09 were for other duties outside the region at the time of study, and estimated 10-12 were for further studies and thus the number reached were only 144 (81%) response rate. Response rate in social research have been a discussion of concern since the turn of the 21st Century. Until the end of 2020, there is a conclusion that a response rate of 68% and above would provide a generalisable results that can be used to give meaningful interpretation to study outcome, hence this response rate was sufficient to provide a hypothetical conclusion(Brooks Holtom, Yehuda Baruch, Herman Aguinis, Gary A Ballinger, 2022).

The response rate disaggregation is as shown in the table below.

Questionnaires	Frequency	Percent
Interviewed	144	81.8%
Not interviewed	32	18.2%
Total	**176**	**100%**

Table 4.1 The Response rates

4.2 Socio-Demographic characteristics of respondents.

4.2.1 Distribution of respondents by gender.

Figure 5 shows the distribution of respondents by gender during the study. The proportion of male healthcare workers were more 76(53%) compared to the female 68(47%) healthcare workers during the study. In relation to team composition and working, male normally takes up higher proportion of leadership role especially being departmental in-charges compared to women, secondly, this could be related to male curiosity of wanting to always be in the lead of doing every task in a team specially making sure that they are more aware to departmental or facility healthcare goals than the female, and lastly this could be explained based on the assumption that male are more educated than women and are given opportunity to communicate organisation information as compared to women.

This is shown in the figure below.

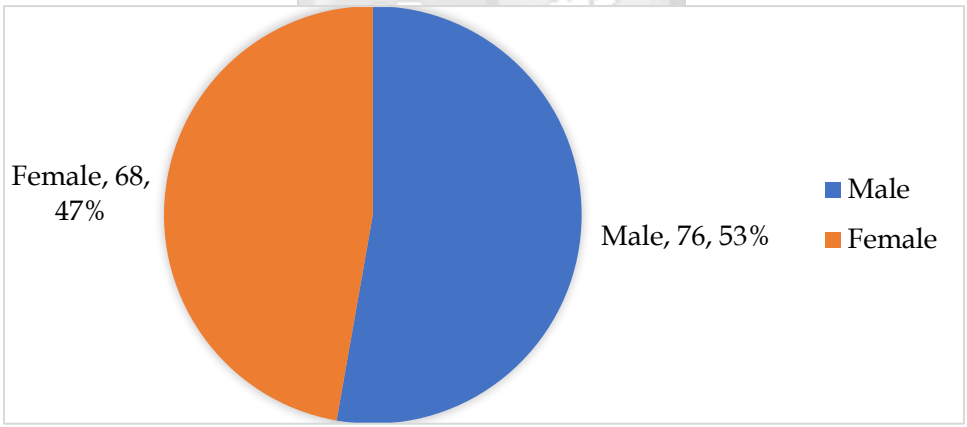

Figure 4.1. The Gender of healthcare workers interviewed, Nov 2023, GRRH.

4.2.2 The Age group of Respondents in the study.

Overall, the age group of healthcare workers at GRRH comprised majorly of the youths 30-40 years of age 72(50%) this could be because information on quality of care such as clinical errors are best known by this age group who form the majority of the team structure and are able to communicate reliable information and are involved already in team leadership at eh facility. The second highest respondents were those below 30 years at 49(34%) who could be young graduates with adequate skills and are gearing up to become new departmental managers or are already involved in some leadership role sufficient enough to share facts about clinical errors at this

facility; and 15 (10.4%) were healthcare workers in their early 50s while 8(5.60%) were those above 50 years of age owing to the fact that these could be elites in teams structure at the facility and are involve in background oversight to enable efficient facility team operations and providing regular guidance on policies implementation within teams of healthcare workers at the facility.

The table below shows the respondents age bracket during the study.

Age group	Frequency	Percent
< 30 Years	49	34.00%
31-40 Years	72	50.00%
41-50 Years	15	10.40%
+50 and above	8	5.60%
Total (n=144)	**144**	**100.00%**

Table 4.2. The Respondents Age Group in the study, November 2023, GRRH.

4.2.3 The Education level of the Respondents in the study.

GRRH healthcare workers interviewed in this study were majorly Diploma holders 65(45.1%) and Bachelors 58(40.3%) while those with masters and PhD were as show in diagram below. About 13(9.0%) were other categories of healthcare workers whose education professional grading do not fall under any of the system above. By virtue of the educational institution available in Ugandan health system, school of nursing or clinical officers offers the highest proportion of diploma holders' output and they normally form the biggest proportion of qualified professional in healthcare team. For example, at each unit there are approximately 7-15 diploma holders' clinical officers or nurses trained, and they remained the highest proportion of team members always on he front-line of care. This is followed by the bachelor's holder who could be general practitioners and offers back-door support to the team of nurses and clinicians at the facility, while lastly the specialist with non-frequent team communication is generally few because they are only communicating with the team in times of special cases of medical and clinical care which require advance advises and possible medical or surgical interventions. This is the bases of which appropriateness of a team structure is so that there is a layered levels f

knowledge base with interconnected network of professional skills especially in a high performing team.

The education level of the respondents is shown in figure below.

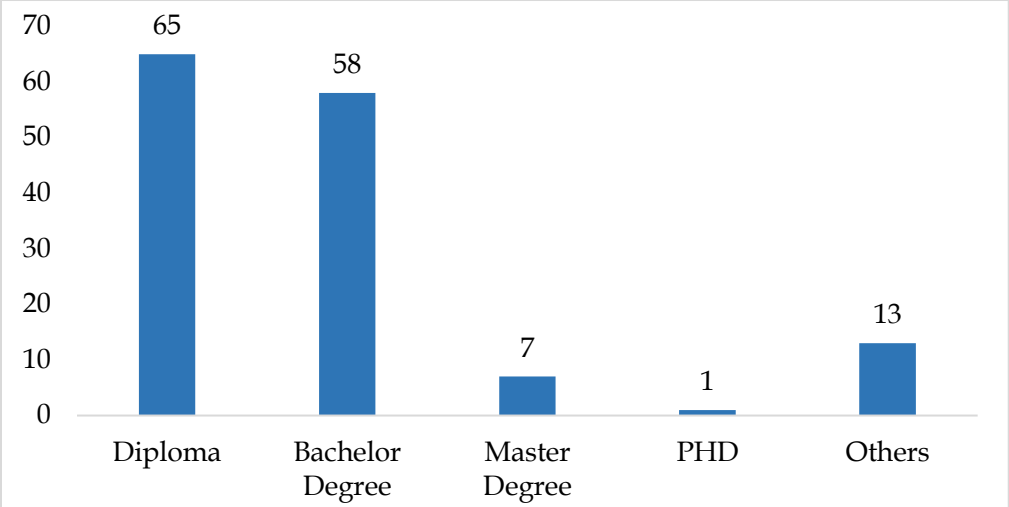

Figure 4.2. The Respondents Education Level, November 2023, GRRH.

4.2.4 The Position of the Respondents in the study.

According to the positions at the Hospital, the following Table 7 shows the results of the finding. Overall majority of the respondents at GRRH were Nurses 57(39.60%) while Clinical Officers, Lab technicians, Pharmacist, and Doctors were almost at equal number of responses. This result is indicative of the output level first from the nursing schools, and secondly the need to have adequate team mix and expertise in promoting effective teamwork. Its consequently a necessity for an effective situation monitoring and providing adequate patient care and probably mutual team support. Nurses forms the backbone of general patient care in every team of healthcare, they take vital signs, gives medications, carries out minor surgical procedures, and are from time to time involved in closed patient situation monitoring while providing effective communication on patient handover during duty shifts.

This is shown in the Table below.

Position in the Hospital	Frequency	Percent
Nurse	57	39.60%

Lab Technician	23	16.00%
Clinical Officer	28	19.40%
Pharmacist	16	11.10%
Doctor	20	13.90%
Total (n=144)	**144**	**100.00%**

Table 4.3. The Position of healthcare interviewed during the study, Nov 2023, GRRH.

4.2.5 The Work Experience of the Respondents in the study.

The study was able to understand the working experience of the respondents and this was presented in a chart as shown below. Majority of the workers 75(52%) has 2-5 years of work experience, followed by health workers with 6-10 years of experience 43(30%) while those above 10 years formed a quarter of the respondents. While its necessary to have experienced team members, too much of experienced and expertise in the team can results into conflicts at all time of care, therefore, it is equally important as well to have few who are still in need of new knowledge about teamworking because this gives a team drive that can result into closed loop communication for the desire to innovate, test, and practice certain concept of quality of care. However, the study finding showed that the facility is adequately well mixed may have in place good communication or leadership and governance structure which promote efficient team work during patient care.

The Figure below shows the work experience of the study respondents at GRRH.

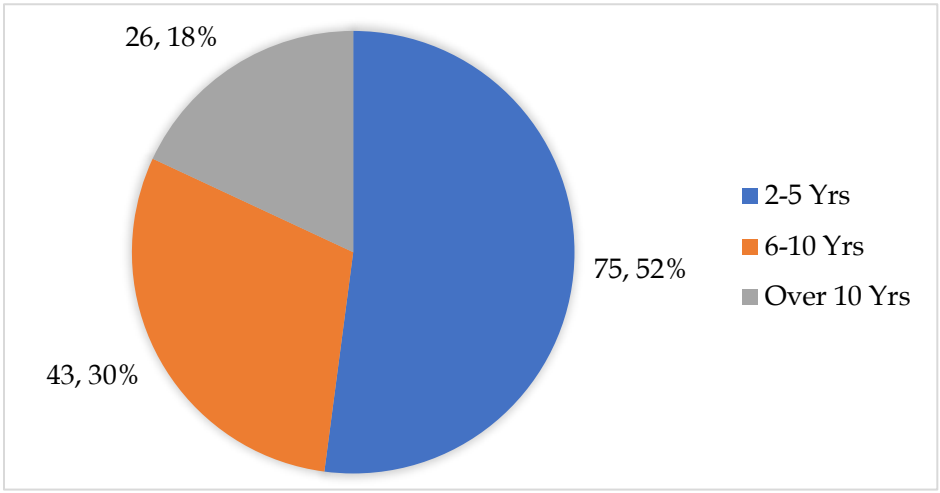

Figure 4.3. Work experience of the study respondent, Nov 2023, GRRH.

4.3 Impact of teamwork structures on clinical error incidence and severity.

The first objective of the study examines two functions of team structure. Promotion of accountability and responsibility by using instruments of work such as SOPs, rules, and CMEs; and team awareness and information on goal and objectives of clinical care at all times.

Likert scale questions were used and participants were able to give opinions on whether a right team structure promotes an accountable and responsible procedures which can lead to quality of care and patient safety--that is, a reduced occurrence and severity of clinical errors. Spearman's correlation analysis revealed a statistically significant relationship *(P-value <0.05, CI 95%, Spearman's 0.06)* between team structure and clinical error resolutions; however, no significant relationship (*Spearman's -0.06 and -0.12)* was found between team structures and clinical error reporting or deaths resulting from clinical errors. Most healthcare 91(63.2%) agrees that the likelihood of a clinical error occurring is lower when there is a right team structure who are accountable, responsible, and aware of clinical care goals. Additionally, 44(30.6%) healthcare workers strongly agreed that using these tools effectively and efficiently for care and treatment at all times improves patient outcomes and safety during clinical care. Only 4% objected or strongly disagreed with this statement, and about 6% were unsure.

Similarly, the study investigated if team awareness and knowledge of clinical care goals and objectives have an impact on clinical error incidence and severity for patient receiving care at any given time. The findings showed 83 (57.3%) agreed being informed and made aware of clinical care objectives based on the hospital or other national or regional quality of care instrument leads to improved treatment for patients. 42 (29.2%) of healthcare workers strongly agree with the statement, while 15.4% are unsure and less than 2% disagree or strongly disagree. The findings from the two sets of questions indicates and is suggestive that participant feels appropriate team structures especially a mix of cadres that works collaboratively to promote accountable and responsible clinical care while adhering to use of SOPs and clinical care goals reduces the incidence and severity of clinical errors among patient on care.

The Spearman's Correlation analysis result is shown in the table below.

Symmetric Measures- Team structures

	Dose team structures promote goal awareness, accountability, and responsible efficient use of resources at all times (SOPS, RULES, CME done)				
			Value	Asymp. Std. Error	Approx. T
Error reporting	Ordinal by Ordinal	Spearman Correlation	-0.01	0.08	-0.07
	Interval by Interval	Pearson's R	-0.05	0.08	-0.59
	N of Valid Cases		**144**		
Error resolution	Ordinal by Ordinal	Spearman Correlation	0.06	0.08	0.73
	Interval by Interval	Pearson's R	0	0.07	-0.06
	N of Valid Cases		**144**		
Death occurrence	Ordinal by Ordinal	Spearman Correlation	-0.12	0.08	-1.4
	Interval by Interval	Pearson's R	-0.14	0.07	-1.73
	N of Valid Cases		**144**		

Table 4.4. Team structure and clinical error incidence and severity, GRRH, 2023

4.4 Teamwork leadership and clinical error incidence and severity.

In the second objective and questions, the team used a Likert scale to understand how team leadership and management styles impacts on clinical error incidence and severity in a given context of care and specifically at Gulu Hospital (GRRH).

Though leadership and management styles differ greatly across all sectors of healthcare, social sciences, and other professional career, they do share some similarities in promotion of goals, objective, and results in any field. This study showed a statistical significance between leadership styles and clinical error reporting *(P-value <0.05, CI 95%, Spearman's 0.04);* however, no significant relationship exists between leadership and management styles and clinical errors resolution and resultant deaths *(Spearman's -0.02 and -0.05).* More than half 75(52.1%) of the health workers agreed that leaders who provides support without punitive or blame to healthcare staffs promote better patient clinical outcome, about 46(31.9%) strongly agree, and 19(13.2%) were not sure while about 4(2.8%) do not agree or strongly disagree with the statement. This finding is an indication that suggest team leadership styles have a great impact on clinical care outcome for patients during care continuum.

This is shown in two tables 4.5 (a) and (b) below.

Responses	Frequency	Percent
Strongly Disagree	1	0.70%
Disagree	3	2.10%
Note Sure	19	13.20%
Agree	75	52.10%
Strongly Agree	46	31.90%
Total (n=144)	**144**	**100.00%**

Table 4.5(a). Impact of team leadership styles on incidence and severity of clinical errors.

Symmetric Measures- Leadership and management approaches

	To what extent does team leadership styles- Supervisors support quality of care (do not punish, blame).				
			Value	Asymp. Std. Error	Approx. T
Error reporting	Ordinal by Ordinal	Spearman Correlation	0.04	0.08	0.43
	Interval by Interval	Pearson's R	0.01	0.08	0.06
	N of Valid Cases		**144**		
Error resolution	Ordinal by Ordinal	Spearman Correlation	-0.02	0.08	-0.29
	Interval by Interval	Pearson's R	-0.04	0.08	-0.48
	N of Valid Cases		**144**		
Death occurrence	Ordinal by Ordinal	Spearman Correlation	-0.05	0.08	-0.6
	Interval by Interval	Pearson's R	-0.11	0.07	-1.28
	N of Valid Cases		**144**		

Table 4.5 (b). Impact of team leadership styles on incidence and severity of clinical errors.

Effective management and team support are crucial for supporting smooth unit operations, which lead to an improved team performance and overall goal achievement. The study's showed that, while 54 respondents (37.5%) believe having an effective manager encourages good clinical treatment, 38 respondents (26.4%) strongly agree that patient outcomes are improved by good team management and consistent support for effective unit operation. Surprisingly, the survey discovered that 39 healthcare professionals, or 27.1%, were unsure of whether good team management improves clinical care outcomes. Less than 1% strongly disagree and 12 (or 8.3%) disagree with the study's objectives. Considering the participants opinion here, the results

suggest participants are aware good management support for efficient unit operation during patient clinical care can reduce the incidence and severity of clinical error.

Responses	Frequency	Percent
Strongly Disagree	1	0.70%
Disagree	12	8.30%
Not sure	39	27.10%
Agree	54	37.50%
Strongly Agree	38	26.40%
Total (n=144)	**144**	**100.00%**

Table 4.6. Impact of team management and leadership support on efficient unit operation.

4.5 Teamwork situation monitoring and mutual support and clinical error incidence and severity.

Team mutual support, conflict management in care, and patient situation monitoring are critical for reducing clinical error incidence and severity in clinical settings. Three Likert scale questions were dispensed here: the impact of mutual support among team, feedback to patients and healthcare workers, and conflict resolution during patient clinical care.

The findings indicate majority of participants strongly agreed that enabling effective conflict management 101 (70.1%), providing feedback to patients and health staff on duties 91 (63.2%), and providing mutual team support 48 (33.0%) at all times during patient care reduces incidences and severity of clinical error they are to occur. Meanwhile, 40 (27.8%), 47 (32.6%), and 48 (49.3%) believe and agreed that open conversation and conflict management, feedback, and mutual team support provided during patient care lower the incidence and severity of clinical errors. About 2 (1.4%), 5 (3.5%), and 18 (12.5%) are not sure, whereas less than 10 or 6.3% disagreed with the statement. Through Spearman's rank correlation, further analysis showed no significant relationship between team mutual support and clinical error reporting, resolutions, and deaths *(P-value <0.05, CI 95%, Spearman's -0.07, -0.11, and -0.27).*

The result of Spearman's Correlation is shown in the table below

Symmetric Measures- Mutual support and situation monitoring

	To what extent does mutual staff support and situation monitoring reduce workload in your department?				
			Value	Asymp. Std. Error	Approx. T
Error reporting	Ordinal by Ordinal	Spearman Correlation	-0.07	0.09	-0.8
	Interval by Interval	Pearson's R	-0.02	0.09	-0.21
	N of Valid Cases		**144**		
Error resolution	Ordinal by Ordinal	Spearman Correlation	-0.11	0.08	-1.29
	Interval by Interval	Pearson's R	-0.17	0.07	-2.1
	N of Valid Cases		**144**		
Death occurrence	Ordinal by Ordinal	Spearman Correlation	-0.27	0.07	-3.35
	Interval by Interval	Pearson's R	-0.26	0.06	-3.21
	N of Valid Cases		**144**		

Table 4.7 (a) Mutual support and situation monitoring on error occurrence

This observation is suggestive that clinical care outcome is independent of mutual team support and situation monitoring, a result which is contrary to what is expected in general clinical care provision because mutual team support in teamwork is usually linked to better team performance and probably reduced incidence and severity of clinical errors during patient care. However, on the positive end, team conflict management and clinical care outcome were statistically significantly related; that is error reporting, resolution, and number of deaths *(P-value <0.05, CI 95%, Spearman's 0.16, 0.23, and 0.07)* respectively. This result is true because conflict management at patient's bed side or within healthcare facility can enhance better quality of care and promotes patients' safety. This is shown below

Symmetric Measures-Mutual support and situation monitoring

	To what extend does Conflicts Mgt, feedback, and open discussion on care reduce error occurrence				
			Value	Asymp. Std. Error	Approx. T
Error reporting	Ordinal by Ordinal	Spearman Correlation	0.16	0.08	1.93
	Interval by Interval	Pearson's R	0.13	0.09	1.53
	N of Valid Cases		**144**		
Error resolution	Ordinal by Ordinal	Spearman Correlation	0.23	0.08	2.85
	Interval by Interval	Pearson's R	0.17	0.11	2.07
	N of Valid Cases		**144**		
Death occurrence	Ordinal by Ordinal	Spearman Correlation	0.07	0.08	0.86
	Interval by Interval	Pearson's R	0.06	0.07	0.66
	N of Valid Cases		**144**		

Table 4.7(b) Conflict management, feedback, and open discussion impact on clinical error

4.6 Impact of teamwork communication on clinical error incidence and severity

Effective communication is one of the cornerstones to enabling positive engagement in any form of teamwork. During this study, the following were examined and analyzed: Providing adequate information while giving care to patients was one objective analyzed, and the study found that 62 (43.1%) strongly agreed, 76 (52.8%) agreed, and only 2 (1.4%) were not sure, disagreed, or strongly disagreed with the statement. Under the objective of reliability of information to support patients while on care, the study found 40 (27.8%) to strongly agree, 80 (55.6%) agreed, and less than 20 (11.1%) were not sure, with only 8 (5.6%) disagreeing with the statement. Lastly, under the objective of providing valid information to patients during care provision, the study found that 40 (27.8%) strongly agreed and 47 (32.6%) agreed. Strikingly, almost a quarter (22.9%) of the staff disagreed with the statement, whereas 21 (14.6%) were not sure and only 3 (2.1%) strongly disagreed with the statement. However, giving adequate, reliable, and valid information during patients care continuum was statistically significant only in improving error reporting and resolution but not clinical error deaths *(P-value <0.05, CI 95%, Spearman's 0.08, 0.15 and -0.06)* respectively.

This is shown in the table below

Symmetric Measures- Effective team communications

	Do giving adequate reliable, and valid, information's to patient reduces error incidence and severity?				
			Value	*Asymp. Std. Error*	*Approx. T*
Error reporting	Ordinal by Ordinal	Spearman Correlation	0.08	0.09	0.99
	Interval by Interval	Pearson's R	0.09	0.11	1.03
	N of Valid Cases		**144**		
Error resolution	Ordinal by Ordinal	Spearman Correlation	0.15	0.08	1.75
	Interval by Interval	Pearson's R	0.07	0.1	0.79
	N of Valid Cases		**144**		
	Ordinal by Ordinal	Spearman Correlation	-0.06	0.08	-0.69

Death occurrence	Interval by Interval	Pearson's R	-0.09	0.06	-1.05
	N of Valid Cases		**144**		

Table 4.8 Impact of effective team communication on clinical error incidence and severity.

Conclusively, this finding suggests that adequate, reliable and valid information sharing with patients, staffs and caretakers reduces the likelihood of clinical errors and its severity, however, clinical error deaths is independent of information given during clinical care to patients, caretakers, and staffs.

The summary of the finding was collated and presented in the chart below.

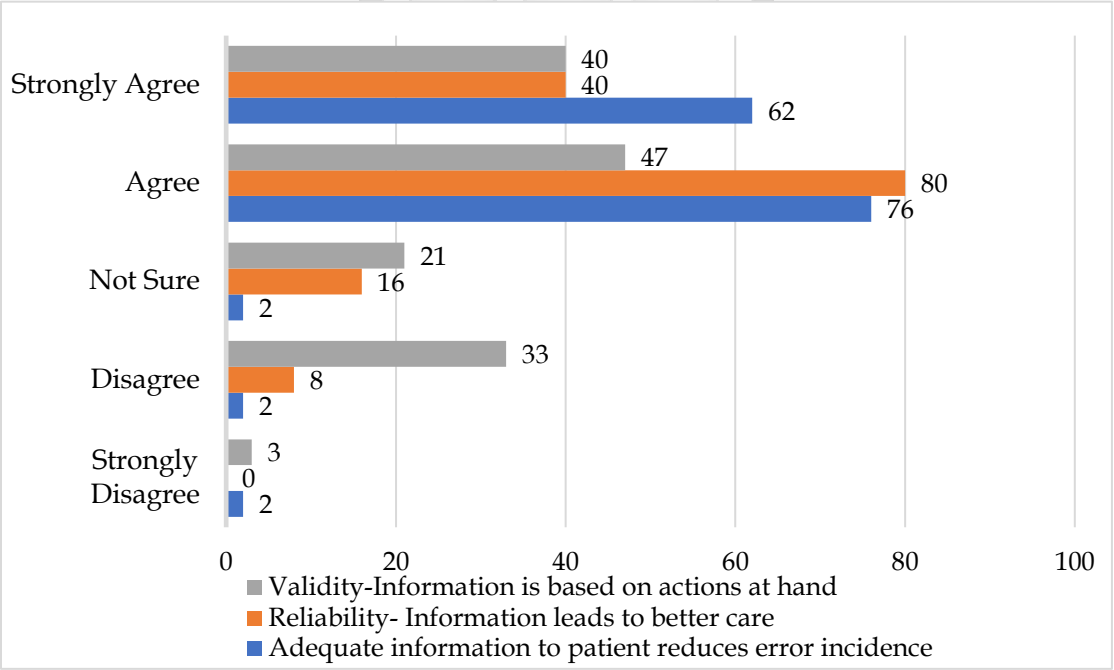

Figure 4.4. Impact of adequacy, reliability, validity of patients' information on clinical error outcome, November 2023 at GRRH.

4.7 Clinical error incidences documented, managed, and resultant deaths reported at GRRH.

This study further looked onto the number of clinical errors reported, documented, and managed during the last 12 months period November 2022 to October 2023 with a resultant death recorded at the facility. A retrospective recall of information was provided by the healthcare staff.

Despite the fact that memory recall does not provide evidence-based information, it was obtained at the facility through document analysis to aid and appreciate the quality and dependability of the information being collected from the workers. The results showed that clinical errors did occur at the hospital, however, only 5 (3.5%) were recorded, addressed, and resulted into deaths. Approximately 98 (68.1%) of the healthcare staff were able to state that fewer than 10 clinical errors were reported, documented, managed, and/or resulted in a death at the hospital during the period of November 2022 to October 2023 at GRRH. 16 (11.1%) of the healthcare staff recalled an error magnitude of over 20 cases reported, managed, and resulting deaths between November 2022 to October 2023; whereas approximately 39 (26.9%) of healthcare workers can recall a total of over 10 cases of clinical errors reported, managed, and probably a resultant death at the facility during the last 12 months period.

The detail is shown in the table below.

Range of # of clinical errors recorded	Clinical Errors documented in the last 12 months	Clinical errors managed in the last 12 months	Deaths due to clinical errors the last12 months	Health staff who recall clinical errors in the last 12 months
>40 Errors	0(0.0%)	1(0.7%)	0(0.0%)	0
31- 40 Errors	1(0.7%)	1(0.7%)	3(2.1%)	2
21-30 Errors	8(5.6%)	3(2.1%)	5(3.5%)	5
11 - 20 Errors	31(23.0%)	60(43.2%)	25(18.4%)	39
<10 Errors	104(77.0%)	79(56.8%)	111(81.6%)	98
Total (n=144)	**144**	**144**	**144**	**144**

Table 4.9. Clinical error reported, managed, and deaths recorded at GRRH. (Nov,2022- Oct, 2023)

A further attempt was made to interact with a few of the departmental in charges and this is what they have to say;

……**Respondent 1:** Registered Nurse in-charge (*Surgical Ward, 13th Nov 2023): We don't have many clinical errors; if we do, we write them in our 24-hour duty book, but we don't maintain a separate book for exclusively clinical errors.*

……. **Respondent 2:** Physician (*TB Ward, 13th Nov 2023): We have no record; we do face clinical errors; nonetheless, we believe that as a department, we should begin tracking in the new year.*

While at Paediatrics ward this is what the in charge had to say;

…....Respondent 3: Paediatrician (*Paed Ward, 14th Nov 2023). The majority of clinical errors go unreported, and only a few are documented in our duty book. It would be critical if the hospital administration placed a high priority on it, especially given the vast number of students we have. I believe it is critical that we begin reporting as a department in our own book.*

Lastly in two other departments these were some of the responses based on their available records about clinical errors;

……. Respondent 4: Physician (*ART Clinic, 14th Nov 2023). We are aware of clinical errors, but we have not been recording them. Perhaps the hospital should emphasize the need of tracking and reporting clinical errors.*

……...Respondent 5: Physician (*Medical Wards, 14th Nov 2023). We don't keep a separate record for clinical errors; instead, we document things like blood responses and lack of oxygen in our daily report book*.

Most of the errors reported were;

1. Blood transfusion error- wrong blood group to patients,
2. Administration of wrong drugs to patients in both Paed and Medical ward,
3. Wrong x-ray results to decide a longer regimen for DR TB which was later corrected. However, none of these errors reported and noted led to death.

4.8 Chapter summary

This chapter had presented, analysed, described, and interpreted the outcome of the study objectives with an outline of key findings stated and described. The various findings were analysed based on the study objectives, the questions under each objective, and the resultant

summary were presented in different format as shown in the list of figures and tables in the chapter.

Key findings were as summarised in the table below.

Themes	Sub themes analysed	Percent of Results
Team structure	Responsible and accountable process to goal awareness and objectives	91 (63.2%) and 83 (57.6%) Agreed.
Team leadership and management	Leadership and management support for efficient unit operations	75 (52.1%) and 54 (37.5%) Agreed.
Mutual team support	Conflict management, feedback, and mutual team support	Average of 80 (55.6%) Strongly agreed.
Team communication	Adequacy, reliable, and valid information sharing during patients care	Average of 68 (46.9%) Agreed.
Clinical error incidences and severity	Number of clinical errors documented, managed, and deaths recorded (Sep, 2022-Oct, 2023)	98 (68.1%) recalled <10 clinical errors in the last 12 months.

Table 4.10. Summary of study findings at GRRH, Nov ,2023.

CHAPTER FIVE

DISCUSSIONS, CONCLUSION, AND RECOMMENDATIONS

5.0 Introduction.

This section discusses the key findings from the study based on the study objectives in comparison with experiences from other studies done in Uganda and other parts of the region and globally. The chapter has incorporated the conclusion drawn from the findings and suggested probable recommendations from the result of the findings.

5.1 Discussion.

5.1.1 Impact of team structure on clinical error incidence and severity.

Under this objective, the study examined the impact of team goal awareness and structure in promoting an accountable, responsible clinical care and procedures to patients. In clinical context, the term "team structure" describes the interdisciplinary makeup of the team that provides patient care continuously.

According to the study results, team goal awareness is improved effectively and efficiently through the use of SOPs, CMEs, and other clinical guidelines which subsequently leads to improvement in each person's capacity for making accountable and responsible decisions and an improved patient outcome(Naome et al., 2020). Because heuristics which is an inborn human error according to human error theory, team huddles, which are a debrief and orientation on clinical care goals, objectives, and other clinical procedural activity, have been demonstrated in this study to improve healthcare personnel's learning ability and acquire new knowledge of how to give high-quality care. Such team meeting, which frequently covers critical patient data, clinical management and care, and other general care processes, is critical in achieving a favourable therapeutic outcome and a low incidence and severity of clinical errors if they occur(Lin et al., 2022).

Similarly for healthcare providers to keep consistent with the growing advances in medical healthcare services delivery as shown in the SEIPS and TeamSTEPPS models, Continuous Medical Knowledge Drills (CMKD) which incorporates the use of simulation exercises, quality of care tools, and other bedside learning to enhance quality patient care is recommendable. This

study further showed that, the use of quality-of-care tools to improve patient clinical outcome is significant therefore, using clinical care drills and simulation to healthcare workers is a better means to reduce clinical error occurrence and severity during patient care. This is consistent with studies done in Tanzania, South Africa and elsewhere which indicates that team drills, collaboration, and patient care outcome are correlated in enhancing quality of care and patient safety(Alsabri et al., 2022; Egenberg et al., 2017; Rowland & Adefuye, 2022).

This study has revealed that though human error and system error do exist in the healthcare system, promoting goal awareness, being accountable, and responsible within the clinical team encourages team collaboration and improves team performance. It further indicated that a well mix and right expertise team structures reduces the likelihood of clinical error incidence and severity and thereby improving the quality of care and providing better patient safety net during care continuum.

5.1.2 Impact of teamwork leadership and management on clinical error incidence and severity.

The Joint Commission on Patient Safety defines safety culture as the collection of "beliefs, values, attitudes, perceptions, competencies, and patterns of behaviour that determine the organization's commitment to quality and patient safety"(Brooke et al., 2020). It is one of the core foundations on which quality of care and patient safety is realised especially in a complex healthcare environment. However, safety culture in healthcare comes only with ethical leadership practices during patient care(M & Ns, 2020). However, such practices don't exist in the vacuum because in healthcare setting human being are in continuous interaction with equipment and other fellow human beings. This calls for proper configuration as human and machines interact as seen in the SEIPS model and requires effective engagement especially between colleagues in team work during patients care.

The findings in this study showed that majority of healthcare workers agrees with the hypothesis that ethical and effective team leadership and management enhances collaborative teamwork by promoting open communication, shared vision on patient care goals, transparent non-punitive and blame-free measures on clinical errors reporting among healthcare workers. This has an impact on improving individual performance and promoting error detection, reporting,

resolutions, and which reduces the incidence and likelihood of clinical errors during patient care. They also support findings from another study which concluded that promoting effective ethical leadership that promote open and closed-loop communication and coordination among health practitioners results into better and high performing team and a reduced incidence and severity of clinical errors(M & Ns, 2020; Manser, 2009). Similarly in another study its shown that promoting ethical leadership among nursing managers encourages error reporting and a reduced incidence of clinical errors(M & Ns, 2020).

However, it must also be noted that the findings showed negative relationship between leadership and management styles in clinical error resolution and death. This is indicative that leader's and managers who have no supportive effort towards healthcare workers who erred may likely not receive error reports or because leaders and managers who implement policies without being supportive in its operation may not be able to resolve errors once they have occurred(Alhassan et al., 2022). In a similar studies done in Uganda, it has shown that mere implementation of policy on clinical error reporting and management is not enough if leaders and managers do not provide conducive environment for reporting and resolution of clinical errors(Mauti & Githae, 2019).

It is also found that whereas leaders and managers have different style and practice different ethics, having a dynamic leaders and managers who encourages open door policy and non-punitive or blame during patient care continuum increases the likelihood of clinical staff being responsible and accountable to error reporting and foster a better management of clinical error once it occurs.

5.1.3 Team situation monitoring, mutual support impact on clinical error incidence and severity.

WHO, Uganda National Drug Authority, and The Quality of Health Care Institutions recommends pharmacovigilance among patients receiving care at any given time through the use of three most effective tools in patient situation monitoring: Apparent Cause Analysis, Root Cause Analysis, and Common Cause Analysis, all of which are intended to inform situational events and their likely course of outcome, particularly in medical settings(Harrington et al., 2023). However, burn-out resulting from high patient-provider ratios and lack of mutual team support

among healthcare workers is a serious performance issue that can aggravates and enhance clinical error occurrence among practicing healthcare professionals(Junpei, 2021). Thus, encouraging vigilant patient status monitoring and fostering teamwork within teams lowers the likelihood of clinical errors, and consequently, morbidity and death. In this practice, situation monitoring especially during time of critical patient care, its advisable that team promotes consistent feedback, reduces conflict, and mutually support one another to enhance quality of care for all patient. The findings showed that these three components of situation monitoring and mutual support during patient reduces the Ockham or tunnel vision decision process as proposed in human error theory and further helps individual to navigate mishaps especially in a faulty system configuration and subsequently reduce chances of clinical error or harm to patient while receiving care.

According to the study's findings, close observation of the patient's condition and reciprocal team support reduce the possibility of a burn-out, inadequate interaction between patient and care providers, and conflict of interest during patient care and management. They also promote favourable patient-health professional feedback and vice versa. This is crucial because conflicts of interest, unsatisfactory feedback, and burn-out during patient care and management can result in processes and procedures that are prone to error, particularly when making crucial clinical decisions. This can harm patients and increase the frequency and serious consequences of clinical errors. This is consistent with findings from elsewhere which showed that reduced error rates and severity among patients receiving care and treatment hinges on mutual support, consistent feedback and effective conflict management during care continuum(Junpei, 2021). These enables better error reporting, resolution, and a reduced chances of death resulting from clinical error during patient care.

The finding in this study is similar and consistent with other studies which showed that nurses who provides critical patient situation monitoring and are at all time providing mutual support among teams of multidisciplinary workers reports adverse events which reduces clinical errors incidence and severity among patient during care(Kakemam et al., 2021).

5.1.4 Team communication impact on clinical error incidence and severity.

Communications is regarded as cornerstone to extract positive energy especially during heavy workload among clinicians and nurses. Communication happens between people and people with machines or equipment. Similar to what has been indicated in the accident causation or the System theory where healthcare workers are at the receiving end while system configuration is at the producing ends, information is need to make decision, to improves results, and to reduce chances of human-system inborn clinical errors(Roumeliotis et al., 2019). Therefore, the practice of effective communication especially when adequate, reliable, and valid information about patient management is shared, the outcome of the clinical care would be safe at all time. However, health professionals are becoming more and more concerned with learning how to defend themselves against the legal or non-legal actions of external stakeholders in the event of clinical or medical blunders(Miziara & Miziara, 2022). Yet open communications among teams improves patient outcome of care, many clinicians tend to seal reporting on clinical errors to avoid punishment. However, this self-management paradox can only be overcome when hospital administration and leaders promote candid and open communication among teams(Cusin & Goujon-Belghit, 2022).

The findings from this study revealed that sharing adequate, valid and reliable information within team, patients, and clients provides better outcome of patient care and safety. However, there is a point of Patient-Hands-off; a moment defined by the transfer of patient information to the next shift of workers or staff without the patient providing any integral actions of communication; this point in time impacts information reliability, adequacy and validity(Rodziewicz et al., 2024). This is consistent with the findings of other studies, which indicated that open communication, in which reliable, adequate, and valid information is shared as part of a clinical care continuum by team of multidisciplinary cadres, is essential in reducing clinical errors, promotes safe patient care, and improving the providers-patient relationship and attitudes during clinical care(Kilner & Sheppard, 2010; Mujumdar & Santos, 2014). But because providers are trying to practice defensive medicine to seal themselves off any communication which can be used against them by a third party, pen communication among team during clinical care has been negatively impacted and which subsequently affects the quality of patient care and safety(Cusin & Goujon-Belghit, 2022).

The finding in this study is true which showed that giving or sharing of information adequately between patients and healthcare providers does negatively affects clinical error deaths, meaning a reduced number of death due to clinical error would occur. However, because providers would not want to be convicted in the court of law for committing errors, they tends to less likely reports deaths which have resulted from clinical errors in healthcare setting.

5.1.5 Clinical error reported, managed, and deaths recorded at GRRH.

Globally there are very limited framework and tools for the classification and grading of clinical error or harm experienced or committed to patients while on care(AbuRuz et al., 2006). While more than fifty tools do exist, they are not equally suitable and tested to provides a reliable measure of the degree of clinical error due to differences in health system across the world. For example, the Harm Associated with Medication Error Classification (HAMEC) a new tool only focusing on medication errors recording using a score rating of no harm to severe at a scale of 0-4. While attention may not be drawn by minor to moderate harm, severe harm are the only cases which clinicians and nurses do report and record(Gates et al., 2019).

In this study particularly a generalizability concept to reach a classification of errors reported, managed, and deaths at the hospital was used. The findings indicates that majority of staff are aware of clinical error occurrence and reports error of less than 10 per year, approximately 8/370 bed capacity. However, there are no documentation to provides more evidence onto this recall except at the mental health unit where a record of potential harm or error committed to patient are being recorded and which provide very little sample to the overall hospital department managing patients routinely.

This is very unfortunate because being a teaching and referral hospital, there is a high need to promote quality patient care to enhance patient safety as a core value to improving population health outcomes. The lack of data and record of clinical harm at the various department and within the quality assurance department is a huge gap which has reflected how possibly a silent harm is taking away lives of many innocent people accessing healthcare from this facility.

From this study its worth noting that in promoting clinical error reporting, management should remain a key role of the leadership and management in the hospital because this is the only way

quality of healthcare can be improved and hence patients would be safe at every time while accessing care. However, the lack of clinical error in the International Classification as Diagnosis and should be written as the final outcome in a patient course of care is an area which requires further attention from the WHO so that such an event which is increasingly becoming the bottleneck to quality of care and patients' safety is recognised addressed in a holistic approach.

5.2 Conclusion

This study uncovered a vital clinical care paradigm, marking a significant turning point in the management and promotion of quality of care among patients and the general public. According to research, people who die as a consequence of clinical error are unlikely to be formally documented as deceased as a result of clinical error because clinical error is not considered a diagnosis. This highlights the need for the World Health Organization (WHO), which regulates health care, to review how as causes of death are categorized in the general population, including clinical error. This would aid routine mortality data in identifying and emphasizing fatalities caused by clinical errors as a potential event which requires addition to the International Classification of causes of deaths.

In the first objective of the study, the findings highlight the importance of having the right team structure, skill mix, and expertise in clinical practice for patient care and management. Promoting clinical care goal awareness, accountability, and responsible team collaboration can foster better quality of care through tools like SOPs and CMEs.

Secondly, Ethical healthcare leadership and management play a key role in promoting non-punitive and open discussions with clinical teams during patient care, particularly during ward rounds and team huddles. This can reduce errors and its consequences which has the potential of improving the performance of health workers and promoting quality of care and patient safety.

In the third objective, healthcare system, particularly in low-income countries like Uganda, faces challenges with adequately staffed facilities, putting pressure on available human resources. This results in a lack of mutual support, critical patient situation monitoring, and conflict management during patient care. The study finding showed that mutual team support, interaction with

patients, and conflict resolution during patient care promote a culture of trust between patients, clinicians, and health institutions.

Lastly, the study emphasizes the need for open communication and comprehensive patient reports among staff, regardless of their experience. Providing adequate, reliable, and valid information among teams and patients promotes trust and gives patients the values they attach to healthcare institutions and their staff.

The study exposes the ideal clinical care department vs expected standards, establishing a baseline for quality assurance to promote WHO and Joint Commission on Patient Safety Core Values of reducing harm to all patients through; 1) Team configuration, 2) engagement, and 3) adaption as emphasized in the SEIPS Model. The study limitations included the absence of predicted clinical error reports, fewer participants than intended, and a piloting failure due to time restrictions. The overall attendance rate was greater than 80%, allowing for a reasonable extrapolation of the findings. Due to time restrictions, the piloting was done to only few numbers than planned, resulting in a tool review based on the Supervisor and principal investigator comments. These restrictions may have an impacted on the overall quality of the research work.

5.3 Recommendations

From the findings of this study the following are recommendations to the hospital, the practicing healthcare workers, the policy body- MoH Uganda, and future research study.

5.3.1 Recommendation to Gulu Hospital

The hospital administration should establish a quality assurance unit to oversee the quality of care and ensure that clinical errors are assessed, detected, recorded, and managed. This will help document individual outcomes and meet national health policy goals of safe care and universal health access. Insufficient records to monitor and track clinical errors across departments are crucial for improvement. Enforcing documentation of clinical errors and implementing resolutions to improve patient care quality are essential steps. The medical facility should also continue working on training for health workers, particularly in recording clinical errors without fear of intimidation. This should be regulated by enacting a policy safeguarding employee right while on the job.

5.3.2 Recommendation for practice of healthcare workers at the Hospital

Teamwork should be practiced by healthcare professionals and clinicians through collaborative and open communication within the team. This is critical for enhancing patient care outcomes and the overall quality of treatment at the hospital. Second, the other department that is missing clinical error records needs to continue the implementation of strong medical records. This is crucial because it informs the quality assurance department about the need for additional staff training and medical drills.

5.3.3 Recommendation to the Policy body in Uganda, MoH.

The Ministry of Health (MoH) should establish a quality-of-care department to oversee healthcare facilities and patient safety, thereby improving cost and reducing harm. The MoH assesses other facilities using accreditation tools to ensure they meet minimum standards for healthcare delivery. The WHO should reassess its nomenclature of causes of mortality to include clinical error as a diagnosis, because its absence in the International Statistical Classification of Diseases (ICD-10 Version 2019) has led to unclear or under-reporting of these events. Additionally, a tool for grading clinical error degrees should be developed to track facilities' performance from poor to excellent. This will help improve healthcare delivery to the general population.

5.3.4 Recommendation for further research.

Because there are no adequate data and records of clinical error being documented at the facility, this study can give a baseline against which future studies can be utilized to determine whether or not clinical error management in healthcare facilities has improved. Second, future research should look into why such errors occur and maybe define the types of errors most typically committed in the facility.

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APPENDICES.

APPENDIX I: Participant Information and Informed Consent

This information sheet is for the study on "Clinical errors-The unclassified diagnosis- Application of TeamSTEPPS tool to examine the impact of teamwork among medical and paramedical workers on the incidence and severity of clinical errors in Gulu Hospital, Gulu District.

Name of Principle Investigator:____Abacha OMARA GEOFFREY Reg#138193_____

Name of Organization:____Strathmore University Business School_____

Name of Sponsor:__SU-IERC _&_NACOSTI_____

Name of Project and Version:___Thesis Reserch Project_____

This document has two parts as explained and described below;

- Information Sheet (to share information about the study with you)
- Certificate of Consent (for signatures if you choose to participate)

Part I: Information Sheet

Introduction:

I am Abacha OMARA GEOFFREY, pursuing a Master's Business Administration degree in Healthcare Management at Strathmore University. I am doing research on Clinical errors- The unclassified diagnosis: Application of TeamSTEPPS tool to examine the impact of teamwork on the incidence and severity of clinical errors at Gulu Hospital.

I am going to give you information and invite you to be part of this research. You do not have to decide today whether or not you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research.

This 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 assistant.

Purpose of the research:

Assessing the impact of teamwork on the incidence and severity of clinical errors is of great importance in enforcing efficient and an effective performance of team in delivering and achieving organisational medium term objectives as well the strategic goals. In the current setting, such research has not been done before, therefore we want to examine and understand better on what healthcare workers perceive in teamwork structures and leadership as of great impact in reduction of the incidence and severity of clinical errors. We believe that you can help us by responding to the questionnaire about this hospital and the overall daily healthcare practices in general. We want to learn what the healthcare staff (medical and paramedical) who work in this institution feels about mutual team support and situation monitoring in promoting quality of care and patient safety in this hospital. We also would like to learn what are the impact of team communication among healthcare workers in influencing provision of quality health care, and its role in reducing clinical error incidence and severity among patients seeking care in this institution because this knowledge might help us to learn how to improve the organizational practices in enhancing quality healthcare.

Type of Research Intervention:

This research will involve your participation in a questionnaire that will take about half an hour or less, to complete.

Participant Selection:

You are being invited to take part in this research because we feel that your experience and interaction with patients daily or regularly as a health worker can contribute much to our understanding and knowledge of teamwork impact in reduction of the incidence and severity of clinical errors among patients.

Voluntary Participation:

Your participation in this research is entirely voluntary. The choice that you make will have no bearing on your job or on any work-related evaluations or reports. You may change your mind later and stop participating even if you agreed earlier.

Procedures:

We are asking you to help us learn more about the impact of teamwork on the incidence and severity of clinical errors at Gulu Hospital. We are inviting you to take part in this research project. If you accept, you will be asked to sign a confidentiality and consent form confirming your privacy and rights of participations.

Duration:

The research take place for over 3-5 days. During that time, we will visit you once or more depending on time convenience from your side for interviewing you and each interview will last for about half an hour or less.

Risks:

There is a risk that you may share some personal or confidential information by chance, or that you may feel uncomfortable talking about some of the topics. However, we do not wish for this to happen. You do not have to answer any question or take part in the interview if you feel the question(s) are too personal or if talking about them makes you uncomfortable. Due to COVID-19 risk and the risk associated with any other infectious disease transmissions, during the period of the interview the interviewers will observe social distance, use of face mask, hand hygiene practices using washing or hand sanitizing, and equally promotes safe disposal of any used mask within the unit.

Benefits:

There will be no direct benefit to you, but your participation is likely to help us find out more about how patient safety can be improved in healthcare organization.

Confidentiality:

We will not be sharing information about you to anyone outside of the research team. It will not be shared with or given to anyone except the research department of Strathmore University.

Sharing the Results:

Nothing that you tell us today will be shared with anybody outside the research team, and nothing will be attributed to you by name. Each participant will receive a summary of the results and further disseminated via policy briefs, working paper, and journal articles or as maybe applicable.

Right to Refuse or Withdraw:

You do not have to take part in this research if you do not wish to do so, and choosing to

participate will not affect your job or job-related evaluations in any way. You may stop

participating in responding to the questionnaire at any time that you wish without your job being affected.

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 any of the following:

Name:___Dr Ocen Simon__OR __Abacha Omara Geoffrey_____

Address:__Gulu City, NORTHERN UGANDA_____

Mobile number:__+254725122293/+256788944546_____

E-mail: _geoffrey.abacha@strathmore.edu _& _____

This report has been reviewed and approved by Strathmore university IREC and GUREC, which are committees whose task it is to make sure that research participants are protected from harm.

If you wish to find about more about the IREC,

The Chairman GUREC,

P.O. Box 166, Gulu, Kampala Uganda, Email: gurec@gu.ac.ug ,Tel:- +256 471 432 096

The Secretary, Strathmore University Institutional Ethics Review Board,

P. O. BOX 59857, 00200, Nairobi, Email ethicsreview@strathmore.edu, Tel:- +254 703 034 375

It has also been reviewed by the Ethics Review Committee of the GUREC, SU-IERC & NACOSTI, which is supporting the study.

Part II: Informed Consent (*This section is mandatory)*

I have been invited to participate in research about examining the impact of teamwork on the incidence and severity of clinical errors at GRRH. 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

Name of Participant_____ Supervisor Name. _____

Signature of Participant _____Sign, _____

Date _____/_____/_____ Date _____/_____/_____

Day/Month/Year *Day/Month/Year*

APPENDIX II: Questionnaires

SECTION A: DEMOGRAPHIC DATA

Please tick [✓] inside the appropriate box below

- Gender:

Male [ ] b) Female [ ]

- What is your age bracket:

<30 Yrs [ ] 30-40 Yrs [ ] 41-50 Yrs [ ] Over 50 years [ ]

- What is your education level:

Diploma [ ] Bachelor Degree [ ] Master Degree [ ] PhD [ ] Others [ ]

- What is your position at the hospital:

Nurse [ ] Lab Technician [ ] Clinical Officer [ ] Pharmacist [ ] Doctor [ ] Others [ ]

- What is your work experience in this department?

2-5 Yrs [ ] 6-10 Yrs [ ] > 10 Yrs [ ]

SECTION B: TEAM STRUCTURE IMPACT ON CLINICAL ERROR INCIDENCE AND SEVERITY

Please tick the most appropriate opinion based on the following questions	Strongly Agree	Agree	Not	Disagree	Strongly Disagree
Does team structures promote accountability & responsibility- Efficient use of resources at all times (SOPS, rules, CME done)					
Does team structure promote team goal- awareness and informed about goal/objectives.					

SECTION C: TEAM LEADERSHIP AND MG'T IMPACT ON CLINICAL ERROR INCIDENCE AND SEVERITY

Please tick the most appropriate opinion based on the following questions	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
To what extent does team leadership styles- Supervisors support quality of care (do not punish, blame).					
Both Mgt & Leaders support efficient unit operations					

SECTION D: TEAM MUTUAL SUPPORT AND SITUATION MONITORING ON CLINICAL ERROR INCIDENCE AND SEVERITY

Please tick the most appropriate opinion based on the following questions	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
To what extent does mutual staff support reduce workload in your department?					
Do you think feedback on care support- patient & staff can reduce error occurrence?					
Conflicts Mgt- Open discussion on care reduce error occurrence					

SECTION E: TEAM COMMUNICATION IMPACT ON INCIDENCE AND SEVERITY OF CLINICAL ERRORS

Please tick the most appropriate opinion based on the following questions	Strongly Agree	Agree	Not	Disagree	Strongly
Do giving adequate info to patient reduces error incidence					
Reliability- Information leads to better care, to what extent?					
Validity-Information is based on actions at hand					

SECTION F: CLINICAL ERRORS INCIDENCE AND SEVERITY IN THE LAST 12 MONTHS.

Please tick the range of the most appropriate opinion based on the following questions	<10 Cases	11-20 Cases	21-30 cases	31-40 Cases	>40 Cases
How many numbers of errors reported					
How many numbers of errors resolved					
How many numbers of death due to errors					

The End.

Thank you for your time!!

APPENDIX III: Research Timelines

Names	**Abacha OMARA GEOFFREY**	
Reg No#.	**138193/21**	
Title of Project	Clinical errors- The unclassified diagnosis: Application of TeamSTEPPS tool to examine the impact of teamwork on clinical errors at Gulu Hospital (GRRH).	
Project Start Date	1st August 2022	
Project Lead	Self	
Dates	Activity Descriptions	No. of days
Aug-2022- Jan 9th 2023	Report preparation and Submission for Défense	
Jan-10th -20th 2023	Approval letter & License for project proceedings	
Oct 20th -31st 2023	Data tool cleaning and research assistance selection and training and tool piloting	
Nov-2nd -12th 2023	Final study execution & data collection	
Nov-14th -16th 2023	Data cleaning, analysis, and first Draft of Project Report for review	
Nov -26th -28th 2023	Amendments and correction of report	
Jan -15th 2024	Submission of final copy of Project Report & defense	
March- 2025.	Graduation registrations	

APPENDIX IV: Field Workplan

Dates/Days	Activity Descriptions
Day-1	Team constitution -Supervisor, interviewers and personnel
Day-2	Training of field teams
Day-3	Pilot of study and tool cleaning
Day-4	Team role assignment
Day-5	Logistic and printing works and assigning schedule in health facility
Day-6-14	Data collection, cleaning, coding, entry, and analysis
Day-14-17	Draft reporting sharing with relevant authority
Day-18-30	Feedback to participant and health facility

APPENDIX V: Budget Plan (Tentative).

S No.	Item Descriptions	Units	# of Units	Unit Cost (Shs)	Total Cost (Shs)
Personnels					
	Coordinators	Person	1	150,000	150,000
	Registrars/Data collectors		4	100,000	400,000
	Statistician		1	150,000	150,000
SUB TOTAL					700,000
Equipment's					
	Laptops/Tablet	Pcs	1	450,000	450,000
	USB Sticks	Pcs	4	60,000	240,000
SUB TOTAL					690,000
Stationeries					
	Printing papers	Reams	2	75,000	150,000
	Pens	Pcs	12	1,000	12,000
	File covers	Pcs	4	6,000	24,000
	Plastic bag- File holders	Pcs	3	4,000	12,000
	Toner	Pcs	2	75,000	150,000
	Printer	Pcs	1	250,000	250,000
SUB TOTAL					598,000
DSA					
	Break & Lun- 4 pple for 10 days	Days	40	7,000	280,000
SUB TOTAL					280,000
Registrations-NACOSTI					
	License	Lumpsum	1	350,000	350,000
SUB TOTAL					350,000
GRAND TOTAL					2,618,000

APPENDIX VI: SU-ISERC Approval

Strathmore UNIVERSITY

31st March 2023

Mr Omara Geoffrey Abacha,
geoffrey.abacha@strathmore.edu

Dear Mr Omara,

RE: Clinic Errors- The Unclassified Diagnosis: Application of TeamSTEPPS Tool to Examine the Impact of Teamwork on the Incidence and Severity of Clinical Errors at Gulu Regional Referral Hospital, Uganda

This is to inform you that SU-ISERC has reviewed and **approved** your above **SU-masters** research proposal. Your application reference number is **SU-ISERC1626/23.** The approval period is from 31st **March 2023 to 30th March 2024.**

This approval is subject to compliance with the following requirements:

i. Only approved documents including (informed consents, study instruments, and MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 48 hours of notification
iv. Any changes, anticipated or otherwise, that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-ISERC within 48 hours
v. Clearance for the export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to the expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days of completion of the study to SU-ISERC.

Before commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) https://research-portal.nacosti.go.ke/ and obtain other clearances needed.

Yours sincerely,

for: **Dr Ben Ngoye,**
Secretary; SU-ISERC

Cc: Mr Ambrose Rachier,
Chairperson; SU-ISERC

STRATHMORE UNIVERSITY INSTITUTIONAL SCIENTIFIC AND ETHICAL REVIEW COMMITTEE
(SU-ISERC)
31-Mar-2023
Email:ethicsreview@strathmore.edu
P.O BOX 59857-00200
NAIROBI-KENYA

APPENDIX VII: GUREC Approval

GULU UNIVERSITY

P.O. Box 166, Gulu (U)
Website: www.gu.ac.ug
Email: gurec@gu.ac.ug

Tel: +256 471 432 096
Fax: +256 471 432 913
Mob: +256 772 305 621
+256 776 812 147

RESEARCH ETHICS COMMITTEE

01/08/2023

To: Abacha OMARA
STRATHMORE UNIVERSITY, NAIROBI KENYA
+256785082086

Type: Initial Review

Re: GUREC-2023-585: Clinical errors-The unclassified diagnosis: The application of TeamSTEPPS tool to examine the impact of teamwork on the incidence and severity of clinical errors at Gulu Regional Referral Hospital

I am pleased to inform you that at the **102nd** convened meeting on **18/05/2023**, the Gulu University REC meeting voted to approve the above referenced application.
Approval of the research is for the period of **01/08/2023** to **01/08/2024.**

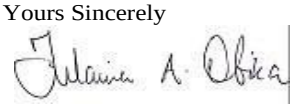
As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re- review and approval **prior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit: ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **01/08/2024** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the list of all documents approved in this application by Gulu University REC:

No.	Document Title	Language	Version Number	Version Date
1	Final Protocol	English	2	2023-07-26
2	Informed Consent forms	English	2	2023-07-26
3	COVID-19 Risk Managment Plan	English	1	2023-07-26
4	Data collection tools	English	2	2023-07-19

Yours Sincerely



Julaina A. Obika (PhD)
For: Gulu University RE

APPENDIX VIII: NACOSTI Research License/Approval

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **201188**

Date of Issue: **12/April/2023**

RESEARCH LICENSE

This is to Certify that Mr.. OMARA GEOFFREY ABACHA of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Clinical errors-the unclassified diagnosis: Application of TeamSTEPPS Tool to examine the impact of teamwork on the incidence and severity of clinical errors at Gulu Regional Referral Hospital, Uganda for the period ending : 12/April/2024.

License No: **NACOSTI/P/23/25070**

201188

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR
SCIENCE,TECHNOLOGY &
INNOVATION

Verification QR Code

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See overleaf for conditions