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DEVELOPMENT OF CLINICAL GUIDELINES FOR PRE AND POST-ANAESTHETIC ASSESSMENT IN GHANA

David Tenkorang-Twum



WITS
UNIVERSITY

A thesis submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in fulfilment of the requirement for the degree of

Doctor of Philosophy

Johannesburg, 2022

DECLARATION

I, David Tenkorang-Twum, declare that this thesis is my own, unaided work. It is being submitted for a Doctor of Philosophy degree at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.



.....

Signed at Johannesburg

On the 14th November 2022

DEDICATION

I dedicate this work to my virtuous wife, Mrs Margaret Tenkorang-Twum and my God given Angels, Maame Dedaa Tenkorang-Twum, Nana Pokua Tenkorang-Twum and Papa Twum Barimah Tenkorang-Twum.

ABSTRACT

Background: Clinical guidelines are evidence-based tools designed to help clinicians provide safe and consistent clinical care. Due to the wide range of contexts in which anaesthesia is practised, existing clinical guidelines are challenging to execute in Ghana.

Purpose: To develop clinical guidelines that may inform pre- and post-anaesthetic assessment of surgical clients to improve surgical safety and post-operative outcomes.

Methodology: In four phases, the researcher recruited certified registered anaesthetists and physician anaesthetists in Ghana. The study utilized an explanatory sequential mixed method design: quantitative, qualitative, integrative review, and document analysis. The AGREE II instrument was used to inform the clinical guidelines development.

Results: Phase I: Early detection and intervention of complications, fluid, and effective pain management are key strategies for excellent recovery and patient comfort. Phase II: Post-anaesthetic assessment has been poor at all four levels of care, with time constraints and early discharge cited as primary causes of unsatisfactory practice. Phase III: Anaesthetic assessment is vital and could improve practice and patient safety, but it is challenged by inadequate logistics and healthcare financing and a shortage of staff. Phase IV: Anaesthetic document analysis exposed patients' biographical information that may help in recognizing patients' problems, such as comorbidities, which may have a negative impact on surgical decisions and anaesthesia administration.

Conclusion: Ghanaian anaesthetists may be trained to use the developed pre and post-anaesthetic assessment guidelines. Well-staffed post-anaesthesia care units (PACU) with regular follow-up visits are essential for patient safety. These recommendations may be useful for anaesthesia teaching, practice, and research.

Keywords: Assessment, anaesthesia, pre-anaesthetic assessment, post-anaesthetic assessment, clinical guidelines, pre-operative, post-operative, post-anaesthesia care unit.

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LIST OF ABBREVIATIONS

AAGBI	Association of Anaesthesiologist of Great Britain and Ireland
AGREE	Appraisal of Guidelines for Research and Evaluation
AP	Anaesthesia Provider
ASA	American Association of Anaesthesiologist
CRA	Certified Registered Anaesthetist
CPD	Continuous Professional Development
DA	Document analysis
GHS	Ghana Health Service
GHS-ERC	Ghana Health Service Ethics Review Committee
GMDC	Ghana Medical and Dental Council
IRB	Institutional Review Board
ILR	Integrated Literature Review
KI	Key informants
LMIC	Lower- and Middle-Income Country
MOH	Ministry of Health
N&MC	Nursing and Midwifery Council
PA	Physician Anaesthesiologist
PHC	Primary Health Care
ScR	Scoping Review
UHC	Universal Health Coverage
WFSA	World Federation of Societies of Anaesthesiologist
WHO	World Health Organization

CHAPTER 1: OVERVIEW OF THE STUDY

1.1 INTRODUCTION

This research was designed to develop clinical guidelines to inform pre and post-anaesthetic assessment of surgical clients in Ghana. This chapter provides a synopsis of the research undertaken. It contains the background, the research problem, specific study objectives, purpose, and significance of the study. Furthermore, this chapter provides the definition of concepts explored in this study, overview of the research methodology, paradigm, and theory employed in this study.

1.2 BACKGROUND

Evidence-based practice in its simplest form is transitioning from generating evidence to using such evidence to guide practice, paying critical attention to cultural nuances and the expertise of the practitioner (Djulbegovic & Guyatt, 2019). The development of clinical guidelines is one recognised way of ensuring evidence-based practice globally (Diallo et al., 2017; Djulbegovic & Guyatt, 2019). Clinical guidelines are a set of evidence-based tools developed through rigorous scientific processes and are used to guide practitioners in providing recognized, safe, and uniform clinical care (Batchelor et al., 2018). Several guidelines have been produced to improve clinical practice, resulting in increased efficiency, improved health outcomes, and lower healthcare costs (Maaløe et al., 2021; Olayemi et al., 2017; Wharton et al., 2020). Guidelines are constituted by evidence-based recommendations that follow an internationally accepted development and evaluation process, including stakeholder inputs with the potential for positive impact on healthcare (Djulbegovic & Guyatt, 2019; Linan et al., 2021; Petkovic et al., 2020; Rudolph et al., 2019; World Health Organization, 2014). Avoiding bias and conflicts of interest during the development process, as well as increasing co-creation of recommendations among stakeholders strengthens the development of the recommendations and makes the implementation seamless (Brems et al., 2021; Maaløe et al., 2021). In this study, evidence-based pre and post-anaesthetic assessment guidelines were developed for Ghana.

Although there are no recent global estimates of surgical volumes, the *Lancet Commission on Global Surgery* reported that 312.9 million surgeries were carried out in 2012 (Weiser et al., 2015). It is expected that the number of surgeries performed will increase drastically, over time (Davies et al., 2021; Meara et al., 2016; Weiser et al., 2015). In the Lancet Commission on Global Surgery's estimates, 22, 039, 728 cases were conducted in eastern, central and southern sub-Saharan Africa (Weiser et al., 2015). They further stated that an extra 143 million surgeries are needed annually if lives are to be saved and disabilities resulting from not having access to surgery are to be prevented (Weiser et al., 2015). Only 6% of the global surgical volume was recorded in very poor countries that host about one-third of the world's population. Surely, the situation leaves those countries prone to more disabled people and fewer saved lives. That is the "danger of missed surgeries" (Weiser et al., 2015; Davies et al., 2021).

Five billion people out of the seven billion people on the planet do not have access to surgery and anaesthetic management, which has a negative influence on humanity's quality of life, worsening problems, and rising deformities (Alidina et al., 2019; Meara et al., 2016). Aside from the devastating effects of poor access to surgical services, low-to-middle-income countries (LMICs) are expected to suffer economic losses of about 12.3 trillion United States dollars between 2015 and 2030 if they do not efficiently improve access to surgical procedures to their minimum capacity (5000 surgeries per 100 000 people) (Meara et al., 2016). Increasing access while mitigating cost is imperative in LMICs as an estimate of 33 million people are already burdened with very high cost of accessing surgical procedures while about 48 million people suffer from catastrophic costs of surgery as a result of other costs of accessing surgical procedures (Meara et al., 2016). The cost of accessing quality, fair, and safe surgical and anaesthetic management has increased due to equipment, logistical constraints, and disease burden, including pandemics (Ammar et al., 2021; Citron et al., 2019; Siow et al., 2020).

Governments and policymakers around the world do not place a high enough priority on the burden of deaths caused by surgery and, in some cases, a lack of safe surgery and anaesthesia. As a result, surgical interventions have been described as the "neglected stepchild" of global health, and anaesthesia as the "invisible sister of a neglected stepchild" (Aitkenhead & Irwin, 2021; Argo et al., 2019; Blaise Pascal et al., 2021; Citron et al.,

2019). The neglected surgical disease has resulted in huge inequities in access and quality of healthcare due to under prioritization of the weight imposed by surgical disease (Henry et al., 2020). The world federation of societies of anaesthesiologists (WFSA) and the world health organization's (WHO) efforts to improve equitable and essential safe surgery and anaesthesia by providing recommended guidelines are hampered by equity gaps, a shortage of skilled personnel, insufficient and functional life-saving devices, and increased out-of-pocket expenditure due to weakened economies and disproportionate economic indicators in lower and middle-income countries (LMIC) (Epiu, Wabule et al., 2017; Gelb et al., 2018; Hu & Jiang, 2021; Jakovljevic et al., 2020; Shahbaz et al., 2021).

Several research studies on the capacity of LMICs to provide safe anaesthesia indicated concerning trends (Goshu & Gemeda, 2020; Odinkemelu et al., 2021). Given the rapid growth of sub-Saharan Africa and its young population, which is more vulnerable to trauma from accidents, a concerted effort to build anaesthesia and surgical capacities is required if the region is to avoid a catastrophic situation and position itself to achieve the much-touted universal health coverage (UHC), of which surgery and anaesthesia services are part.

Each year, 143 million people in sub-Saharan Africa (SSA) are expected to require surgery (Biccard et al., 2018). Without safe and efficient anaesthesia services to relieve pain and improve patient safety and surgical results, many surgical therapies would be difficult to perform (Biccard et al., 2018; Brouillette et al., 2017). The value of having highly qualified and skilled anaesthesia providers cannot be overstated. Most sub-Saharan African countries' health systems are divided into various levels of treatment, with each level dealing with patients with varying needs (Amoah et al., 2021; Asamani et al., 2021a). Surgery and anaesthesia are conducted by a small number of skilled practitioners in most LMICs, especially at the district level (Asamani et al., 2021c; Blaise Pascal et al., 2020; Khan & Merry, 2018). The United Nations goal of "leaving no one behind" will only be realized if an aggressive plan is put in place to achieve universal access to health care (Asamani et al., 2021b). Access to equitable, safe, and expert care can help achieve the Sustainable Development Goals (SDG) if it is prioritized in healthcare reform efforts.

Although key health indicators, such as surgery and anaesthesia-related morbidity and mortality, have improved significantly in high-income countries (HIC) as a result of sustained economic growth and improvements in health infrastructure, training, technological advancement and innovation, and medications, the same cannot be said for SSA countries (Alidina et al., 2021; Kruk et al., 2018; Machado et al., 2020). The right to health and well-being for individuals, as entrenched in Article 25 of the United Nations' Universal Declaration of Human Rights, has escaped many and has become the privilege of inhabitants of industrialized nations (Machado et al., 2020). The irony is that a basic service, such as surgical and anaesthetic care, is not spared. Nonetheless, unfettered high expectations, changing health needs, and healthcare preferences provide a unique conundrum in LMICs, which, if not handled by policymakers, will further worsen health indicators (Santhirapala et al., 2020).

Again, LMICs are predicted to need 143 million procedures each year to avoid the disability and mortality caused by surgical disease burden (Gelb et al., 2018). Surgical and anaesthetic services are provided at various levels of care in most LMICs. Although, most of the population in LMICs live in rural communities, all quaternary and tertiary health facility surgeons and anaesthetists live in metropolitan cities and work at quaternary and tertiary hospitals. Non-specialists perform surgical services in the primary and secondary levels of the healthcare continuum. The bulk of non-physician providers, who make up the majority of anaesthesia providers, work in district hospitals where minor and general surgical services are provided (Bentounsi et al., 2020; 2021). Accessing specialist healthcare in the cities comes at an extra cost of accommodation and transport for rural dwellers.

Internationally procured evidence-based practice standards fail to identify the inherent shortfall in service provision in terms of cadre of practitioners, depth of knowledge, training and regulatory frameworks, logistical restrictions, and a lack of organizational culture (Franco et al., 2020). Additionally, Beard et al. (2019) concluded that a non-surgical specialist's surgery had no significant outcome when compared to a specialist's surgery. Such an assumption could be problematic for preserving standards of practice and accountability as stipulated by evidence-based practice recommendations (Beard et al., 2019; Zitzman et al., 2018). It is everyone's responsibility to advocate for surgical and

anaesthetic safety. This will shed light on this particularly advanced technique, demystify it, and change policymakers' conversations so that it receives the attention it deserves.

1.2.1 Health System of Ghana

Ghana is a middle-income country with a population of 32 239 206 million people (Ghana Statistical Service, 2022) and a gross domestic output of 72.35 billion dollars in 2020, according to a World Bank report from 2021. Over the years, key health indices have been steadily improving (Amoah et al., 2021). According to World Health Organization data from 2019, under-five mortality decreased from 111 per 1000 live births in 2003 to 44.7 in 2019; and life expectancy increased (from 57 in 2000 to 63 for males and 69 for females in 2019) (WHO, 2020). Ghana has a pluralistically decentralized health system, with public, private, and mission health facilities providing services and the Ministry of Health acting as a supervisory and policy-making body.

It has several agencies that carry out the country's health policies. The Ghana Health Service, which includes the Christian Health Association of Ghana and Ahmadiyya Moslem facilities, constitutes the largest agency of health delivery in Ghana. There are a slew of private hospitals that offer healthcare services. There are primary, secondary, and tertiary levels of care in the country, each with its own set of services. Primary health care is the basis upon which all other types of healthcare are built. It is made up of health facilities and community-based health planning and services (CHPS). Ghana Health Services use the CHIPS concept to increase geographical access to health care (Ashiagbor et al., 2020). This concept attempts to decrease the barriers that prevent residents from having equitable access to health care and to strengthen the referral system to improve citizens' quality of life (Seidu et al., 2020; Varela et al., 2019).

In the mid-1990s, the French made a key legislative breakthrough in anaesthetic evaluation by requiring all patients scheduled for surgery to undergo an obligatory pre-anaesthetic assessment (Skvarc et al., 2016). The regulation's goal was to ensure three things: that hazards during surgery were identified; that a surgical plan was devised; and that the client's legal consent was obtained before the surgical procedure was executed (Nelson & Wu, 2017).

Patients who have scheduled surgical services readily accept the perioperative procedures if they have a good grasp of how anaesthesia services, which include pre-anaesthetic, intraoperative and post-operative care, will alleviate the prospective and actual pain and discomfort. The foundation of the perioperative trajectory is pre-anaesthetic assessment, which dates back to a classic paper by Lee and colleagues (1949), who proposed that an out-patient anaesthetic assessment may contribute successfully to preventative medicine. Pre-anaesthetic care includes pre-anaesthetic assessment, which is a thorough examination of a patient for potential medical and other conditions that may elicit physiological bases of probable contraindication through risk assessment and documentation in anaesthesia or certain types of anaesthetics and surgical interventions (Birkelbach et al., 2019; Bloomstone et al., 2020; Kifle et al., 2021). The unique environment created during the pre-anaesthetic examination allows for patient education, anxiety reduction, and perioperative care planning based on scientific data gathering and analysis.

It has been proven that a properly and quickly obtained pre-anaesthetic assessment increases patient satisfaction, saves the client money by lowering pre-operative admission time, length of stay on admission and cancellation of surgery, thereby improving patient comfort and fostering effective family reintegration (Abate et al., 2020; James & Thampi, 2018). Poor pre-operative evaluation, on the other hand, might lead to poor decision-making, including the choice of anaesthetic, exposing the client to a variety of anaesthetic problems that raise intra-operative and post-operative morbidity and mortality (Morley et al., 2020). The lack of appropriate equipment and logistics overworked anaesthetic workers, an anaesthetist's hectic schedule, or the client's presentation at odd times could all contribute to an inadequate pre-anaesthetic assessment (Kristoffersen et al., 2021). Mnemonics have proven to be useful in predicting eventful anaesthetic episodes (Mshelia et al., 2018): a careful consideration would serve as a guide for safe practice. In some developed countries, such as Australia and the United Kingdom, a standardized pre-anaesthetic assessment criteria and processes are followed to enhance a patient’s safety (Australian and New Zealand College of Anaesthetists, 2017; Kumar et al., 2013).

The bulk of post-operative deaths occur in the post-anaesthetic care unit, which is noteworthy. Within the first 48 hours after surgery, regular post-anaesthetic check-ups and evaluations are critical in diagnosing post-anaesthetic problems, which can lead to

mortality (Biccard et al., 2021; Vogelsang et al., 2020). The adoption of the World Health Organization's (WHO) surgical checklist has been shown to dramatically reduce morbidity and mortality (Chhabra et al., 2019; McCarthy, 2017). Alpendre and colleaques (2017) supported this claim, stating that using the WHO surgical checklist improves surgical results. Unfortunately, post-anaesthetic visits and evaluations are not performed in Ghana and many other LMICs (Bath et al., 2019; Biccard et al., 2018). In Ghana, there appears to be no empirical research on the quantity, process, substance, significance, or problems of post-anaesthetic assessment. Furthermore, the researcher could not find any post-anaesthetic assessment protocols. The pre-anaesthetic assessment protocols available are not standardized. As a result, there is no standardized way of performing pre and post-anaesthetic assessment. Evaluating the quality of the pre and post-anaesthetic assessment also seems irrelevant as there are no guidelines against which it could be done. Developing practice-based pre and post-anaesthetic assessment guidelines for Ghana will make pre-anaesthetic evaluation evidence-based, uniform, and allow for quality assessment and surgical safety improvement (Dhingra-Kumar, Brusaferro & Arnoldo, 2021, p. 18).

Pre-anaesthetic assessment is a set of clinical examinations performed by an anaesthetist before the administration of an anaesthetic as part of preparations for either the performance of a surgical or non-surgical procedure, whereas post-anaesthetic assessment is performed after the procedure for which an anaesthetic was given has been completed (Shim et al., 2020). Anaesthetic assessment entails not only physical but also psychological considerations; and mentally prepares the client for anaesthesia induction and, as a result, the surgical procedure. Pre-anaesthetic evaluations are frequently performed days before surgery to prevent having to make last-minute medical decisions, putting the client and his or her family at risk of increased psychological stress and anxiety (Rungwattanakit et al., 2019).

Anaesthesia quality is a significant term in anaesthetic evaluation. The information gathered during the pre-anaesthetic evaluation stage aids the anaesthetic and medical teams in predicting the likelihood of any adverse events that may occur during the surgical procedure (Avidan et al., 2020). Certain measures can help to improve the quality of anaesthetic evaluation. The necessary anaesthetic, as well as the equipment that will be used for the procedure, are also determined. This is accomplished using data gathered

during the pre-anaesthetic assessment stage. This information sets the tone for the post-anaesthetic assessment, which aims to return the client to his or her pre-anaesthesia state, if not better (Vide et al., 2020).

Data gathering during the pre-anaesthetic stage is fraught with difficulties, one of which is the absence of standards of data collecting (Choi et al., 2020). To be sure, designing a systematic and unique data-gathering instrument for use during a pre-anaesthetic assessment may not be achievable (Pitimana-aree et al., 2016; Tian et al., 2017). However, standardizing the instrument can help with communication across medical teams, data collecting for research and evaluation, and the facilitation of a seamless client referral process (Skvarc et al., 2016). Standardized guidelines or protocol can also reduce the cost of surgery by prescribing the minimum number of investigations that are necessary in a specific phase of the surgical procedure (Prapakornkovit et al., 2022).

According to the American Society of Anaesthesiologists, history taking, airway, pulmonary, and cardiovascular examinations should all be addressed when making a pre-anaesthetic assessment (Lee et al., 2020). Categories of information collected include demographic information, functional findings, past history of clinical findings, behaviour findings, patient status observation, family history, medication review, laboratory test, diagnostic procedure, physical examination procedure, pre-operative evaluation, anaesthesia, administrative information, and surgical procedure (Lee et al., 2020).

Demographic information comprises the client’s age, gender, height, and weight. It is also known as "socio-demographic data" in some documents, and it includes information on race/ethnicity, marital status, level of education, and employment, among other things (Lee et al., 2020).

Underlying medical conditions or past medical diagnoses are taken into consideration in the patient's medical history. It comprises information about diabetes, heart disease, and hypertension (high blood pressure). Research has shown that comorbidities influence the outcomes of surgical operations and influences blood glucose levels in the post-anaesthetic period (Yoon et al., 2021).

Behavioural data pertain to the patient's participation in "unhealthy" habits such as smoking cigarettes or tobacco, whereas functional findings refer to the patient's tolerance of physical activity and general functional capacity (Mendoza-Jiménez et al., 2021). Patient personal information are sensitive issues that clients can sometimes hold back if they are not assured of their privacy and confidentiality; therefore, an ethical approach to confidentiality must be the watch word of all practitioners (Bayisa et al., 2022; Snelling & Quick, 2022).

Family history is one source of data gathered during the pre-anaesthetic period. The occurrence of anaesthesia-related difficulties and surgical-related complications in one's family is regarded as family history (Gupta et al., 2021; Hopkins et al., 2021). Other categories include medication review (anticoagulant medications, aspirin-containing medications, and herbal medications); physical examination procedures (cardiovascular examinations, respiratory examinations, and blood pressure); laboratory tests (glucose, complete blood count, and partial thromboplastin); and diagnostic procedures (anticoagulant medications, aspirin-containing medications, and herbal medications) (electrocardiogram, chest x-ray, and pulmonary function tests). Administrative information includes informed consent, family, or support after surgery and during hospitalization and information about how to contact the patient's family after surgery (Dhingra-Kumar et al., 2021; Khan & Merry, 2018; Khan et al., 2021; Najah et al., 2021; Omole et al., 2021).

The structure and the process of data gathering and storage are as important as the content of the data collected. Some mnemonics and terminologies are used to guide the data collection process. SNOMED CT and LOINC (Logical Observation Identifiers Names and Codes) are two standardised terminologies that could be used to gather data from clients in a well-defined manner (Lee et al., 2020). Most hospitals and health facilities across the world use a centralized digital system that collects data from many departments within the hospital or health facility. In other circumstances, data is managed by hand, which increases the risk of data loss or harm. Client confidentiality can also be readily compromised in the data gathering and utilization process. The introduction of an anaesthetic information management system (AIMS) aims to address anaesthesia data management issues (Vide et al., 2020). It addresses the issue of clients' whole health data being g r o u p e d together by establishing a dedicated window for the storage and

management of anaesthesia data. Designing a core health information management system with sub-parts for each component of health information is a more expedient means of harmonizing the central administration of health data with the specific management of anaesthesia data (Vide et al., 2020). This allows for the separation of anaesthesia information from public health information, for example, while also allowing for the retrieval and analysis of holistic information on a specific client from all other areas of health for the client's medical benefit. The AIMS innovation considerably minimizes the risks of confidentiality breaches involved with manually managing anaesthetic data (Lee et al., 2020).

Because of its distant and cloud data storage capabilities, the system, which can only be accessed with authorization, decreases the risk of client confidentiality breaches and avoids data loss or damage. Grade I represents a normal healthy patient, whereas Grade VI refers to "a proclaimed brain-dead patient whose organs are being removed for donor purposes", according to the American Society of Anaesthesiologists.

Anaesthesia services have not received the attention and priority they need over the world. Anaesthesiologists who work in distribution avoid HICs (Turkot et al., 2019). Recent population density research revealed alarming trends in sub-Saharan Africa and Southeast Asia, where there is less than one anaesthetic provider per 100,000 people (Figure 1.1). The majority of anaesthesiologists in Africa and LMICs prefer to operate in urban areas where equipment and resources are readily available. The worst examples can be seen in LMICs and sub-Saharan Africa, particularly Ghana, where the majority of surgical services and anaesthesia are given at the primary care level by medical officers with limited surgical capabilities. Non-physician anaesthetic professionals, known as Certified Registered Anaesthetists, offer the majority of anaesthesia services in Ghana's public district and mission hospitals, accounting for 92.7% of all anaesthesia providers (Anabah et al., 2017; Choo et al., 2011).

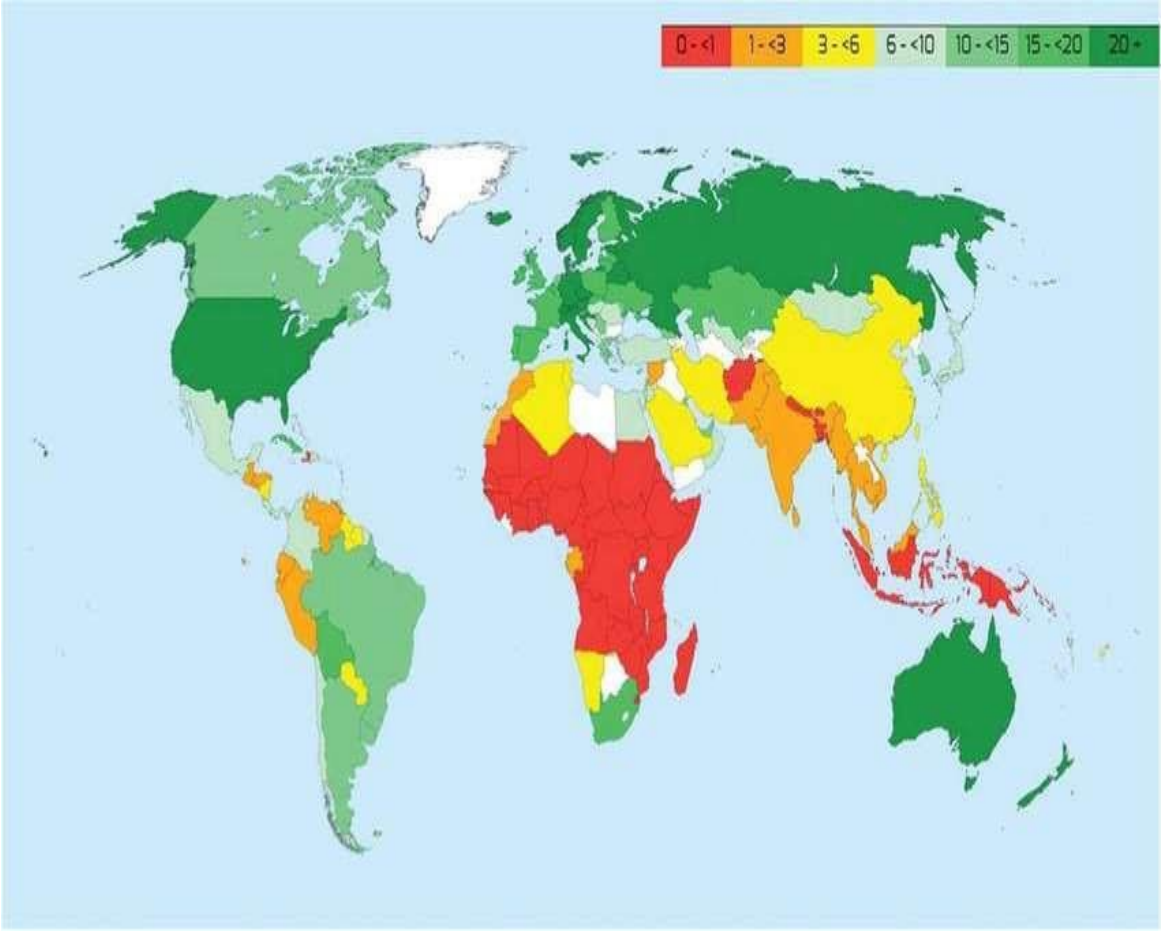


Figure 1.1: Global anaesthesia landscape adopted from the World Federation of Societies of Anaesthesiologists (WFSA) Global Anaesthesia Workforce Survey (Turkot et al., 2019).

1.2.2 Anaesthesia Landscape in Ghana

Surgical services begin at district hospital level, where they are mostly provided by general practitioners. Anaesthetic services at district level are provided by non-physician anaesthetists, known as "Certified Registered Anaesthetists" who are originally trained as nurses and retrained at schools of anaesthesia for between 18 and 36 months. They account for 92.7% of all anaesthesia providers and work without direct supervision (Anabah et al., 2017). The few physician anaesthetists are only found at the tertiary level, quaternary, and a few regional hospitals in Ghana (Figure 1.2).

If Ghana is to provide high-quality anaesthesia services, it must adhere to international standards for training and staffing of the required personnel mix, as well as the provision of modern equipment and logistics, as recommended by the World Health Organization (WHO) and the World Federation of Societies of Anaesthesiologists (WFSA). *The Lancet Commission on Global Surgery* proposed at least 20 anaesthetists per 100,000 people to provide the much-needed services to enhance outcomes (Meara et al., 2016). This would ensure the gold standards (5-10 anaesthetist per 100 000 population) of anaesthesia staff is met. The gold standard regarding personnel as well as the necessary anaesthetic equipment, drugs, and improved healthcare infrastructure are essential for quality anaesthesia services (Biccard et al., 2018; Kempthorne et al., 2017; Luboga et al., 2009). A step-down from the gold standard was proposed by Davies et al. (2018), recommending a minimum of four anaesthesiologists per 100,000 people for an appreciable quality of care. Unfortunately, several nations have not reached Davies' recommendation let alone that of the gold standard proposed by the *Lancet Commission on Global Surgery* (Davies et al., 2018).

In Ghana, there are two types of anaesthetic providers. The first type are anaesthesiologists, qualified physicians who have completed a three-year membership program in anaesthesia and intensive care at the Ghana College of Surgeons and Physicians, which provides them with the necessary knowledge and skills to provide safe anaesthesia services that are accountable to the public (Jonker et al., 2020). The second cadre is the certified registered anaesthetists (CRAs) who must complete a three-year curriculum at a recognized anaesthesia school of learning, as well as an obligatory one-year internship, and must have a first-level qualification in nursing (Choo, 2020; Potisek et al., 2017).

To address the interests of the public, the ever-increasing disease load, and worldwide anaesthetic evolution, anaesthesia practice demands a tough and rigorous process of training, certification, and credentialing. The profession's procedural requirements and real-time crisis interventionist needs necessitate competency in training and a focused internship program that radiates competence and eliminates incompetence (Jaramillo-Rincón et al., 2020). Despite the intensity and varied courses of training, the Ghana Medical and Dental Council regulates both cadres of practitioners.

Disproportional distribution of these two cadres of practitioners does not foster effective supervision that encourages continuous professional development, capacity building, and the necessary competences for safe practice. The CRAs are required by law to be overseen by an anaesthetist. Nonetheless, they practice on their own because all anaesthesiologists are unwilling to accept posts in difficult-to-reach places. According to a survey conducted in Ghana, there are 70 professional anaesthesiologists in the country, all of whom are stationed in urban areas (Brouillette et al., 2017). This was corroborated by Choo (2020) in a similar study to determine the state of anaesthesia practice in sub-Saharan Africa. On the other hand, the number of practicing CRAs gazetted is 824 (Ghana Medical and Dental Council, 2020). CRAs man district, mission, and regional hospitals. They also complement anaesthesia services at teaching and military hospitals. They are evenly distributed throughout the country and accept postings to facilities where equipment resources and logistics are scarce.

Even though CRAs practice without supervision, they lack the required recognition and respect. They claim that physician anaesthetists undermine them, resulting in inter-professional friction that negatively affects service delivery and erodes cooperation and collaboration among the two cadre (Aberese-Ako et al., 2015; Brouillette et al., 2017).

The bulk of anaesthetic providers in Ghana and most LMICs are CRAs and non-physicians who practice in remote locations without supervision. The majority of them are in the first and second levels of care. Surgical patients are classified according to the structure and purpose of the facility in which they are operated. At the highest level of care, quaternary hospitals and teaching hospitals, advanced and complicated surgical operations are conducted. Depending on the availability of a specialist, high level hospitals are structured in the form of specialist units such as paediatric surgical unit, general surgery, gynaecology, cardiothoracic, neurosurgery unit, orthopaedic surgery, and so on. The lower-level hospitals mostly have a general-purpose surgical unit where all surgeries are done.

Independently managing anaesthesia services is a high level and critical care competency that requires quality practitioners and some level of experience. For mid-level practitioners

to effectively and safely manage anaesthesia services without supervision, there must be clinical guidelines and protocols that they can follow and consult timeously (Kumar et al., 2019; Mehta et al., 2021). Recalling the definition of pre and post-anaesthetic assessment, which are the processes involved in collecting data to determine whether a patient is safe for surgery (pre-anaesthetic). Recovering well after surgery (post-anaesthetic), with the main purpose of protecting the patient from surgical and anaesthetic complications, CRAs must ensure they conduct pre and post-anaesthetic assessment. This cannot be effective without evidence-based and standardized guidelines. This study sought to provide evidence-based pre and post-anaesthetic assessment guidelines to guide the practice of anaesthesia in Ghana. The end result is to improve surgical and anaesthetic safety, eliminate complications, improve post-anaesthetic and surgical morbidity and mortality, and optimize post-operative outcomes for surgical patients.

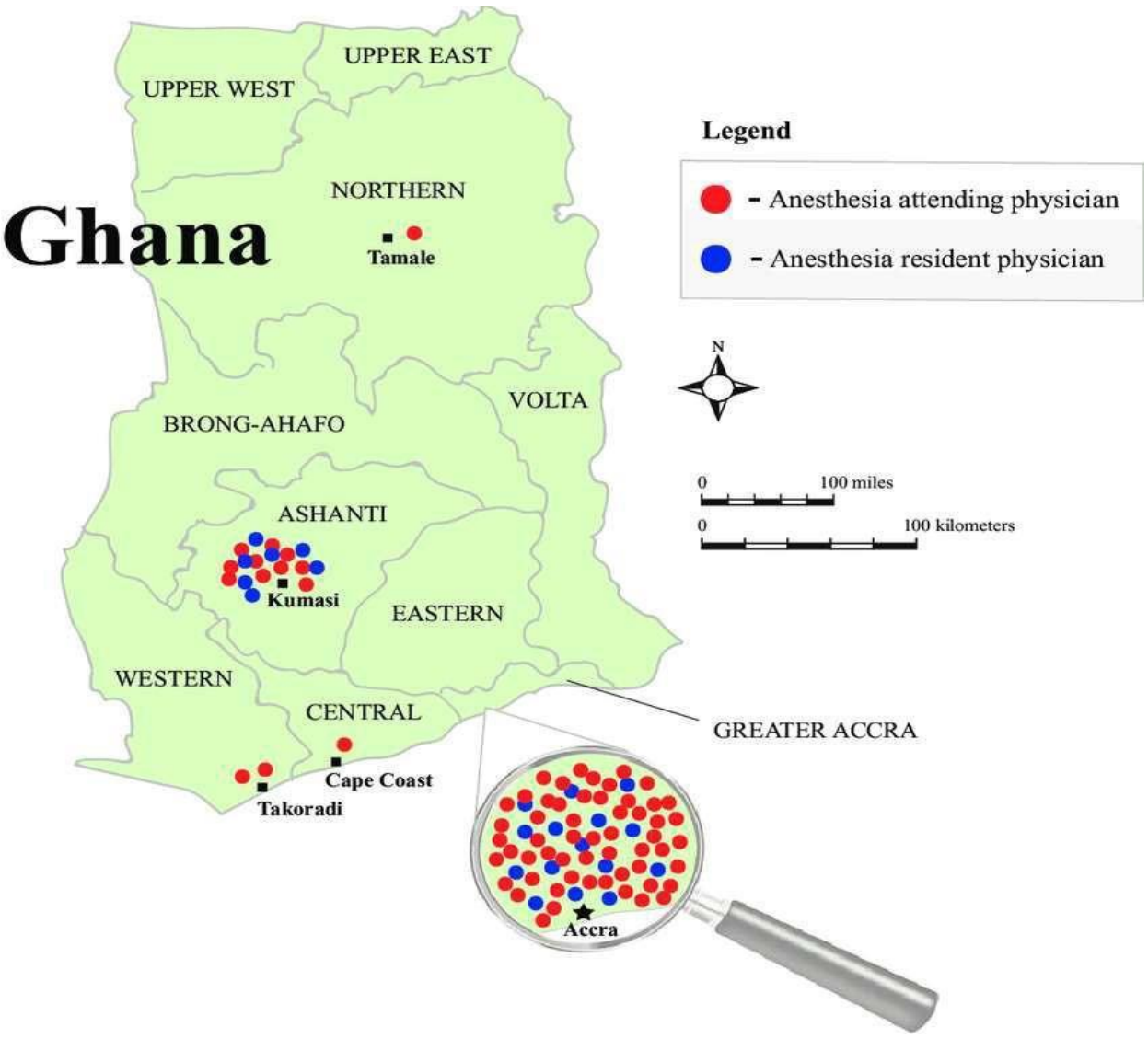


Figure 1.2: The distribution of anaesthetist practitioners in Ghana

[Source: Brouillette et al. (2017)]

1.3 PROBLEM STATEMENT

Ideally, there should be standardised clinical guidelines to direct anaesthesia practice in Ghana. Building public trust through leadership and well-regulated, standardised practice improves surgical safety and increases patient confidence (Jones et al., 2018; Law et al., 2019). Physician anaesthetists (7.1%) and Certified Registered Anaesthetists (CRAs) (92.9%) are the two cadres of anaesthesia providers in Ghana (Anabah et al., 2017).

Physician anaesthetists are medical professionals who have completed a three-year fellowship program in anaesthesia at the Ghana College of physicians and surgeons or an equivalent program elsewhere. CRAs, on the other hand, are Registered General Nurses who have completed 18 months to three years advanced diploma program in anaesthesia. The advanced diploma was phased out in 2012 in favour of a three-year post-nursing registration Bachelor of Science degree. The Ghana Medical and Dental Council oversees the practice of physician anaesthetists and CRAs in Ghana.

Physician anaesthetists primarily practice in teaching institutions, specialized facilities and a few regional hospitals. In regional hospitals, however, there are a few physician anaesthetists, but none in district hospitals. The majority (70.7%) of Certified Registered Anaesthetists (CRAs) work in regional and district hospitals where physician anaesthetists are not available (Brouillette et al., 2017). According to the Ghana Certified Registered Anaesthetists Association (2015), CRAs provide anaesthesia services for about 70,000 patients each year.

According to the Medical and Dental Council of Ghana, CRAs are supposed to be supervised by physician anaesthetists in their line of duty. Unfortunately, the varying nature of their placement, physicians at higher-level facilities and CRAs at lower level facilities, do not provide such opportunity. Anabah and colleagues (2017) confirmed that 92.7% of CRAs work without supervision; and pre-anaesthetic assessment is not undertaken consistently in Ghana because many facilities lack established protocols, and those that do exist, are inconsistent. Additionally, post-anaesthetic visits, which form part of the four basic duties of anaesthetic providers, is not effectively done in Ghana (Brouillette et al., 2017). These practices expose surgical patients, especially those attended to by the CRAs, to serious surgical and anaesthetic errors and complications. Brouillette et al. (2017b) cited lack of personnel and equipment as reasons for poor anaesthetic practices and supervision in Ghana. The fact that there is no supervised practice of non-physician anaesthetist, and the inability to use common medication and monitoring equipment adversely impacts on standardization, affecting safety of anaesthesia practice (Asemu et al., 2021; Goshu & Gemeda, 2020).

There are three main implications arising from the above situation. These are inter-professional conflicts and its effects on proper patient assessment. This is because the majority of the world's anaesthesia providers are non-physicians who work independently, but by regulation, are supposed to be supervised by physician anaesthetists. Moreover, most guidelines are developed from the industrialised world, which has no contextual dimensions to anaesthesia practice in Ghana; and there are no composite guidelines to guide both pre and post-anaesthetic assessment. These implications may pose compromised surgical outcomes.

The development of guidelines for pre- and post-anaesthetic assessment may improve pre- and post-anaesthetic assessment (Galvez et al., 2019; Street et al., 2018; Woelfel et al., 2019). Against this backdrop, this study was designed to develop clinical guidelines on pre and post-anaesthetic assessment of surgical patients that may be valuable for anaesthesia in low and middle income countries (LMIC's) including Ghana.

1.4 RESEARCH QUESTION

How can pre and post-anaesthetic assessment of surgical clients in Ghana best be conducted to enhance post-operative outcome?

1.5 PURPOSE OF THE STUDY

The purpose of this study is to develop clinical guidelines to inform pre and post-anaesthetic assessment of surgical clients in Ghana.

1.6 RESEARCH OBJECTIVES

The specific objectives of the study are to:

i. Describe the existing pre-anaesthetic and post-anaesthetic assessment practices in Ghana.
ii. Explore the challenges of anaesthetic provision in Ghana.
iii. Describe current pre-anaesthetic and post-anaesthetic assessment practices through an integrative literature review.
iv. Develop evidence-based pre and post-anaesthetic assessment guidelines for Ghana that will enhance surgical safety and post-operative outcomes.
v. Pilot the developed guidelines to ensure practicability and appropriateness for use.

1.7 SIGNIFICANCE OF THE STUDY

The results of this study will be used to produce practice-based and culturally acceptable pre and post-anaesthesia assessment guidelines in Ghana, which may improve surgical safety and post-operative surgical outcomes. The guidelines may help anaesthetic practitioners to detect and avoid potential problems that could endanger patients' lives, as well as to manage post-operative anaesthetic complications more proactively. The findings may likewise lead to stakeholder involvement to help create policy and rethink safety practices in hospitals and clinics that deliver minor-to-major surgical operations. Through simulation, high-risk operations (such as airway control and management, intra- and post-operative bleeding treatment, and pre-operative evaluation) may be less prone to difficulties. The goal of the guidelines is to reduce human errors, particularly those caused by a lack of experience or competence that results in deviations from approved patient care and work practices. Educational and anaesthesia training institutions may adopt the guidelines as a training module for early exposure of context driven-evidence-based clinical guidelines. Finally, the findings of this study may make a significant contribution to the body of knowledge to anaesthesia practice.

1.8 RESEARCHER'S ASSUMPTIONS

This section presents the researcher's assumptions relative to the conceptual framework and the concept definitions specific to the study.

1.8.1 Conceptual framework

One major pre-requisite for the development of clinical guidelines is to support the development process with a framework (Tetreault et al., 2019). This helps improve the application of the guideline in clinical practice. There are several frameworks used in the development of clinical guidelines (Alonso-Coello et al., 2016; Karim et al., 2020; Tetreault et al., 2019). Some of these frameworks include the grading of recommendations, assessment, development, and evaluation (GRADE) framework (Alonso-Coello et al., 2016), the unique Persian framework (Karim et al., 2020), the knowledge action framework (Tetreault et al., 2019), and the appraisal of guidelines for research and evaluation (AGREE II) (Bargeri et al., 2021). Most of these guidelines are insufficient in their methodological pathways deployed in the development of guidelines. As such, the AGREE II framework was believe to be

sufficient to support the development of the pre-and-post anaesthetic guidelines.

As the conceptual framework for the research, and to guide the development of the pre and post-operative assessment clinical guidelines, the researcher used the internationally approved Appraisal of Guidelines Research and Evaluation (AGREE II) evaluator framework, which is made up of 23 items spanning over spanning over in six classic domains. Experts created the AGREE II framework to make the writing of practice guidelines easier. The domains instruct developers to adopt a systematic, rigorous, and unbiased procedure for collecting evidence, synthesized from reliable sources, to improve acceptability and applicability (Dijkers et al., 2020). Scope and purpose, stakeholder involvement, development rigor, clarity of presentation, applicability, and editorial

independence are the domains. The following is how the framework was applied to this research:

1.8.1.1 Domain 1: Scope and Purpose

By addressing clinical health concerns of the intended group to whom the guidelines apply, this domain sought to highlight the broader purpose. The researcher outlined the study's goal and aim while conceptualizing it, which was to produce clinical guidelines to inform pre- and post-anaesthetic assessments of surgical clients in Ghana to improve surgical safety and post-operative results. In addition, to meet study objectives one and two, the researcher included questions that addressed the first domain in the questionnaire and semi-structured interview guide. The user demographic was designated as anaesthesiologists, non-physician anaesthesia providers, including Certified Registered Anaesthetists, and nurses participating in pre-anaesthetic assessment, and it was to be applied to patients of all ages and conditions booked for surgical intervention.

1.8.1.2 Domain 2: Stakeholder Involvement

This domain entails forming a guideline development group comprised of members from all relevant professional groups, incorporating the views and preferences of the target population, which includes patients, the general public, and other interest groups, and identifying the guidelines' intended users. To begin, the researcher identified and interviewed heads of directorates, departments, and units to gather evidence for the study's second purpose. The recommendation was developed utilizing triangulated and synthesized information from phase 1 of the study by a diverse panel of experts including anaesthesiologists, critical care nurses, certified registered nurse anaesthetists, surgeons, administrators, patients, and patient advocacy groups.

1.8.1.3 Domain 3: Rigour of Development

The integrity of the practice guideline development process is examined in this domain. The AGREE II framework recommends that systematic methods for searching for evidence be clearly stipulated; that criteria for selecting evidence be plainly described; that the strengths and limitations of the body of evidence produced from the study be clearly described; that methods for formulating recommendations be clearly described; and that side effects, risks, and health benefits be considered when formulating the

recommendations. There should also be a clear link between the recommendations and the supporting research, and the guidelines should be evaluated by specialists outside of the organization before being released.

In addition, the framework suggests that procedures and processes for upgrading the guidelines be provided. In phase one, the researcher conducted four studies: a survey of practicing anaesthetists in Ghana on the Redcap Electronic platform; a qualitative document analysis of pre and post-anaesthetic guidelines and protocols of selected Ghanaian hospitals using MQDA software; a key informant interview of purposefully selected heads of anaesthesia directorates, departments, and units (qualitative research); and an integrative literature review of curricula in anaesthesia.

All of the evidence was triangulated and arranged in a table. To construct pre- and post-operative clinical guidelines, the evidence was presented to a group of experts. The recommendations were created based on the evidence gathered from the studies. The researcher presented the evidentiary limitations, the clinical guidelines' health advantages, hazards, and side effects, as well as the problems of its implementation. The guidelines were subjected to professional assessment, and important recommendations were made.

1.8.1.4 Domain 4: Clarity of Presentation

The items in this domain examine how recommendations are made in a clear, concise, and exact manner. The fourth domain is concerned with the clear presentation of various alternatives for managing diseases or health difficulties, making recommendations easily recognized, and providing instructions emphasizing applicability, facilitators, and barriers. The researcher ensured that the recommendations stand out in bolded words and are bulleted with the required clarity when completing these tasks in the domain. The recommendations were described as "merely a guide". However, a provider's professional judgment based on a patient's assessment of a circumstance takes precedence over the guidelines.

1.8.1.5 Domain 5: Applicability

The domain examines how the planned guidelines provide advice and/or instruments for putting the recommendations into practice, the cost implications of implementing the

guidelines' recommendations, and whether the guidelines include monitoring and/or auditing criteria. The researcher recognizes that increased stakeholder engagement and expert involvement will make the application seamless and that once the guidelines are captured on hospital-integrated electronic data platforms, access will be simple and free. The problem arises when facilities lack integrated electronic platforms and must rely on hard-printed copies. The guidelines include a proposal for hospitals to use internally generated income fairly and judiciously, directing it to patient care.

1.8.1.6 Domain 6: Editorial Independence

The sixth and final category examines how the funding body's opinions did not impact the content of the guidelines and how members of the guideline's development committee declared and recorded conflicts of interest. The competing interests of members of the guideline's development group have been documented and addressed. The researcher made certain that any conflict of interest was declared by the guidelines developers and that they were stated in the guidelines. Surprisingly, there weren't any. The researcher was adamant that he was the sole funder of the study and that no one else had an impact on its outcome.

1.8.2 Concept definitions specific to the study

The concepts used in this thesis are defined in Table 1.1.

Table 1.1: Concept definitions specific to the study

Concept	Definition
Pre-anaesthetic assessment	Pre-anaesthetic assessment consists of a medical review of a patient by an anaesthetic provider before surgical intervention (Aitken et al., 2021).
Post-anaesthetic assessment	This consists of a routine visit to a patient who has undergone surgical intervention by an anaesthetic provider (Cook, 2017).
Anaesthesia	Anaesthesia is a medically produced condition of controlled, transient loss of feeling or awareness.
Assessment	Assessment is the systematic and continuous process of collecting, organizing, validating, and documenting patient data to inform clinical practice.

Guidelines	Standardized operative procedure or system of rules governing anaesthetic practice (de Graaff et al., 2021).
Evidence-based practice (EBP)	A concept of meticulous and prudent use of the most current scientific and current best evidence in conjunction with clinical expertise and patient values to guide healthcare practices (Abu-Baker et al., 2021).
Surgical safety	The process of enhancing patient safety by minimizing errors in surgery.
Clinical practice guidelines	Statements based on a systematic analysis of existing data that include recommendations aimed at improving patient care by evaluating the benefits and drawbacks of various treatment options (Franco et al., 2020).
Research	Research is an organized, methodical attempt to explore a particular issue and offer a solution (Mohajan, 2020).
Research methodology	It is a systematic scientific pathway that researchers use to conduct research (Hassan et al., 2019)

1.9 OVERVIEW OF THE METHODOLOGY

This section provides a high-level overview of the paradigm, research methodology, study design, and thesis processes. Pragmatism underpins the entire investigation. The six key domains of the Appraisal of Guidelines for Research and Evaluation (AGREE) II instrument were used to guide an explanatory sequential mixed method (Creswell & Creswell, 2018) research design. The inquiry was broken down into four phases, as described in Table 1.2. All phase are important guidelines for selecting and involving stakeholders in the planning and implementation process so that stakeholder ownership can be achieved. The directors of anaesthetic directorates and departments, as well as patients, were included in the guidelines development team for steps two, three, and four. The exploration of anaesthesiologist thoughts and opinions about present pre and post- anaesthetic practices in Ghana, as well as the inherent flaws, were incorporated in the information gathering and baseline assessment processes, increasing their interest and ownership.

Table 1.2: Summary of research methodology

Phase	Objective	AGREE II DOMAINS	Design	Sampling/Sample	Data collection Tool and procedure	Data analysis
One	(1)To describe the existing pre and post-anaesthetic assessment practices in Ghana.	Scope and purpose Rigour of development	i. Survey of anaesthetists' views	i. Quota sampling of three teaching and 1military hospital ii. 10 regional hospitals, and 20 district hospitals Population N=**750** anaesthetists Sample n= **225** RaoSoft used to determined	Adapted Self-administered questionnaire by Epiu, Wabule et al. (2017) (Annexure H) Loaded unto REDCap	Data was analysed into descriptive statistics to explain the phenomenon using Stata version 16.1. Chi-squared test, Analysis of Variance (ANOVA) was performed. A P-value of <0.05 was considered significant for all tests conducted.
			ii. Qualitative document analysis (QDA)	ii. Assessment guidelines/protocols from selected hospitals in (i) above	ii. QDA guide (Annexure E)	(a) QDA was conducted based on the data as described by Wach et al.'s (2013) criteria; document search;

Phase	Objective	AGREE II DOMAINS	Design	Sampling/Sample	Data collection Tool and procedure	Data analysis
						articulating focus of document analysis; coding; verification; and data synthesis Thematic content analysis (Hsieh & Shannon, 2005)
	(2) To identify the challenges of anaesthetic provision and the use of pre and post-anaesthetic assessment guidelines in Ghana		iii. semi-structured interviews for heads of anaesthetic departs	iii. purposive sampling of at least **15** heads of anaesthetic directorates and departments of selected hospitals in (i) above	Interview guide (Annexure G)	Thematic content analysis guided by conventional content analysis (Hsieh & Shannon, 2005) using MAXQDA Software 2020.
	(3) To describe the current pre and post-anaesthetic assessment practices through an integrative literature review		Integrative literature review	Peer-reviewed studies published in Scopus, CINAHL, Science direct	Data was extracted into a data matrix	Thematic content analysis

Phase	Objective	AGREE II DOMAINS	Design	Sampling/Sample	Data collection Tool and procedure	Data analysis
Two	(4) To develop evidence-based pre and post-anaesthetic assessment guidelines for Ghana that will enhance surgical safety and post-operative outcomes in Ghana.	Stakeholder involvement	Developing the guidelines	**Seven** multidisciplinary surgical experts and patients	Guidelines development using results from phase one	
Phase three	(5) To pilot an evidence-based pre and post-anaesthetic assessment guide for Ghana that will enhance surgical safety and post-operative outcomes. Adaptation of the draft guidelines	Clarity of Presentation and Applicability Editorial independence	Qualitative descriptive Validation of the guidelines	Three hospitals (one teaching, one regional and one district hospital). Balloting of one each from the list of each category. **Seven** multidisciplinary surgical experts and patients group consisting of; One anaesthesiologist One intensivist One surgeon	Field notes and open-ended feedbacks from anaesthetists Results from phase three (pilot testing)	Thematic content analysis

Phase	Objective	AGREE II DOMAINS	Design	Sampling/Sample	Data collection Tool and procedure	Data analysis
				One patient Three CRAs		

1.10ORGANISATION OF THE THESIS

This thesis is presented in nine chapters as follows:

- Chapter one: overview of the study
- Chapter two: research methodology
- Chapter three: exploratory phase- quantitative
- Chapter four: exploratory phase- qualitative document analysis
- Chapter five: exploratory phase- qualitative interviews
- Chapter six: integrative literature review
- Chapter seven: development, validation, and appraisal of the clinical guidelines
- Chapter eight: discussion
- Chapter nine: summary, conclusions, limitations, and recommendations

1.11 SUMMARY

This chapter provided an overview of the entire research project with emphasis on the background, problem statement, research objectives, phases, and summary of the methodology adopted to answer the various research questions. The next chapter presents the methodology that was used to unpack the study.

CHAPTER 2 : RESEARCH METHODOLOGY

2.1 INTRODUCTION

The research methodologies employed in this study are described in this section. The study design, study settings, target population, sampling, and sampling methods are all part of it. The variables studied have also been described, along with data collection techniques, data analysis, ethical considerations, and quality control.

2.2 RESEARCH PARADIGM

The term "research paradigm" refers to a "philosophical method of thinking", which is now commonly referred to as a "school of thought," and it essentially reflects the researchers' guiding principles and aspirational worldviews that offer scientists a framework for thinking about and solving problems (Davies & Fisher, 2018; Rieger, 2019). It plays a crucial role in guiding the scientific foundations across all research methods, including the decision of methodology and study design. There are three main characteristics of a research paradigm, namely epistemology, ontology, and methodology (Kivunja et al., 2017). The area of metaphysics known as ontology is concerned with the study of existence, nature, or reality. There are two ontological perspectives on how beings exist in the universe. One ontological perspective speaks of the "being and existence" of the world in terms of foundationalism, objectivism, and realism. The opposing view of ontology, which sees the universe as socially constructed, incorporates anti-foundationalism, constructivism, and relativism. These worldviews follow the qualitative research methodology.

Epistemology is the study of knowledge because its roots are in the Greek term episteme, which means "knowing" (Jaworsky, 2019). In contrast to ontological viewpoints, which talk about the researcher's perspective on the world, epistemological positions conveyed a researcher's opinion of what we can know about it. In Plato's dialogues with Socrates, Socrates argued that knowledge is a real belief that is justified and has two aspects (a priori knowledge and a posteriori knowledge). The prior knowledge should be supported by intellectual and

analytical justification (positivism worldview). This worldview adheres to quantitative research methodology. In essence, the choice to use a certain research paradigm will permeate the methodology all the way through data collection and analysis in the pursuit of acceptable responses to a given research question (s).

There are four main research paradigms: positivism, constructivism, pragmatism, and transformative paradigm (Kivunja et al., 2017). The positivism paradigm, which emphasizes verifiable knowledge, is frequently referred to as "scientific method or science research" (Park & Artino, 2020). An empiricism, scientism, and determinism-based epistemology sheds light on the positivist research paradigm. The basic ontology is held by positivists, who are interested in establishing a causal link between social phenomena in order to create explanatory and predictive models. The positivist holds that generalization can be facilitated by measuring a single known reality using the quantitative method and nomothetic approach.

Constructionism refers to the subjective interpretation of human experiences and is the source of ‘interpretative paradigm’. Constructivists focus on the perspectives and first-hand knowledge of the participants on the phenomena being studied. The value of the individual and how he interprets socially constructed events is emphasized by this paradigm. It asserts that people who hold these viewpoints socially build reality and are subject to social construction themselves. Constructivism is a paradigm for comprehending the universe that uses a bottom-up method to examine phenomena from several points of view. Constructivists use qualitative methodologies and designs to get their data in natural environments. The results are then presented by the researcher in a fair manner based on the values and social environment of the participants.

A scientific philosophy known as pragmatics holds that decisions and opinions have meaning only in as much as they have consequences. The core idea of pragmatic philosophy has been derived from the Greek term "pragma", which signifies activity. They believe human behaviour and life experiences are inextricably related and intertwined. Scholars that advocate pragmatism reject the idea that only one scientific technique can be used to do research and, as a result, embrace a variety of research approaches. According to the postmodern paradigm,

reality exists but must be built (or deconstructed) in light of gender, cultural, political, ethnic, and religious considerations. Dialectic approach, emancipatory approach, critical ethnography, and action research are all approaches used in postmodern research.

2.2.1 Pragmatism Paradigm and its Application in the Study

The present study adopted pragmatism as the research paradigm to serve the methodological foundation (Allemang et al., 2021). The researcher employed a number of research methodologies to address the many study questions, which served as justification for the pragmatist approach. Pragmatist philosophical assumptions was the approach used to investigate the phenomenon of interest. These assumptions are based on logic to expose the proof of its authenticity (Polit & Beck, 2018). This study used a mixed-method approach, with pragmatism (Allemang et al., 2021; Dawadi, Shrestha, & Giri, 2021; Maarouf, 2019). The pragmatist's perspective assumes that, despite the belief in a single world view, various people might perceive the real world differently and, as a result, do not subscribe to a single philosophical reality system. In other words, rather than relying on absolute truths, they use people's experiences to construct knowledge based on credible evidence for intellectual discourse (Allemang et al., 2021; Kaushik & Walsh, 2019).

As a research paradigm, pragmatism has three key characteristics. First, the conditions and contexts in which activities take place are inextricably linked to them. Second, pragmatists think that actions and consequences are linked in a flexible manner. The situational aspect of change refers to the notion that outcomes might vary depending on the circumstances. Other pragmatists assert that decisions are influenced by world views, which are collectively held beliefs. Thus, at its core, pragmaticism is both singularly distinct and socially shared. Consequently, it treats beliefs as interrelated rather than secluded. In order to perform mixed-method research, pragmatics use relational epistemology, multi-reality ontology, and value-laden axiology. It presents the opportunity to select methodological combinations that can more effectively address the research question(s). By integrating rigorous qualitative and quantitative methodology, the quality criteria are ensured. Data collection and analysis

procedures are based on the nature of the research question without adhering to a particular paradigm, to adequately and credibly respond to the research question(s).

This thesis was structured into three phases which employed several research paradigms and methodologies (pragmatism). The first phase was divided into four research studies: quantitative, document analysis, qualitative, and integrative literature review. The second phase focussed on the guidelines development; and the third phase was the piloting, validation, and apprisal of the clinical guidelines. During the stage one of the first phase, the researcher adopted positivists paradigm and employed cross-sectional design to describe the existing pre and post-anaesthetic assessment practices in Ghana. The survey engaged CRAs, and physican anaesthetists to obtain their perspectives of the current practices of anaesthesia in Ghana and the use of clinical guidelines in anaesthesia practice. In the second stage of anaesrthetic docucument analysis, a constuctivist paradigm was employed to qualitatively assess and describe the anaesthetic practices. The researcher furthermore conducted a qualitative constructivists exploration and description of the contextual challenges of pre and post-anaesthetic provision and the use of pre and post-anaesthetic guidelines in Ghana. This was done by engaging the heads of departments of anaesthesia in the study setting in individual semi-structured interviews. In the final stage of phase one, an integrative literature review of peer reviewed studies was conducted to describe current pre and post-anaesthetic practices using the JBI methodology and content analysis. In the second phase, experts in surgical and anaesthesia practice were engaged to develop the clinical guidelines based on the evidence from phase one of the study. Finally, the guidelines were pilot tested using separate experts from the three different levels of care in Ghana (district, regional and teaching). This was necessary to subject the contextual evidience from the various stages of the research to validate and appraise the guidelines for acceptable implementation in the Ghanaian context.

Epistimologically, the researcher is a CRA, and as such, his knowledge of anaesthesia practice illuminated the research processes. Ontologically, the researcher's experiences of the real world contextual anaesthesia practices aided in the identification of the challenges of using separate pre and post-anaesthetic clinical guidelines from the developed world in the

Ghanaian setting. As such, deploying several methodologies to harness contextual evidence through pragmatism was essential in the guidelines development.

Given the unique strengths and inherent flaws of quantitative and qualitative paradigms, combining and integrating them in a single study, as in the case of mixed methods, provides an effect that produces advantages equivalent to the sum of their parts (Creswell & Creswell, 2018; Plano Clark, 2019; Timans et al., 2019). The pragmatic epistemological predisposition enabled the researcher to conduct research across the various phases of the study to elicit the necessary information from practicing anaesthetists and multidisciplinary experts that brought to bear their experience in developing and evaluating clinical guidelines to improve anaesthetic and surgical safety and post-operative outcomes. Given that many research methods cannot be fully applied in a single study, the researcher's main issue may have been the limitations of properly using pragmatism and mixed method studies. The next section specifies mixed method design applied in the study.

2.2.2 Explanatory Sequential Mixed Method Design

The decision of a researcher to choose a particular research design depends primarily on the research questions and how the design could assist in the intended investigations. The researcher used a mixed-methods approach (Creswell & Creswell, 2018; Dawadi, Shrestha, & Giri, 2021; Maarouf, 2019). In social science research, Creswell identifies six mixed method designs: convergent parallel mixed methods, explanatory sequential mixed methods, exploratory sequential mixed methods, transformational mixed methods, embedding mixed methods, and multiphase mixed methods designs (Creswell, 2014). The researcher used an explanatory sequential mixed method design (Creswell & Creswell, 2018) based on the research questions. An explanatory sequential mixed method approach was adopted to raise trust in the study's findings and project evidence and balance any defects that a single paradigm may produce (Dawadi et al., 2021; Ghiara, 2020; Halcomb, 2019). This strategy was chosen because of its complementing qualities in creating several types of information for evidence-based decision-making (Aspers & Corte, 2019).

Furthermore, an explanatory sequential mixed-method facilitates systematic analytic integration and promotes a richer understanding of phenomena. According to Love and Corr (2022), the explanatory sequential mixed-method approach enhances systematically conscious analytical integration that facilitates a better understanding of a phenomenon under consideration. The researcher expressed that a mixed-method process was the only method that could best address the phenomenon of interest and generate a piece of incontrovertible evidence to develop an evidence-informed pre and post-anaesthetic clinical guideline for Ghana. After establishing the approach, the researcher beheld how best the data could be collected to generate the required rigour and reliance concurrently or sequentially. The quantitative phase consisted of purely closed-ended descriptive questions that sought to explore the existing pre and post-anaesthetic assessment practices. Complementarily, the qualitative approach, which had a semi-structured questionnaire with inherent question probes, allowed participants to elucidate further to bring meaning to the evidence-seeking trajectory.

The quantitative approach (cross-sectional survey) aided in the description of pre-anaesthetic and post-anaesthetic assessment practices (Taris et al., 2021), whereas the qualitative approach (exploratory, descriptive design) aided in the exploration of the challenges associated with an anaesthetic provision in Ghana (Hamilton & Finley, 2020). In addition, an integrative literature review and document analysis of reports, including but not limited to pre- and post-anaesthetic assessment forms, were carried out. Implementing an explanatory sequential mixed-method design allowed for enough investigation, which improved the triangulation and credibility of the findings (Bans-Akutey & Tiimub, 2021). The next section presents the research setting.

2.3 THE RESEARCH SETTING

Research setting is a sociocultural physical site where the researcher conducts a study with the aim of answering a set of questions in unravelling a definitive hypothesis (Creswell, 2014). In putting the research into perspective, a detailed glowing description is required to reposition the study. The researcher presented a picturesque account of the study setting. The study adopted a multi-phased-multi-centered style because of the phenomenon of interest. A survey

of practicing anaesthetist in three selected teaching, 10 regional and one Military hospital as well as 20 district hospitals across Ghana. The country was divided into three belts, southern, middle and northern. One teaching hospital was selected from each belt. One regional hospital each from the previously ten political regions of Ghana were also selected. Practicing anaesthetists were surveyed from 20 district hospitals across the country.

2.3.1 The Three Tertiary Teaching Hospitals

Practicing anaesthetists in Korlebu, Komfo-Anokye and Tamale Teaching hospital took part in the cross-sectional survey in addressing objective one of the study. Korle-Bu Teaching hospital is the biggest hospital in West Africa and third on the continent of Africa with a 2000 bed capacity. It was built in 1923 and provides specialist healthcare services for the southern belt in Ghana and other patients in the sub-region. It also serves as a training facility for medical and other allied health students of the University of Ghana. Although it is a referral centre and a medical hub, daily outpatient attendance and admission stands at 1,500 and 250, respectively. Korle Bu Hospital provides modern and scientific investigative procedures and curative interventions in the field of cardiothoracic surgery, neurosurgery, ophthalmology, ear nose and throat, paediatric surgery, dentistry, renal, orthopaedics, oncology, reconstructive plastic surgery and burns dermatology, radiotherapy and anaesthesia. It plays host to other national centres including the Reconstructive Plastic Surgery and Burns Centre, the National Cardiothoracic Centre and the National Centre for Radiotherapy and Nuclear Treatments responsible for management of cancers. Other state-of-the-art services provided by the hospital include kidney transplant and brachytherapy intervention for the treatment of prostate cancer and keyhole surgeries.

Komfo-Anokye Teaching Hospital is the second biggest hospital in Ghana with a 1200 bed capacity. It is located in Kumasi, the regional capital of Ashanti Region and the second largest city of Ghana previously referred to as the "garden city" of West Africa, due to its serenity and trees lacily interspersing rich heritage buildings. It takes direct referrals from 12 out of the 16 administrative regions. For efficient administration, the hospital has been divided into 15 directorates, 13 clinical and two non-clinical directorates. There are also clinical and non-

clinical supporting units. The clinical directorate are emergency medicine, surgery, trauma and orthopaedics, child health and family medicine. The rest are eye ear nose and throat, laboratory services, oral health and anaesthesia, radiology, and intensive care.

The third tertiary facility whose anaesthesia practitioners participated in the survey was Tamale Teaching Hospital. It is situated in the Northern Regional Capital of Ghana, Tamale, one of the fastest growing metropolises in Ghana. It is the only tertiary health facility that provides specialist care to the six northern regions of Ghana and the Sahel countries to the north upper regions of Ivory Coast to the west and Togo on the east. It is an 800-bed capacity and serves as a training site for nursing, medical, and other allied health students of University of Development Studies. The military hospital, has almost the same characteristics as the third teaching hospital.

2.3.2 The 10 Regional Health Facilities

Anaesthesia practitioners in 10 regional hospitals and one military hospital participated in the cross-sectional survey. Each regional hospital is situated in the regional capitals of Ghana with between 250 and 400 bed capacities offering secondary level care with few specialist services. They all have similar characteristics in administration, management and function serving as the referral centre for district level care and training for nursing, medical and allied health students. They offer a place for adaptation to foreign trained clinical staff preparing to write their professional examinations. It provides the environment for rotation, internship and house-manship for graduate nurses, pharmacists, certified registered anaesthetists, and yet to be commissioned medical officers.

2.3.3 The 20 District Hospitals

The researcher selected 20 district hospitals across the country. Anaesthesia practitioners in all the hospitals participated in the cross-sectional survey. In Ghana, district hospitals are the first level or leading the primary healthcare and providing medical and surgical interventions. They are mostly situated at the district capitals with an average 150 bed capacity with few or no

specialists. Most surgical cases are handled by medical offices with few surgical skills. The next section presents the phases of the research.

2.4 PHASE ONE

Phase one of the study has been subdivided into four stages as presented below.

2.4.1 Stage I of Phase One: Quantitative component of the study

This stage of the study was designed to describe the existing pre and post-anaesthetic assessment practices in Ghana using a quantitative study.

2.4.1.1 Cross-sectional survey study

A cross-sectional survey was used in the first stage of the research. A descriptive quantitative cross-sectional design is often a component of a multidimensional research design to provide an account of what is present in a population, uncover novel meaning, ascertain how frequently a phenomenon occurs, and categorize the data.

2.4.1.2 Study population and sample

In the selected health facilities, practicing physicians and registered anaesthetists were recruited. Those completing house-manship or internships, on the other hand, were excluded. Epiu et al. (2017) designed a pre-and post-anaesthetic care questionnaire that was used in this study.

2.4.1.3 Inclusion and exclusion criteria

This stage of the study included practicing physicians and certified registered anaesthetists in the setting study. Intern anaesthetists, student anaesthetists, and anaesthetists not currently engaged in clinical practice were all excluded from the quantitative stage.

2.4.1.4 Sample size and sampling procedure

A multi-stage sampling strategy was used to recruit participants. First, all three areas in Ghana with teaching, a military, regional and district hospitals were chosen. Second, a simple random sampling procedure was used and three teaching, 10 regional and 20 district hospitals from the selected regions were picked. Third, a stratified sample strategy was used to account for the study participants' unique characteristics. The stratified sampling technique divides a population into smaller groups (i.e., strata) based on shared qualities and/or attributes (Sharma, 2017). Physician anaesthetists and registered anaesthetists were divided into two groups. Fourth, the individuals were chosen by a census method. Because the target population was tiny, the census method was utilized. Everyone who satisfied the inclusion criteria and was willing to participate in the study, were included. The participants were approached in their various departments. A RaoSoft estimate was used to determine the sample size (N=208).

2.4.1.5 Data collection tool and procedures

The quantitative component included a national survey of anaesthetists in Ghana utilizing Epiu et al.'s (2017) pre and post-anaesthetic care questionnaire (Annexure H). This is a self-administered survey, and respondents were given the opportunity to opt out. Participants in the study were those who agreed and signed the consent form. The self-administered survey took about 15-20 minutes to complete. The final version of the surveys was mounted and controlled using REDCap (Research Electronic Data Capture), a secure, web-based tool housed at the University of Witwatersrand that allows the gathering of data for research investigations (Project Redcap, 2018). The REDCap Administrator then signed the researcher onto the platform and had them fill out several questions. Once the respondents had finished them, the questions were then returned to the researcher. The questions took each respondent between 15-20 minutes to complete.

2.4.1.6 Data management

REDCap (Research Electronic Data Gathering), a secure, web-based tool maintained by the University of the Witwatersrand that allows data capture for research investigations, was used to collect and manage the quantitative data (Project Redcap, 2018). The researcher was granted access to the platform by the REDCap Administrator, and the researcher linked all responders independently and individually. The questionnaire was uploaded to the website so that respondents could complete and return it to the researcher individually.

Using STATA 16.1, the data management procedure comprised labelling and creating category variables from existing variables. For statistical analysis, string variables were transformed to float variables. Binary (yes/no) answer variables were coded with "1" for yes and "0" for no. Variables with scale responses, such as the number of anaesthesiologists and anaesthetists, were recategorized into two categories (0 and more than 1). Each data table was cleaned separately after extraction. To look for discrepancies and outliers, variables were reported, tabulated and cross-tabulated, summarised, and looked through.

2.4.1.7 Validity and reliability

The degree to which a research tool measures what it is intended to measure is referred to as validity (Jaghsi et al., 2021). The questionnaire in this study was separated into sections that addressed each of the variables under inquiry, ensuring that the validity of the instrument was maintained. The questionnaire was designed to reflect important study concepts, such as pre and post-anaesthetic assessment, in order to ensure face validity; and was developed based on existing instruments to add to the validity. It was pretested using respondents with similar characteristics before the main data collection. The content validity of the questionnaire was verified using five anaesthetists.

2.4.1.8 Data analysis procedures

STATA 16.11 (StataCorp Texas, USA) was used to process and analyse the data (Moyer et al., 2016). Graphs were generated using Microsoft excel. The completeness of the recovered questionnaires was examined, and those with more than 10% missing replies were eliminated

from the analysis. Descriptive statistics were used (percentages, frequencies, means, and standard deviations). Frequencies and percentages were used to summarise categorical variables, while means and standard deviations were used to summarise continuous variables.

Demographic characteristics of the participants were summarised in frequencies and percentages. The Chi-squared test was used to determine the association between the type of hospital and categorical variables. The analysis of variance (ANOVA) was used to determine the difference in means between the types of hospital by continuous variables. A P-value of <0.05 was considered significant for all tests conducted.

2.2.2 Stage II of phase one: qualitative document analysis

The stage II of the study was designed to describe the existing pre and post-anaesthetic assessment practices in Ghana by reviewing anaesthetic documents.

2.4.2.1 Method

The qualitative document analysis was carried out using a guide developed expressly for this study (QDA) (Annexure E). The guidance is based on Wach, Ward, and Jacimovic's (2013) process, which includes defining the inclusion criteria, document search, and articulating the focus of document analysis, coding, verification, and data synthesis. Rather than just gathering together sampling documents utilized by anaesthetists in their various units and departments, the documents were purposefully sampled with the ultimate goal of starting on an in-depth study with the goal of performing a rich and detailed in-depth interpretation. Document analysis is an approach of the qualitative paradigm where the content of relevant documents regarding a phenomenon are retrieved, synthesised, interpreted, and reported. The researcher collected and analysed these documents to give meaning and a voice concerning the phenomena under study (Bowen, 2009). Document analysis, like any other, integrates coding into themes and possible sub-themes as found in a focus group discussion or semi-structured interview (Bowen, 2009).

2.4.2.2Sources of data and inclusion

All existing anaesthetic documents, including the pre-anaesthetic assessment form, intraoperative monitoring form, and post-anaesthetic assessment form were included for the qualitative document analysis. The documents were purposefully sampled to provide a rich and detailed interpretation of relevant materials utilized by anaesthetists in their various sections and divisions. Out of the 15 hospitals written to in this phase of the study, only eight hospitals provided their pre-anaesthetic assessment tool for review (Table 2.1). The hospitals are distributed across the country: Ashanti Region (2), Volta Region (2), Western Region (1) and Eastern Region (3) tools. There was no evidence of a post-anaesthetic assessment tool in practice in Ghana.

Table 2.1: Documents included

No	Name of Document	Source	Aim	Key recommendations
1.	Pre-Operative Anaesthetic Assessment Form Questionnaire (Koforidua Regional Hospital	Koforidua Regional Hospital	Assess pre-operative patients	-All planned cases undergo anaesthetic Clinic in a designated Consulting room -Patients are allowed to choose anaesthesia of choice based on experts' advice
2.	St Dominic's Pre-anaesthetic form	St' Dominic's Hospital	Assess pre-operative patient	-All cases are assessed at the ward since there was no designated centre for assessment. -Patients' history (anaesthetic, social, medical, surgical well captured
3.	Tafo Government hospital Pre-anaesthetic form	Tafo Government Hospital	Assess pre-operative patient	-Assessment is performed in anaesthetist office and ward by the head of department
4.	Directorate of	Komfo-	Assess pre-	-Pre-anaesthetic assessment in the

No	Name of Document	Source	Aim	Key recommendations
	Anaesthesia and Intensive Care Anaesthesia Assessment Form	Anokye Teaching Hospital	operative patient	consulting room are performed by only doctors. -Planned of care is laid out by document by the attending Physician -Key laboratory investigations are made. -There are designated days for anaesthetic clinic
5.	Pre-anaesthetic form (Tetteh Quashie hospital)	Tetteh Quashie hospital	Assess pre-operative patient	-All elective cases undergo pre-anaesthetic assessment. -All anaesthesia providers have clinic days for assessment
6.	Tema General Hospital Pre-anaesthetic form	Tema General Hospital.	Assess pre-operative patient	-All cases must be assessed prior to surgical intervention. -The need laboratory investigations are requested
7.	Catholic Hospital, Battor Pre-Operative Anaesthetic Assessment Form	Catholic hospital, Battor	Assess pre-operative patient	-All elective cases undergo pre-anaesthetic assessment. -Key investigations are requested. -Patient history is key to anaesthetic decision
8.	Department Of Anaesthesia Pre-anaesthetic evaluation	Kumasi South government hospital	Assess pre-operative patient	-Both elective and emergency cases are seeing by the anaesthetist prior to surgery. -Needed investigations are requested

2.4.2.3Exclusion criteria

Other assessment documents such as doctors and nurses' notes as well all other medical records were excluded.

2.4.2.4 Document Analysis

Document analysis as a structured process in critiquing and synthesising relevant documents about the phenomenon under study (Dalglish et al., 2021). It is usually conducted to supplement other data sources in a study (Bowen, Glenn, 2009; Dalglish et al., 2021). Document analysis is conducted in social, health, and political sciences (Dalglish et al., 2021). Although document analysis is an underutilised research methodology, it is essential to understand the research context and track events over time.

Although document analysis can solely be used for a study, the rigour in document analysis is improved by triangulating findings from document analysis with results from other methods. In this study, the document analysis was conducted to review and synthesise the content of pre-and post-anaesthetic assessment tools in Ghana to serve as a foundation for developing evidence-based pre- and post-anaesthetic assessment protocols for the country.

An evidenced-based pre-anaesthetic assessment tool offers the practising anaesthetist a unique standardised guide that enables the caregiver to solicit useful information from the client who is to undergo surgical intervention to provide care specific interventions that are safe, standardised and acceptable. The information gathered with the help of this tool allows the anaesthetist and the surgical team to address various challenges confronting the patient to return the individual to their pre-anaesthetic and surgical state in a more optimal fashion. The engagement between the anaesthetist and the patient and the use of such a tool engenders collaborative decision-making that portends behavioural change targeted at comorbidity management and expectant management, psychological preparation for surgery, and improved quality of life in the patient's care pathways.

A document analysis guide explicitly created for this study was used to conduct the qualitative document analysis (QDA) (**See Annexure E**). Wach, Ward, and Jacimovic explain a process used in the handbook (2013): 1) defining the inclusion criteria; 2) document search; 3) articulating the document analysis' focus; 4) coding; 5) verification; and 6) data synthesis were all performed. The content of the documents were transcribed and analysed to provide the contextual pre and post-anaesthetic assessment among practitioners.

2.4.2.4 Stage III of phase one: Qualitative study

A qualitative exploratory descriptive study was conducted to identify the challenges of anaesthetic provision and the use of pre and post-anaesthetic assessment guidelines in Ghana.

2.4.2.5 Exploratory descriptive qualitative design

The researcher adopted an exploratory descriptive qualitative design. The individual and his interpretation of socially produced events are valued in this design. With the help of this research methodology, it is possible to analyse phenomena from a variety of viewpoints in order to get a deeper understanding.

2.4.2.6 Study population

The present study included heads of units, departments, or directorates, including physicians and certified registered anaesthetists as the participants.

2.4.2.7 Sampling and sampling procedure

The researcher used a purposive sampling strategy, which is a sort of non-probability sampling technique in which participants are recruited into the study based on the stated inclusion criteria (Palinkas et al., 2015; Etikan, Musa & Alkassim, 2016; Polit & Beck, 2018; Gray, Grove & Sutherland, 2020). Purposive sampling focuses the researcher's attention on a specific experience that the participants have (Baltes & Ralph, 2020; Sharma, 2017) and on who can help the researcher answer the research questions (Mayan, 2009).

2.4.2.8 Inclusion and exclusion criteria

Any anaesthetist who was not a head of department or director, as well as student anaesthetists on internships were excluded from the study.

2.4.2.9 Informed consent

All research participants who met the criteria were given an information sheet (Annexure C) and were then invited to participate. Semi-structured interviews with these participants were conducted after they gave their informed consent (Annexure D). To make it easier for the interviewer to collect the material stated, all of the interviews were performed in English and audio-recorded (with informed consent) (Annexure D). The researcher also took field notes to fill in any gaps that were observed.

2.4.2.10 Data collection guide and procedure

A minimum of 15 anaesthesia department heads were carefully chosen. The participants in the qualitative study were recruited using a purposive sampling technique. The premise for this is to conduct interviews with a semi-structured questionnaire to collect in-depth information that could answer the study questions (Burns, Grove, & Gray, 2015). A total of 15 heads of units, departments, and directorates from district, regional, and teaching hospitals were selected for this study. With innumerable question probes, in-depth information was extracted from the participants, bringing out all of the necessary material to make the study rich enough to answer the phenomena of interest's aims. When data saturation was reached, the number of participants was determined. Data saturation was determined at a point where no new information could be elicited from participants no matter the question probes. The interview/data collection guide was developed by the researcher and the supervisor. This was done having the objectives of the study of that stage in mind, as well as the research questions. Three certified registered anaesthetists were interviewed using the semi-structured interview guide to test for content validity. The supervisor further perused the interview guide to ensure that it was valid. The guide was found to be suitable since it could elicit useful information to answer the research questions.

2.4.2.11 Data analysis

To follow the principle of inductive inquiry, data collection and analysis were conducted simultaneously. The interviews were taped and transcribed, with the transcripts kept in a locked cabinet. These audio files were kept on a password-protected computer and will be deleted after the ethics committee's deadline has passed. The transcript was entered into MAXQDA 20 plus version 20.1.1 software, which helped with coding by recognising commonalities (codes) in the narrative text. These codes were organised into distinct themes and sub-themes by categorising and thematising them. The inter-coder agreement was established by the researcher and supervisor independently coding a sample of the transcripts. The remaining interviews were analysed by the researcher using the agreed-upon codes.

2.4.2.12 Methodological rigour

Three anaesthetists pre-tested the interview guide for applicability. The self-administered questionnaire was furthermore examined by the supervisor and two anaesthesiologists. The redesigned questionnaire was subsequently pilot tested in Ghana with a group of seven anaesthetists.

- **Trustworthiness**: In qualitative research, trustworthiness is equivalent to "validity and reliability" in quantitative research. According to Lincoln and Guba (1985), in qualitative research, trustworthiness is established through assuring data quality or rigor. A qualitative study's trustworthiness is determined by four criteria: credibility, dependability, confirmability, and transferability (Polit & Beck, 2018). The use of methods to assure the correctness of the findings is referred to as trustworthiness (Brink et al., 2013).
- **Credibility:** The consistency of findings to reality is referred to as credibility. The researcher used four sources of data in this study: document analysis, key informant interviews, an integrative literature review, and a survey of anaesthetists and department heads to ensure credibility of the findings.
- **Transferability**: According to Lincoln and Guba (1985), transferability occurs when the study's findings may be applied to diverse groups of subjects (people)

and in different situations. In this case, the knowledge gained in the current study is relevant in another environment, and investigators conducting research in a different context will be able to apply certain concepts developed in the current study to get the same or comparable outcomes. The researcher provided detailed explanation of the research processes to grant some transferability by future researchers.

- **Dependability:** If another researcher uses the same methods in a different context with similar individuals, the same or similar research findings will emerge (Brink et al., 2013). The researcher in this study followed the specifications of the research proposal and documented any deviations or changes that occurred during the investigation to ensure dependability.
- **Confirmability:** Confirmability ensures that the researcher's personal prejudices are not instilled in the study findings (Forero et al., 2018; Nowell et al., 2017). To reduce human or process bias, the researcher triangulated four data sources in this investigation. To avoid the inclusion of personal biases, the researcher followed a rigorous research plan. To establish confirmability, the researcher used bracketing during the interview. An audit trail was kept for every step of the study process, including data collection, analysis, and interpretation, making it easy for anybody to follow along and see any mistakes.

2.4.4 Stage IV of phase one: Integrative literature review

The purpose of the fourth stage of phase one was to describe the current pre and post-anaesthetic assessment practices through an integrative literature review.

2.4.4.1 Method

The review was carried out using the critical appraisal methods of the Joanna Briggs Institute (JBI) and the Mendeley reference manager (Mendeley, 2018). PubMed, Scopus, and CINAHL were among the databases used. This review aims to summarize current pre-anaesthetic and post-anaesthetic assessment techniques through an integrative literature review. As a result, the evaluation was directed by the question, "What are the current pre-anaesthetic and post-

anaesthetic assessment practices?" Studies were included in full journal papers published in English and authored between January 2016 and December 2020 on pre-anaesthetic and post-anaesthetic assessment techniques.

2.4.4.2 Design

Scoping reviews are thorough literature reviews that provide comprehensive responses to research issues by putting a lot of effort into examining the literature and determining its volume and possible reach in a given phenomenon (Verdejo et al., 2021). It can accomplish numerous goals and can encompass a large number of studies (Munn et al., 2018; Pham et al., 2014; Sucharew, 2019). However, an integrative review was adopted for this study due to the need to elicit rich evidence to support the development of clinical guidelines. This enabled the extraction of evidence from both quantitative and qualitative paradigms (Lubbe et al., 2020). The Joanna Brigs Institute's (JBI) critical appraisal tools and Mendeley reference management were used to organize the review process for this integrative review (Mendeley, 2018). The integrative review approach was chosen above other review methods because it synthesizes findings from both the positivist and constructivist orientations.

2.4.4.3 Search and Inclusion

Journal articles published on the current pre-anaesthetic and post-anaesthetic assessment practices from January 2016 to December 2020 were searched from Science Direct, PubMed, Scopus, and CINAHL using the keywords; post-anaesthetic, pre-anaesthesia, evaluation, and assessment. These keywords were then combined into a search query; (pre-anaesthe* or post-anaesthe* or pre-anesthe* or post-anesthe*) and (assessment* or evaluate*) and (preanaesthe* or postanaesthe* or preanesthe* or postanesthe*) and (assessment* or evaluat*). The decision to search between 2016 and 2020 was based on the need to determine the current pre and post-anaesthetic assessment practices.

Many mnemonics and frameworks have been developed to guide the search and inclusion of papers in systematic-like reviews (Munn et al., 2018). One of the frameworks, the SPIDER (Sample, Phenomenon of Interest, Design, Evaluation, Research type) framework, is widely used for reviews that involve qualitative and mixed-method research papers (Amir-

Behghadami, 2021; Cooke et al., 2012; Methley et al., 2014). This study sought to summarize current pre-anaesthetic and post-anaesthetic assessment techniques through an integrative literature review; consequently, both policy documents, qualitative, quantitative and mixed-method studies that report pre- and post-anaesthetic assessment practices needed to be included. As such, the evidence search, inclusion, and exclusion of the studies followed the SPIDER framework (Methley et al., 2014), thus:

The SPIDER framework of the systematic review:

- **Sample:** surgical patients
- **Phenomenon of Interest:** pre and post-anaesthetic assessment
- **Design:** peer-reviewed and grey literature of any study design
- **Evaluation:** recommendations and current pre and post-anaesthetic assessment practices
- **Research type:** quantitative, qualitative, mixed-methods, gray literature published from 2016 to 2020

2.4.4.4 Critical appraisal

The Joanna Briggs Institute's Critical Appraisal Tools were used to evaluate the whole text that was downloaded. Three reviewers assessed the studies to see if they should be included. For inclusion, a minimum of two recommendations were required. If a study meets 80% of the quality criteria provided by the appraisal tool, it is recommended for inclusion.

2.4.4.5 Data Collection

The researcher extracted the findings from all the studies included in this review. The researcher reviewed the findings extracted to ensure they were accurate and met the inclusion criteria. The finalized data extraction sheet is presented in a data matrix.

2.4.4.6 Data synthesis

A qualifying technique was used to alter quantitative data, then combined with qualitative data utilizing a convergent integrated approach (Hsieh & Shannon, 2005; Sandelowski et al., 2012). Due to the intricacy of recommendations from both qualitative and quantitative research and the data transformation process, the certainty of the evidence from the studies

was not assessed. Because this is an integrative review, the reviewer did not seek to compare phenomena or draw judgments; the assessment of certainty was excluded.

The reviewer independently coded the findings collected from the data matrix, and the codes were compared to the coding done by an external coder. For final coding, the principles were refined based on intercoder agreement. The results section shows that similar codes were integrated into sub-themes and related sub-themes into themes.

2.5 PHASE TWO: GUIDELINES DEVELOPMENT AND VALIDATION

The specific objective of phase two was to develop evidence-based pre and post-anaesthetic assessment guidelines for Ghana.

2.5.1 Application of the Appraisal of Guidelines for Research and Evaluation (AGREE) II in the clinical guidelines development

The Appraisal of Guidelines for Research and Evaluation (AGREE) II instrument's six core domains served as a conceptual framework for this research; and guided the researcher in developing the clinical guidelines. They are: 1) scope and purpose; 2) stakeholder involvement; 3) development rigor; 4) clarity of presentation; 5) applicability; and 6) editorial independence.

Each domain has inbuilt itemized criteria with a rating scale from 1-7: 1-strongly disagree, 7-representing strongly agree with various intervals of improvement. In appraising a guideline, a score of 1-6 means that the rated item does not fully meet the intended recommendation: a score of 7 means the item under consideration was succinctly and excellently captured in the document.

The pre-and post-anaesthetic assessment criteria were developed using the domains above and below. How it was applied to the study was captured in chapter one.

2.5.1.1 Domain 1: Scope and Purpose

- "The overall objective(s) of the guideline is (are) specifically described."
- "The health question(s) covered by the guideline is (are) specifically described."
- "The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described."

2.5.1.2 Domain 2: Stakeholder Involvement

- "The guideline development group includes individuals from all relevant professional groups."
- "The views and preferences of the target population (patients, public, etc.) have been sought."
- "The target users of the guideline are clearly defined."

2.5.1.3 Domain 3: Rigour and Development

- "Systematic methods were used to search for evidence."
- "The criteria for selecting the evidence are clearly described."
- "The strengths and limitations of the body of evidence are clearly described."
- "The methods for formulating the recommendations are clearly described."
- "The health benefits, side effects, and risks have been considered in formulating the recommendations."
- "There is an explicit link between the recommendations and the supporting evidence."
- "The guideline has been externally reviewed by experts prior to its publication."
- "A procedure for updating the guideline is provided.

2.5.1.4 Domain 4: Clarity of Presentation

- "The recommendations are specific and unambiguous."
- "The different options for management of the condition or health issue are clearly presented."
- "Key recommendations are easily identifiable."
- "The guideline describes facilitators and barriers to its application."

2.5.1.5 Domain 5: Applicability

- "The guideline provides advice and/or tools on how the recommendations can be put into practice."
- "The potential resource implications of applying the recommendations have been considered."
- "The guideline presents monitoring and/or auditing criteria."

2.5.1.6 Domain 6: Editorial Independence

- "The views of the funding body have not influenced the content of the guideline."
- "Competing interests of guideline development group members have been recorded and addressed."

2.5.1.7Participants recruitment and data collection procedures

In developing the clinical guidelines, the researcher used the purposive sampling technique to recruit seven multidisciplinary experts consisting of two surgeons, two anaesthesiologists, two certified registered anaesthetists, one critical care nurse and one patient advocacy group leader. This was necessary since their expertise was needed in the development process of the guidelines. The researcher presented the synthesised evidence from phase one to the expert team, which was used to develop the guidelines. The developed clinical guidelines were given to three anaesthetists from three selected hospitals to be used as a guide for pre and post-anaesthetic assessment. The responses, in the form of field notes and open-ended feedback from the three anaesthetists, were analysed and incorporated into the draft guidelines. The final document was given to a different multidisciplinary expert committee for evaluation using the AGREE II evaluation framework for the ratings of the draft recommendations.

2.5.2 Data analysis

The cumulated scores were calculated for each of the 23 items in the six domains. The domain score was obtained for each expert rating by summing up the individual item score and scaling up the total as the percentage of the maximum score obtained. Although the experts that

developed the AGREE framework evaluation tool had not assigned a minimum score as a basis of the strength of a recommendation differentiating a high-quality guideline from another (Brouwers et al., 2010; AGREE Research Trust, 2010), for acceptability, applicability and reliability of the guideline, the researcher assigned 70% and above to a specific domain to represent a high-quality guideline (Bargeri et al., 2021). The researcher could infer that a weak score could be interpreted as a weak guideline. All recommendations, criticism, comments, feedback and suggestions were incorporated into the pre and post-anaesthetic guidelines by the researcher before the final document was presented in the thesis. The result of the appraisal is discussed in Chapter Seven.

2.6 PHASE THREE: PILOTING, AND APPRAISAL OF THE CLINICAL GUIDELINE

The final phase of this thesis was to pilot test and appraised an evidence-based pre and post-anaesthetic assessment guide for Ghana using experts.

2.6.1 Study Design

Qualitative descriptive design was employed at this phase.

2.6.1.1 Study population

The population was multidisciplinary surgical experts. The experts were targeted to add validity and reliability to the developed clinical guidelines.

2.6.1.2 Sampling and sampling technique

Three hospitals (one teaching, one regional and one district hospital) were selected. Balloting of one each from the list of each category was done. **Seven** multidisciplinary surgical experts and patients group consisting of; one anaesthesiologist, one intensivist, one surgeon, one patient, and three CRAs was established.

Out of the eight multidisciplinary experts who agreed to be part of the appraisal, one could not respond, leaving seven. These comprised of an intensivist, an anaesthesiologist, a surgeon, three certified registered anaesthetists and a patient advocate group leader. The team were

verbally informed about the researcher's quest to recruit them for such an exercise to which they willingly consented. They were taken through the official consent process and included in the appraisal phase of the study.

2.6.1.3 Inclusion and exclusion criteria

The experts included in this phase were all in clinical practice. Experts who were not in clinical practice were all excluded.

2.6.1.4 Data collection procedures

The three anaesthesia providers were given the draft guidelines for pre and post-anaesthetic assessment to implement and provide feedback on its applicability. They were not given any guiding questions. The practitioners presented feedback to the researcher in a form of field notes and open-ended comments (Table 2.1). These comments and suggestions were incorporated in the draft guideline.

Table 2.2: Demographic information of three anaesthesia providers

PARTICIPANTS	AGE	SEX	LEVEL OF FACILITY	RANK
ANAES 1	55	M	Tertiary (Level 3)	Consultant Anaesthesiologist
ANAES 2	46	F	Regional (Level 2	Deputy Chief CRA
ANAES 3	41	M	District (Level 1)	Principal CRA

Additionally, the researcher presented the draft guidelines to three licensed anaesthesia providers in three hospitals at various levels of care in Ghana. The three hospitals were selected using quota sampling. One was conveniently (those available and willing to participate) selected from a list of all the tertiary and the military hospitals; the second, from the list of regional hospitals; and the third, the list of district hospitals where the researcher had permission to conduct the study. The three facilities; one tertiary, one Regional and a District hospital were selected to test the applicability of the guidelines across all levels of care where surgical services were provided. The researcher could not select more facilities due to time and financial constraints.

A practitioner was conveniently selected from each of the settings to participate in the pilot testing. The researcher contacted the heads of the anaesthesia units of the facilities to seek their consent to participate in the study. All of them agreed to participate in the study. The researcher then provided the practitioners with a detailed information sheet to read after which they were taken through the consent process.

The practitioners included one consultant anaesthesiologist and two certified registered anaesthetists of the rank of deputy chief and principal certified registered anaesthetists: a male consultant anaesthesiologist aged 55, who works in one of Ghana's teaching hospitals; a female deputy chief certified registered anaesthetist, 46 years old, who works in a Regional hospital, a level two facility; and lastly, a principal certified registered anaesthetist who is 41 years old and works in a district hospital, a level one facility (Table 2.1).

For the purposes of the appraisal, the researcher supplied documents to each of the appraisers containing verified guidelines, a consent form (Annexure D), synopsis of findings from phase 1 of the study, and the AGREE II user guide. The AGREE II instrument for the appraisal was placed on a REDCap platform for the appraisers for easy access and possible audit trail. The researcher made it known to the appraisees to embark on independent assessment and the essence of the appraisal was to determine if the guidelines development followed the rigorous process of scrutiny, meets international standards, and is safe for clinical use. They rated the guideline on a Likert scale of 1-7. 1 means strongly disagree and 7 means strongly agree and 2-6 indicating the AGREE II item did not meet the needed criteria. They were to comment further to recommend the guidelines for use, recommend with modification, or recommend not for use. The guidelines were rated according to the item in each domain and the total summation score was given across domains.

They were made to rate the overall quality of the guideline where 1 denotes the lowest quality and 7 strongest qualities. A judgement could then be passed as to whether the pre and post-anaesthetic guidelines met international best standards. If the total percentage score for each domain was 70 to 100 then it meant that the guideline was of high quality. Any total score below 70 meant that the guideline was of low quality.

2.6.2 Data analysis

During the piloting stage no specific data analysis was employed in detail, albeit some thematic analysis was performed. The comments were read repeatedly. The common suggestions and recommendations were pulled together to make an argument for revision of the draft guideline.

Feedback from the seven experts after the appraisal was subjected to scoring and calculation using the AGREE II guidelines. Empirically, the AGREE II has 23 items in the entire instrument across the six domains as discussed in chapter two. Each of the six domains was rated and calculated independently since it cannot be aggregated as a single quality score (Brouwers et al., 2010, p.12). A quality score was made for each item in the domain and scaled as the maximum score obtained for a particular domain of interest. It is instructive to note that the domain scores are important and inference could be made as to the quality of the guideline, the AGREE II consortium did not set out a minimum indicative score for a low- or high-quality guideline (Brouwers et al., 2010, p.113), the decision, therefore, rests with the users of the guidelines within the context of the usage of the framework. The researcher and his supervisor pegged a 70% score and above as a high-quality score to ensure reliability and provide the users of the clinical guidelines with the confidence of having an international standard. That notwithstanding, the decision of recommending the guidelines was solely the responsibility of the appraisal team of experts.

2.6.3 Validity and reliability of the clinical guidelines

The validity and reliability of the developed clinical guidelines was ensured in three stages. Firstly, the researcher validated the guidelines in phase two of the study using experts. Secondly, the guidelines were pilot tested using three different experts at various levels of care in Ghana (district, regional, tertiary). Finally, the guidelines were appraised by seven additional multidisciplinary experts.

2.7 ETHICAL CONSIDERATION

Research ethics refers to a set of moral and ethical standards as well as accepted norms that are concerned with how well research processes follow to moral, legal, professional, and sociocultural requirements when it comes to participants who have willingly agreed to take part in a study (Polit & Beck, 2014). This study considered the following important ethical problems.

- The research proposal was peer-reviewed for input from the department of nursing education, School of Therapeutic Sciences, Faculty of Health Sciences, University of Witwatersrand
- Permission was sought from Epui et al. (2017) to use their questionnaire.
- The proposal was reviewed by the Wits Postgraduate Committee for approval.
- Ethical clearance was sought from Wits Human Research Ethics Committee (Annexure A)
- Ethical clearance was sort from the Ghana Health Service Ethics Committee (Annexure B).
- A detailed information sheet was given to the participants (Annexures C).
- Informed consent was sought from participants (Annexures D).
- Privacy, anonymity, and confidentiality was observed on all the studies conducted and anaesthetists and multidisciplinary experts involved in the study.
- Permission was sought from all hospitals selected for research.
- Approval was obtained from the University of Witwatersrand Postgraduate Therapeutic Health Sciences research committee.

2.7.1 Risk and benefits

Interviews with key informants and a self-administered questionnaire were part of this study. The participant was not in danger of physical or psychological harm as a result of participating in the study. However, it necessitated a certain level of thought and the exchange of professional experiences. The participant had the option to participate or not, and to withdraw from the study whenever he or she felt it is necessary, according to the information sheet and

consent form. For taking part in this study, the volunteer did not receive any material or financial rewards. Regardless, the findings of this study are expected to aid in the improvement of anaesthesia practice, surgical safety, and post-anaesthetic and post-operative outcomes.

2.7.2 Privacy / Confidentiality

The interviews took place at the participant's discretion in a private venue. In the interview, no personal identification of participants was used. The cassette recorded material was transcribed, and the transcripts coded, but no participant identities were mentioned. Except for years of experience, the questions were self-administered and included no participant identification.

2.7.3 Data Usage and Storage

The tapes and completed questionnaires are stored under lock and key at the University of the Witwatersrand's Centre for Health Policy, and only the study team had access to them for analysis. The tapes and completed questionnaires will be destroyed two years after the findings are published unless the Ghana Health Service Ethics Review Committee specifies otherwise.

2.7.4 Voluntary Withdrawal

Without incurring any penalties, the participant could ask the person interviewing him or her to cease the tape recording and the interview altogether at any time. The participant could opt out of completing the questionnaire at any time without incurring any costs or consequences.

2.7.5 Conflict of Interest

The researcher, who was a practicing Certified Registered Anaesthetist and the previous Head of the Anaesthesia Department at Eastern Regional Hospital in Koforidua, did not complete the self-administered questionnaire.

2.8 DISSEMINATION OF RESULTS

The results of this research will be published in peer-reviewed journals. In each region, the preliminary findings will be provided to the relevant stakeholders. In addition, policy briefs will be created and distributed to key stakeholders.

CHAPTER 3 : EXPLORATORY PHASE - QUANTITATIVE

3.1 INTRODUCTION

This chapter is the exploratory phase of the study that seeks to describe the existing pre and post-anaesthetic assessment practices in Ghana. It involved a survey of practising anaesthetists in Ghana. The study took into consideration the two main cadres of anaesthesia providers in Ghana. It was also intended to answer objective one of the studies. The next section outlines the detailed results of the survey.

3.2 RESULTS

3.2.1 Sociodemographic characteristics

The demographic characteristics of the study participants are provided in Table 3.1. Overall, 208 health workers participated in the study. Of these, the majority were male (n=152, 73.1%), certified registered anaesthetists (n=200, 97.6%), worked in a district hospital (n=102, 50.5%), with less than 250 beds (n=91, 43.7%). The average age of the study participants was 36.8 ± 5.14 years. The average years of experience in anaesthesia was 6.7 ± 4.9 years (Table 3.1).

Table 3.1 Demographic data on pre and post-anaesthesia

Characteristics	**Level**	**Number (n)**	**Percentage**
Age	Mean ± standard deviation	36.8 ± 5.14	
Gender	Male	152	73.1
	Female	53	25.5
	Other	3	1.4
Category of staff	Physician Anaesthetist	5	2.4
	Certified Registered Anaesthetist	200	97.6
Staff Position	CRA	70	37.0
	Senior CRA	67	35.5
	Principal CRA	29	15.3

Characteristics	Level	Number (n)	Percentage
	Dept. Chief CRA	18	9.5
	Chief CRA	1	0.5
	Specialist/Fellow	2	1.2
	Senior Specialist	1	0.5
	Consultant	1	0.5
Hospital size	No hospital	5	2.4
	<250	91	43.7
	250-500	65	31.3
	500-1000	21	10.1
	>1000	10	4.8
	Missing	16	7.7
Years of experience in anaesthesia	Mean ± standard deviation	6.7 (4.9)	
Type of hospital	Teaching	31	15.4
	Military	6	3.0
	Regional	37	18.2
	District	102	50.5
	Other	26	12.9

3.2.2 Association between the type of hospital and pre-anaesthetic assessment

Table 3.2 determines the association between the type of hospital and pre-anaesthetic assessment. The pre-assessment characteristics were grouped into the cadre of staff, surgical checklist and international guidelines, patients, personnel, use of some selected equipment during anaesthesia, and the functionality of some equipment during anaesthesia.

3.2.3.1 Cadre of Staff

There was a significant association between the number of anaesthesiologists and the type of hospital ($p<0.001$). Overall, 19.4% of the participants reported having one or more anaesthesiologists in their hospital. Of the participants from the teaching hospitals, 79.1% (n=23/31) reported having one or more anaesthesiologists in their hospital. All participants from the military hospitals reported having one or more anaesthesiologists. Only 3% (n=3/101) of participants from the district hospitals reported having at least one anaesthesiologist.

There was no significant association between the number of certified registered anaesthetists and the type of hospital. This is because all the participants from the various types of hospitals reported having at least one certified registered anaesthetist.

3.2.3.2 Surgical Checklist and International Guidelines

In the items under surgical checklist and international guidelines, pre-anaesthetic assessment ($p=0.045$) and mean number of daily surgeries done ($p<0.001$) were significantly associated with the type of hospitals. Overall, 93.6% (n=186/202) of participants reported conducting a pre-anaesthetic assessment. A significantly large proportion of participants from the teaching (n=31, 100%) and district (n=97/101, 95.1%) hospitals reported conducting a pre-anaesthetic assessment. The average daily surgery conducted varied significantly by hospital type, with participants from the military hospitals reporting the highest number of surgeries conducted daily.

Although 66% (n=132/202) of participants stated that they used a pre-anaesthetic checklist, that they did not use a surgical checklist because of time constraints, and that they were aware of international standards for safe anaesthetics, none of these factors were significantly related to the type of hospitals.

3.2.3.3 Patients

There was a significant association between patients being taken care of in a recovery room and the type of hospital ($p<0.001$). A significantly high proportion of the participants from the military (n=6/6, 100%) and teaching (n=28/31, 90.1%) hospitals reported patients being taken care of in the recovery room. A smaller proportion of participants from the district hospitals (n=48/101, 47.1) reported patients being taken care of in the recovery room.

In terms of patients being taken care of for at least half an hour during the post-operative period by an intensive care nurse, 43.6% (n=88/202) of the overall participants reported yes. Among participants from the military hospital, 66.7% (n=4/6) reported yes. A significant proportion of participants from the teaching hospitals (n=18/31, 58%) reported yes. Very few participants from other hospitals (n=5/26, 19.2%) reported yes.

There was a significant association between the availability of basic ICU services for monitoring patients post-operatively and types of hospitals ($p<0.001$). Overall, 49.5% (n=100/202) of participants reported the availability of basic ICU services for monitoring patients post-operatively in their hospital.

Checking patient's pre-operative informed consent, identification and type of surgery, and duration of pain relief given to patients after surgery was not significantly associated with the type of hospital.

3.2.3.4 Personnel

In terms of personnel, almost all the various types of hospitals reported having adequate personnel, with the highest proportion of participants from the military reporting having adequate anaesthesia personnel (n=5/6, 83.3) as well as adequate supervision (n=6/6, 100%) and supervision regarding emergency conditions (n=6/6, 100%). Less than 50% of the participants from the district hospitals reported having adequate anaesthesia personnel (n=17/101, 16.7%), available assistant who can give cricoid pressure (n=26/101, 25.5%), adequate supervision (n=50/101, 49.5%), and supervision regarding emergency conditions (n=30/101, 29.4%) (Table 3.2). Except for participants from the district and the military hospitals, more than 50% of the participants from the various hospitals reported having experienced miscommunication during anaesthetic practise (Table 3.2).

3.2.3.5 Use of equipment

In terms of the use of equipment, the proportion of participants who reported using EKG monitoring (n=5, 83.3%, p-value=0.006), suction in every case (n=6, 100%, p-value=0.002), infusion pumps (n=6, 100%, p-value=0.006), and difficult airway cart (n=6, 100%, p-value=0.016), the military hospital was highest compared to the other type of hospitals.

3.2.3.6 The functionality of monitors during anaesthesia

Regarding the functionality of monitors during anaesthesia, the proportion of participants who reported a functional pulse oximeter (n=6/6, 100%, p-value=0.017), manual blood pressure monitor (n=4/6, 66.7%, p=0.047), thermometer (n=4/6, 66.7%, p=0.045), stethoscope (n=6/6, 100%, p<0.001), defribilator (n=5/6, 83.3%, p<0.001), and capnograph and end tidal measurement (n=6/6, 100%, p=0.005) was highest from the military hospital compared to the other type of hospitals (Table 3.2).

Table 3.2: Pre-anaesthetic assessment by type of hospital

Characteristics	**Overall**	**Teaching**	**Military**	**Regional**	**District**	**Other**	***p*-value**
	N=202	**N=31**	**N=6**	**N=37**	**N=101**	**N=26**	
Cadre of Staff							
No. of Anaesthesiologists, ≥1	38 (19.4)	23 (79.3)	6 (100.0)	4 (11.1)	3 (3.0)	2 (7.7)	**<0.001**
No. of Certified Registered Anaesthetists, ≥1	188 (100.0)	22 (100.0)	6 (100.0)	35 (100.0)	100 (100.0)	25 (100.0)	N/A
Surgical Checklist and Intern. Guidelines							
Pre-anaethestic checklist, yes (%)	132 (66.0)	24 (80.0)	4 (66.7)	22 (59.5)	61 (60.4)	21 (80.8)	0.122
Surgical checklist not used due to time, yes (%)	132 (66.0)	17 (56.7)	4 (66.7)	28 (75.7)	72 (71.3)	18 (69.2)	0.529
International guidelines for safe anaesthetics for patients knowledge, yes (%)	132 (66.0)	27 (90.0)	0 (0.0)	33 (89.2)	91 (90.1)	2 (7.7)	0.934
Pre-anaesthetic assessment, yes (%)	189 (93.6)	31 (100.0)	5 (83.3)	31 (83.8)	97 (95.1)	25 (13.2)	**0.045**
Mean number of daily surgery done, SD*	10 (11.5)	26 (17.1)	27.5 (12.1)	11.4 (7.0)	4 (2.3)	6 (9.3)	**<0.001**
patients							

Checking a patient's pre-operative informed consent, yes (%)	193 (95.5)	29 (93.6)	6 (100.0)	35 (94.6)	97 (95.1)	26 (100.0)	0.753
Checking a patient's identification and type of surgery, yes (%)	196 (97.5)	31 (100.0)	6 (100.0)	36 (97.3)	99 (98.0)	24 (92.3)	0.411
Patient taken care of for at least half an hour during post-operative period by an intensive care nurse, yes (%)	88 (43.6)	18 (58.1)	4 (66.7)	24 (64.9)	37 (36.3)	5 (19.2)	**0.001**
All patients taken care of in a recovery room, yes (%)	124 (61.4)	28 (90.3)	6 (100.0)	28 (75.7)	48 (47.1)	14 (53.9)	**<0.001**
Duration of pain relief given to patients after surgery							
Up to 24 hrs, yes (%)	53 (26.2)	7 (22.6)	2 (33.3)	10 (27.0)	29 (28.4)	5 (19.2)	0.567
Up to 48 hrs, yes (%)	48 (23.8)	6 (19.4)	2 (33.3)	11 (29.7)	21 (20.6)	8 (30.8)	
Between 48-72 hrs, yes (%)	52 (25.74)	12 (38.71)	2 (33.3)	10 (27.0)	21 (20.6)	7 (13.5)	
> 72 hrs, yes (%)	49 (24.3)	6 (19.4)	0 (0)	6 (16.2)	31 (30.4)	6 (23.1)	
Experienced at least a case of dental injury in the last year, yes (%)	15 (7.5)	4 (12.9)	0 (0)	6 (16.2)	4 (4.0)	1 (3.9)	0.084
Basic ICU services available for monitoring patients post-operatively, yes (%)	100 (49.5)	30 (96.8)	6 (100.0)	32 (86.5)	25 (24.5)	7 (26.9)	**<0.001**
Personnel							
Adequate anaesthesia personnel, yes (%)	44 (21.8)	12 (38.7)	5 (83.3)	10 (27.0)	17 (16.7)	0 (0)	**<0.001**
Availability of assistant who can give cricoid pressure, yes (%)	50 (24.8)	15 (48.4)	4 (66.7)	4 (10.8)	26 (25.5)	1 (3.9)	**<0.001**
Adequate supervision, yes (%)	103 (51.5)	16 (51.6)	6 (100.0)	23 (62.2)	50 (49.5)	8 (32.0)	**0.023**
Experienced intra-operative cardiac arrest in the last year, yes (%)	77 (38.1)	17 (54.8)	2 (33.3)	16 (43.2)	34 (33.3)	8 (30.8)	0.22

Supervision regarding emergency conditions, yes (%)	85 (42.1)	22 (71.0)	6 (100.0)	21 (56.8)	30 (29.4)	6 (23.1)	**<0.001**
Experience miscommunicating during anaesthetic practice, yes (%)	120 (59.7)	24 (77.4)	3 (50.0)	27 (75.0)	46 (45.1)	20 (76.9)	**<0.001**
Medication error in the past three months, yes (%)	9 (4.5)	4 (12.9)	0 (0.0)	1 (2.7)	3 (3.0)	1 (4.0)	0.183
Use of the following equipment							
Anaesthetic machine and circuit, yes (%)	174 (86.6)	26 (83.9)	6 (100.0)	32 (86.5)	89 (87.3)	21 (84.0)	0.86
EKG monitoring, yes (%)	66 (32.7)	16 (51.6)	5 (83.3)	11 (29.7)	26 (25.5)	8 (30.8)	**0.006**
Nerve stimulator, yes (%)	2 (1.0)	1 (3.2)	0 (0.0)	1 (2.7)	0 (0.0)	0 (0.0)	0.406
Pulse oximeter, yes (%)	201 (100.0)	31 (100.0)	6 (100.0)	37 (100.0)	101 (100.0)	26 (100.0)	N/A
Use of pulse oximeter in every case, yes (%)	201 (100.0)	30 (96.8)	6 (100.0)	37 (100.0)	101 (100.0)	26 (100.0)	0.236
Use of suction in every case, yes (%)	202 (100.0)	24 (77.4)	6 (100.0)	35 (94.6)	100 (98.0)	24 (92.3)	**0.002**
Use of infusion pumps, yes (%)	114 (56.4)	16 (51.6)	6 (100.0)	29 (78.4)	48 (47.1)	15 (57.7)	**0.003**
Difficult airway cart, yes (%)	88 (43.6)	18 (58.1)	6 (100.0)	14 (37.8)	41 (40.2)	9 (34.6)	**0.016**
Functional monitors during anaesthesia, yes (%)							
Pulse oximeter	191 (94.6)	26 (83.9)	6 (100.0)	36 (97.3)	100 (98.0)	23 (88.5)	**0.017**
Automated blood pressure monitor	180 (89.1)	25 (80.7)	5 (83.3)	35 (94.6)	95 (93.1)	20 (76.9)	0.053
Manual Blood Pressure monitor	98 (48.5)	10 (32.3)	4 (66.7)	15 (40.5)	59 (57.8)	10 (38.5)	**0.047**
ECG	149	23	6	32	71	17	0.131

	(73.7)	(74.2)	(100.0)	(86.5)	(69.6)	(65.4)	
Thermometer	103 (51.0)	10 (32.3)	4 (66.7)	15 (40.5)	61 (59.8)	13 (50.0)	**0.045**
Stethoscope	183 (90.6)	22 (71.0)	6 (100.0)	35 (94.6)	99 (97.1)	21 (80.8)	**<0.001**
Defibrillator	39 (19.3)	10 (32.3)	5 (83.3)	7 (18.9)	11 (10.8)	6 (23.1)	**<0.001**
Capnograph and end tidal measurement	123 (60.9)	19 (61.3)	6 (100.0)	28 (75.7)	61 (59.8)	9 (34.6)	**0.005**

SD- Standard deviation, ECG- Electrocardiogram, EKG – Electrocardiography

3.2.4 Intermediate post-anaesthetic care

Figure 3.1 shows the distribution of responses from participants in relation to intermediate post-anaesthetic care. In terms of intermediate post-anaesthetic care, most participants reported it is important to train intensive care nurses on intubation and extubation. Less than 10% of the participants reported the intensive care nurses from their hospitals had been trained to perform intubation and extubation. Over 50% of the participants reported having been called upon sometimes to extubate a patient at the post-anaesthesia care unit/ recovery ward/ ICU. Less than 40% of the participants reported a need to re-intubate a patient at the post-anaesthesia care unit/recovery ward/ ICU.

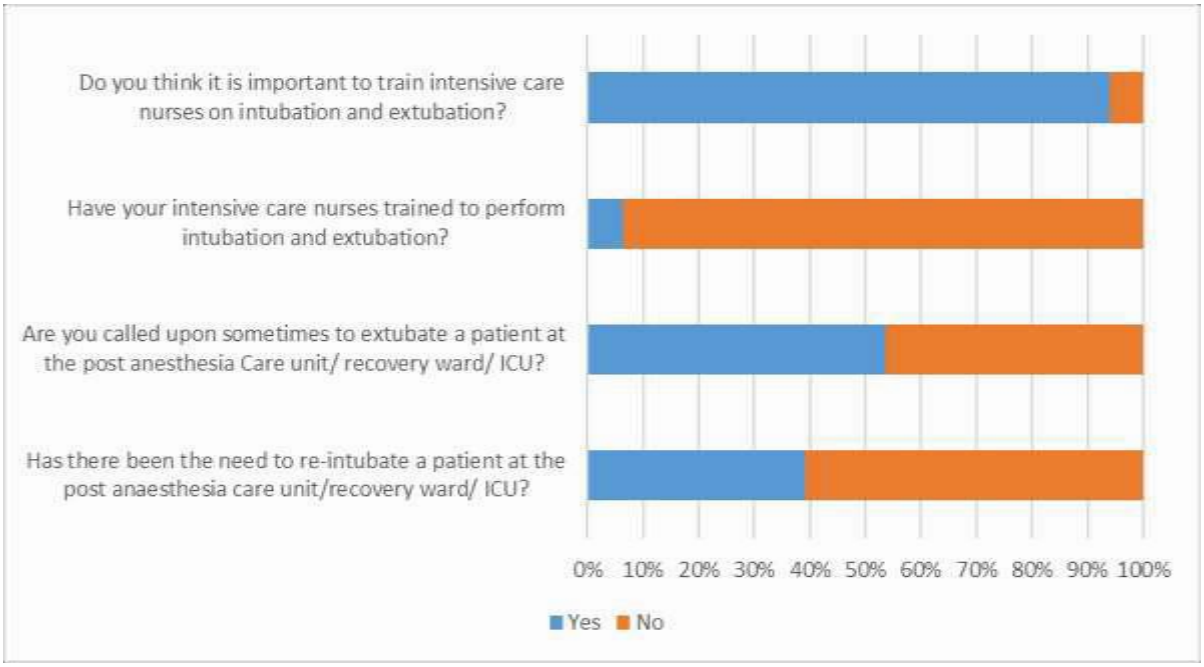


Figure 3.1: Intermediate to intermediate post-anaesthetic care

3.2.4 Post-anaesthetic assessment by type of hospital

There was a significant association between the average percentage of patients visited post-operatively by an anaesthesiologist and the type of hospital ($p<0.001$) (Table 3.3). Overall, most participants (n=128/202, 63.7%) reported none of the patients being visited post-operatively by an anaesthesiologist. All participants from the military hospitals reported an average of up to 50% of patients who were visited by an anaesthesiologist for post-operative visits. Among participants from the teaching hospitals, 6.7% (n=2/31) reported an average of over 50% of patients visited post-operatively by an anaesthesiologist. Among participants from the district hospitals, 12.7% (n=13/101) reported an average of over 50% of patients being visited post-operatively by an anaesthesiologist (Table 3.3).

Overall, less than 50% of the participants significantly reported an available post-anaesthesia team and services in their hospitals (Table 3.3).

There was a significant association between the percentage of patients anaesthetized by participants who had received post-anaesthesia visits and the type of hospital ($p<0.001$).

Overall, most participants reported having anaesthetized over 50% of patients who received a post-anaesthesia visit from the participant in the past year. In addition, there was a significant association between the percentage of patients anaesthetized by participants who have received post-anaesthesia visits from their colleagues in the past year and the type of hospital ($p<0.001$). Overall, the majority of participants reported having anaesthetized less than 50% of patients who received a post- anaesthesia visit from colleagues in the past year.

In terms of frequency of post-anaesthesia visits, the majority of the overall participants (n=64/202, 34.2%) and participants from the district hospitals (n=44/98, 47.8%) reported having daily visits. Half of the participants from the military hospitals reported every 2-3 days, whereas the other half reported less than once in a week. The majority of the participants from the teaching hospitals (n=13/31, 46.4%) and regional hospitals (n=16/37, 45.7%) reported having less than a week of post-anaesthesia visits.

By duration of post-anaesthetic visits, the majority of the overall participants reported spending between 5-10 minutes per patient for every post-anaesthetic visit. This is also similar among participants who reported from teaching, district and regional hospitals (Table 3).

Table 3.3 Post-anaesthetic assessment by type of hospital

Characteristics	**Overall**	**Teaching**	**Military**	**Regional**	**District**	**Other**	***p*-Value**
	N=202	**N=31**	**N=6**	**N=37**	**N=101**	**N=26**	
Average percentage of patients visited post-operatively by an anaesthesiologist							
None	128 (63.7)	9 (30.0)	0 (0)	21 (56.8)	77 (75.5)	21 (80.8)	
<50%	52 (25.9)	18 (60.0)	4 (66.7)	14 (37.8)	11 (10.8)	5 (19.2)	**<0.001**
50%	4 (2.0)	1 (3.3)	2 (33.3)	0 (0.0)	1 (1.0)	0 (0.0)	
>50%	17 (8.4)	2 (6.7)	0 (0.0)	2 (5.4)	13	0 (0.0)	

					(12.7)		
No post-anaesthesia visits, true (%)	97 (48.5)	16 (55.2)	2 (33.3)	19 (51.4)	47 (46.1)	13 (50.0)	0.835
Available post-anaesthesia team and service, yes (%)	30 (15.2)	2 (6.9)	1 (16.7)	5 (13.9)	22 (21.8)	0 (0.0)	**0.046**
Information about the post-anaesthesia visit recorded in the patient's chart							
Time, yes (%)	32 (15.8)	8 (25.8)	2 (33.3)	2 (5.4)	17 (16.7)	3 (11.5)	0.13
Contents, yes (%)	36 (17.8)	7 (22.6)	2 (33.3)	6 (16.2)	18 (17.7)	3 (11.5)	0.693
Duration, yes (%)	22 (10.9)	4 (12.9)	1 (16.7)	1 (2.7)	16 (15.7)	0 (0.0)	0.075
Documentation is not performed, yes (%)	114 (56.4)	14 (45.2)	4 (66.7)	23 (62.2)	56 (54.9)	17 (65.4)	0.51
Percentage of patients anaesthetized by yourself in the last year that have received a post-anaesthesia visit from yourself							
None	24 (12.1)	3 (10.7)	0 (0.0)	8 (21.6)	10 (9.8)	3 (11.5)	**<0.001**
<50%	78 (39.2)	17 (60.7)	5 (83.3)	19 (51.4)	29 (28.4)	8 (30.8)	
50%	15 (7.5)	4 (14.3)	0 (0.0)	3 (8.1)	4 (3.9)	4 (15.4)	
>50%	82 (41.2)	4 (14.3)	1 (16.7)	7 (18.9)	59 (57.8)	11 (42.3)	
Percentage of patients anaesthetized by yourself in the last year that have received a PA visit from colleagues							
None	44 (22.1)	2 (7.1)	0 (0.0)	10 (27.0)	20 (19.6)	12 (46.2)	**<0.001**
<50%	93 (46.7)	22 (78.6)	5 (83.3)	17 (46.0)	40 (39.2)	9 (34.6)	
50%	25	3 (10.7)	1	7 (18.9)	12	2 (7.7)	

	(12.6)		(16.7)		(11.8)		
>50%	37 (18.6)	1 (3.6)	0 (0.0)	3 (8.1)	30 (29.4)	3 (11.5)	
Time PA visits performed							
Within regular working hours (%)	114 (61.0)	20 (74.1)	2 (33.3)	23 (63.9)	57 (60.6)	12 (50.0)	0.265
After regular working hours (%)	73 (39.0)	7 (25.9)	4 (66.7)	13 (36.1)	37 (39.4)	12 (50.0)	
Frequency of PA visit							
Daily	64 (34.2)	4 (14.3)	0 (0.0)	7 (20.0)	44 (47.8)	9 (34.6)	
Every 2-3days	38 (20.3)	5 (17.9)	3 (50.0)	5 (14.3)	18 (19.6)	7 (26.9)	
Every 4-5 days	12 (6.4)	3 (10.7)	0 (0.0)	1 (2.9)	7 (7.6)	1 (3.9)	0.007
Less than once a week	55 (29.4)	13 (46.4)	3 (50.0)	16 (45.7)	16 (17.4)	7 (26.9)	
Only when a PA service patient is operated upon	18 (9.6)	3 (10.7)	0 (0.0)	6 (33.3)	7 (7.6)	2 (7.6)	
Duration of typical PA visit per patient							
< 5 minutes	42 (22.5)	1 (3.7)	2 (33.3)	12 (34.3)	17 (18.3)	10 (38.5)	
5 -10 minutes	115 (61.5)	23 (85.2)	2 (33.3)	22 (62.9)	61 (65.6)	7 (26.9)	**<0.001**
> 10 minutes	30 (16.0)	3 (11.1)	2 (33.3)	1 (2.9)	15 (16.1)	9 (34.6)	
When are PA visits performed?							
On the day of surgery	25 (13.4)	5 (18.5)	1 (16.7)	3 (8.6)	11 (11.8)	5 (19.2)	
On the first post-operative day	148 (79.1)	18 (66.7)	5 (83.3)	27 (77.1)	79 (85.0)	19 (73.1)	0.428
On the second post-operative day	8 (4.3)	2 (7.4)	0 (0.0)	2 (5.7)	3 (3.2)	1 (3.9)	

On the third post-operative day or later	6 (3.2)	2 (7.4)	0 (0.0)	3 (8.6)	0 (0.0)	1 (3.9)	
Contents of your PA visits							
Questions about the general operative condition of the patient, yes (%)	146 (72.3)	18 (58.1)	6 (100.0)	27 (73.0)	79 (77.5)	16 (61.5)	0.081
Specific questions about post-operative problems and complications from the patient, yes (%)	135 (66.8)	18 (58.1)	6 (100.0)	25 (67.6)	67 (65.7)	19 (73.1)	0.333
Short physical examination patient, yes (%)	86 (42.6)	9 (29.0)	4 (66.7)	11 (29.7)	52 (51.0)	10 (38.5)	0.052
Evaluation of the patient's chart, yes (%)	87 (43.1)	11 (35.5)	3 (50.0)	13 (35.1)	48 (47.1)	12 (46.2)	0.634
Anaesthesia-related complications during PA visits							
Regularly	4 (2.2)	0 (0)	1 (16.7)	1 (2.8)	1 (1.1)	1 (3.9)	0.314
Infrequently	79 (42.5)	15 (55.6)	3 (50.0)	13 (36.1)	37 (40.7)	11 (42.3)	
Intermittently	55 (29.6)	7 (25.9)	1 (16.7)	9 (25.0)	28 (30.8)	10 (38.5)	
Never	48 (25.8)	5 (18.5)	1 (16.7)	13 (36.1)	25 (27.5)	4 (15.4)	
Opinion that the regular performance of PA visits may improve the quality of work, yes (%)	194 (99.8)	27 (96.4)	6 (100.0)	37 (100.0)	98 (99.0)	26 (100.0)	0.642
Opinion that the regular performance of post-anaesthesia visits may reduce the incidence of complications, yes (%)	193 (98.0)	29 (100.0)	6 (100.0)	36 (97.3)	96 (97.0)	26 (100.0)	0.764
PA visits level of importance							
Very important	165 (83.3)	24 (82.8)	3 (50.0)	26 (70.3)	91 (91.0)	21 (80.8)	**<0.001**
Important	32 (16.2)	5 (17.2)	2 (33.3)	11 (29.7)	9 (9.0)	5 (19.2)	

Irrelevant	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Completely irrelevant	1 (0.5)	0 (0.0)	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	
Reason not all patients receive PA visits							
Lack of time, yes (%)	164 (81.2)	25 (80.7)	6 (100.0)	34 (91.9)	81 (79.4)	18 (69.2)	0.146
Extensive search for the patient necessary, yes (%)	11 (5.5)	3 (9.7)	1 (16.7)	4 (10.8)	3 (2.9)	0 (0.0)	0.118
Long distances to the patient to be covered, yes	38 (16.1)	5 (16.1)	1 (16.7)	8 (21.6)	19 (18.6)	5 (19.2)	0.986
Patients already dismissed home, yes	47 (23.3)	3 (9.7)	4 (66.7)	9 (24.3)	24 (23.5)	7 (26.9)	**0.045**
Not interested in post-anaesthesia visits	2 (1.0)	1 (3.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.9)	0.268

3.2.4 Availability and functionality of anaesthetic equipment

Figure 3.2 shows the distribution of functioning equipment used in the surgical theatre. Most of the participants reported all equipment being present and functioning. Few participants reported the absence of the selected equipment (Figure 3.2). For difficult airway carts, almost 50% of the participants reported them being absent in the surgical theatre. Less than 15% of the participants reported equipment present but not functioning in the surgical theatre. For the temperature monitor, about 25% of the participants reported it being present but not functioning.

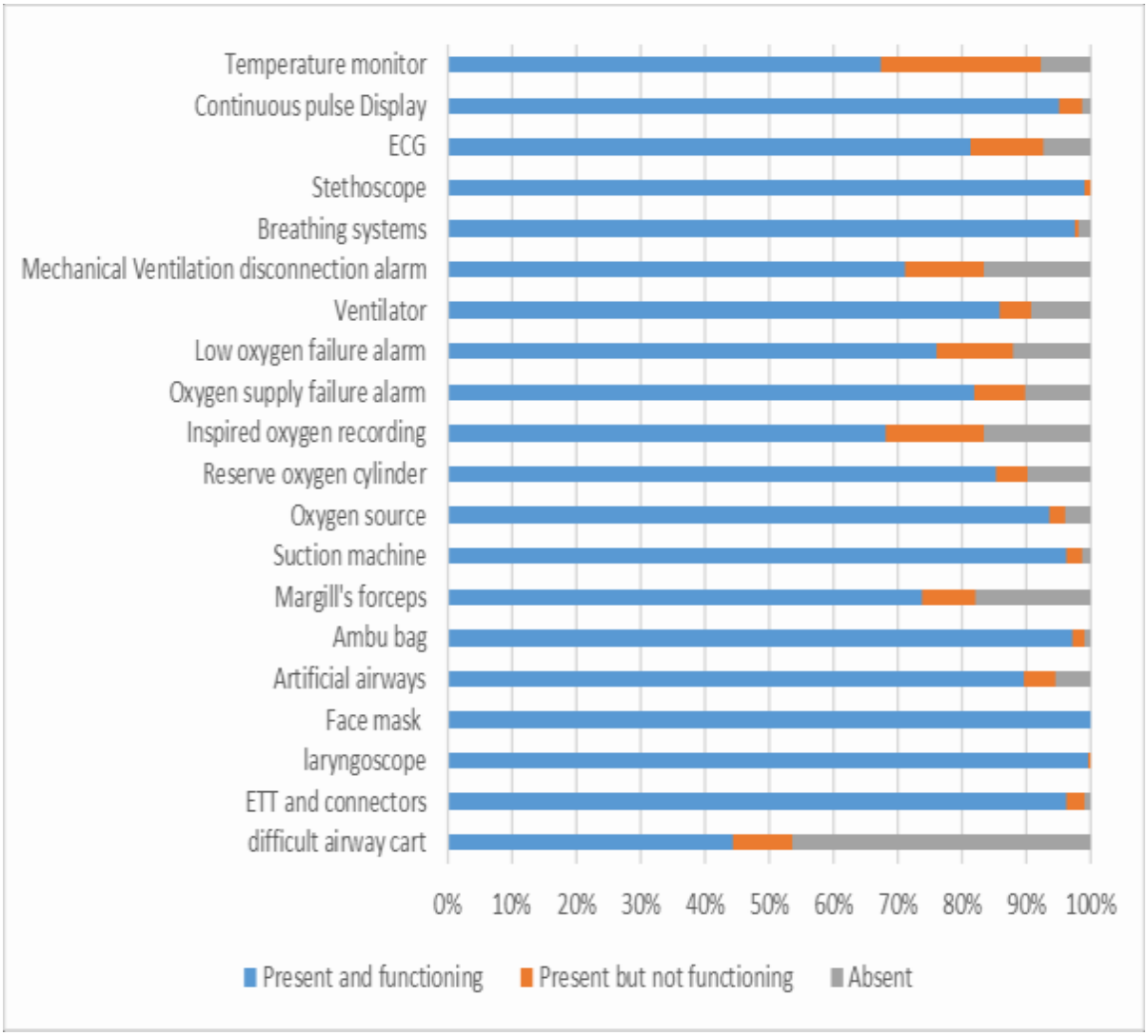


Fig 3.2 Distribution of availability of functioning equipment used in the surgical theatre

Figure 3.3 shows the availability of drugs and equipment during anaesthesia. More than 50% of the participants reported that all the drugs used during anaesthesia were available except for antacids and anti-hypertensives. Over 83% of the participants reported antacid being either never or sometimes present during anaesthesia; and 42% of the participants reported anti-hypertensives were sometimes present during anaesthesia.

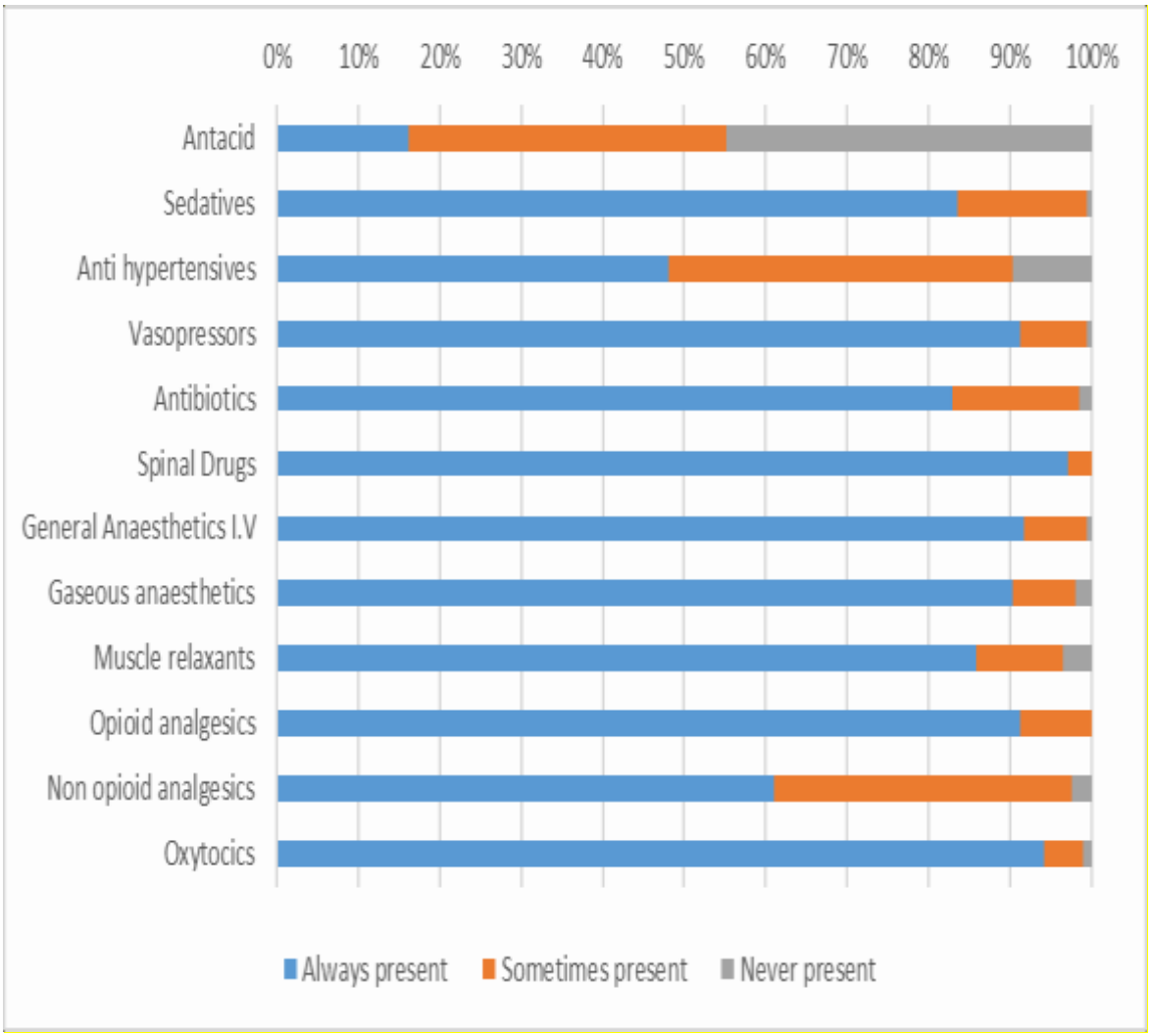


Figure 3.3: Availability of drugs and equipment during anaesthesia

Figure 3.4 shows the distribution of responses from participants on equipment present and functioning for anaesthesia. Over 60% of the participants responded the gadgets for anaesthesia were present and functioning. Less than 10% of the participants responded gadgets for anaesthesia were present and functioning. Of these gadgets, over 90% of the participants reported breathing systems and oxygen source present and functioning for anaesthesia. Less than 68% of the participants reported mechanical ventilation (disconnection alarm) and inspired oxygen recording being present and functioning (Figure 3.4).

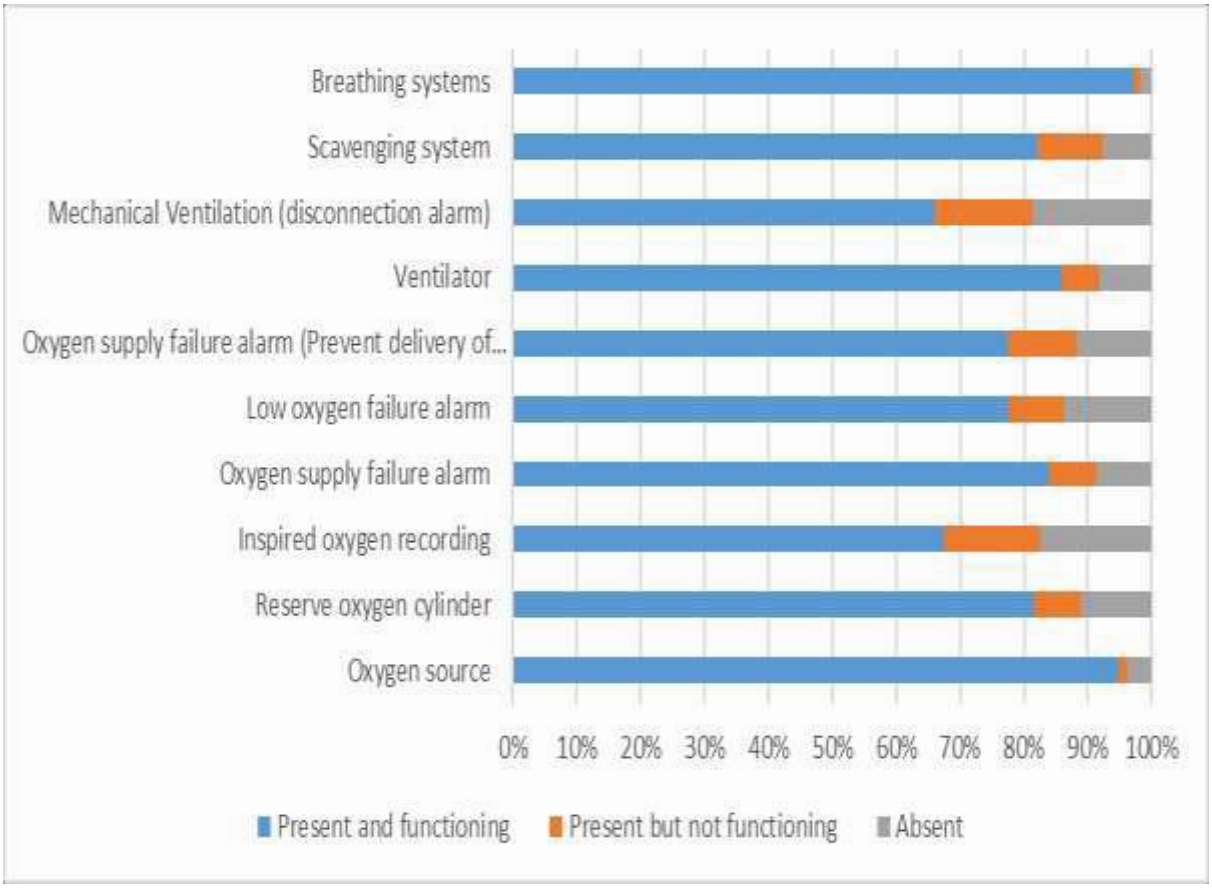


Fig 3.4: Present and functioning gadgets for anaesthesia

3.3 SUMMARY OF FINDINGS FROM THE SURVEY OF PRACTISING ANAESTHETISTS

- A total of 208 health workers participated in the studies. Of these, the majority were males and certified registered anaesthetists (n=200, 97.6%). The average age of the study participants was 36.8 ±5.14 years.
- Most participants (n=128/202, 63.7%) reported none of the patients were visited post-operatively by an anaesthesiologist. All participants from the military hospitals reported an average of up to 50% of patients who were visited by an anaesthetist for post-operative visits.
- About 19.4% of the participants reported having one or more anaesthesiologists in their hospital. Of the participants from the teaching hospitals, 79.1% (n=23/31) reported having an anaesthesiologist. There was no significant association between the number of certified registered anaesthetists and the type of hospital.
- Pre-anaesthetic assessment (p=0.045) and mean number of daily surgeries done (p<0.001) were significantly associated with the type of hospitals. The average daily surgery conducted varied significantly by hospital type, with participants from military hospitals reporting the highest number of surgeries conducted daily.
- There was a significant association between patients taken care of in the recovery room and the type of hospital (p=0.001). Overall, 49.5% of participants reported the availability of basic ICU services for monitoring patients post-operatively. Checking patient's pre-operative informed consent, identification and type of surgery was not significantly associated with the types of hospitals.
- In terms of personnel, almost all the various types of hospitals reported having adequate personnel. The highest proportion of participants reporting having adequate anaesthesia personnel (n=5/6, 83.3) and supervision regarding emergency conditions was from the military. Less than 50% of the participants from the district hospitals reported adequate anaesthetic personnel.
- With the exception of participants from the district and military hospitals, more than 50% of the participants reported having experienced miscommunication during anaesthetic practise.
- The proportion of participants who reported using EKG monitoring (n=5, 83.3%, p-value=0.006) was highest from the military hospital compared to the other types of

hospitals. The proportion of patients who reported a functional pulse oximeter during anaesthesia was also highest in military hospitals.

- Less than 10% of participants reported that their hospital's intensive care nurses had been trained in intubation or extubation.
- Most participants (n=128/202, 63.7%) reported that none of the patients were visited post-operatively by an anaesthesiologist. All participants from the military hospitals reported an average of up to 50% of patients who were visited by an anaesthetist for post-operatively.
- There was a significant association between the percentage of patients anaesthetized by participants who have received post-anaesthesia visits from the participants in the past year and the type of hospital (p=0.001). Overall, less than 50% of the participants significantly reported an available post-anaesthesia team and services in their hospitals.
- There was a significant association between the percentage of patients anaesthetized by participants who have received post-anaesthesia visits from their colleagues and the type of hospital. Overall, the majority of participants reported having anaesthetized less than 50% of patients who had been visited by colleagues in the past year.
- Most participants from teaching, district and regional hospitals reported having less than a week of post-anaesthesia visits. The majority of the overall participants reported spending between 5-10 minutes per patient for every post-anaesthetic visit. Half of the participants from military hospitals reported every 2-3 days, whereas the other half reported less than once a week.
- For difficult airway carts, almost 50% of the participants reported being absent in the surgical theatre and 25% reported equipment being present but not functioning. Few participants reported the absence of the selected equipment.
- More than 50% of participants reported that all drugs used during anaesthesia were available except for antacids and anti-hypertensives. Over 83% of the participants reported antacid being either never or sometimes present during anaesthetic.
- Over 90% of participants reported breathing systems and oxygen source present and functioning for anaesthesia. Less than 68% of the participants reported mechanical ventilation (disconnection alarm) and inspired oxygen recording present or

functioning. Figure 3.4 shows the distribution of responses from participants on equipment present and working for anaesthetic.

- Over 90% of participants reported breathing systems and oxygen source present and functioning for anaesthesia. Less than 68% of the participants reported mechanical ventilation (disconnection alarm) and inspired oxygen recording present or functioning. Figure 3.4 shows the distribution of responses from participants on equipment present and working for anaesthetic.

3.4 CHAPTER SUMMARY

The chapter presented the results of the quantitative survey describing the existing pre and post-anaesthetic practices in Ghana. More than half (n=202) of military and teaching hospital participants reported adequate anaesthesia personnel. There was no statistically significant relationship between the number of certified registered anaesthetists and the hospital type. However, the types of hospitals were significantly associated with pre-anaesthetic assessment and the average number of daily surgeries performed. When compared to other types of hospitals, the military hospital had the highest proportion of participants who reported using EKG monitoring (n=5, 83.3%, p-value=0.006). Less than 10% of participants said their hospital's intensive care nurses were trained in intubation or extubation. The majority of participants from teaching, district, and regional hospitals reported post-anaesthesia visits lasting less than a week. In the case of difficult airway carts, nearly half of the participants reported them being absent from the operating room. The next chapter presents anaesthetic documents analysis.

CHAPTER 4: QUALITATIVE DOCUMENT ANALYSIS

4.1 INTRODUCTION

This section forms part of phase one of the entire study to answer objective one; explore the existing pre and post-anaesthetic assessment practices in Ghana. After a permission letter was sent to purposely select institutions, pre and post-anaesthetic assessment tools were assembled.

The qualitative document analysis was conducted based on the data described using Wach et al.'s (2013) criteria and analysed.

4.2 RESULTS

4.2.1 Overview of documents included

The available documents showed remarkable similarity in content with fewer variations. Twenty significant areas were identified in all the tools that span teaching, specialist, and regional and district hospitals. These are demographic information, identification, details of the surgery, airway assessment, history of anaesthesia, history of surgery, ASA status, state of the spine, lifestyle/social history, medical examination, respiratory system, cardiovascular, neurological, endocrine, gastrointestinal, renal, allergies, investigations, management plan and others.

4.2.2 Themes and sub-themes

Five themes were identified and described. A summary of the themes and sub-themes are presented in Table 4.1.

Table 4.1: Themes and sub-themes

THEMES	SUB-THEMES	SUB-SUB THEMES
PATIENT DATA	Patient background data	Patient Name, Patient Gender, Patient Age, Patient BMI Patient Height Patient Weight
	Patient identifiers	Folder/Patient Number
PATIENT HISTORY	Medical History	Premorbid conditions Last Menstrual Period
	Surgical History	Previous surgeries
	Anaesthetic History	Consent Type of anaesthesia Known complications Family history of anaesthesia
	Social History	Smoking-Number of sticks Alcohol consumption
PATIENT BODY SYSTEMS DATA	Respiratory system	Assessment of each system
	Cardiovascular	
	Neurological	
	Endocrine	
	Digestive system	
	Genitourinary	
	Physical Examination	Crowns and caps Dentures Thyromental Distance Other features are affecting airway

THEMES	SUB-THEMES	SUB-SUB THEMES
MEDICAL EXAMINATION	Physical Assessment	American Society of Anaesthesiology (ASA) classification Airway assessment Mallampati
	Diagnostic investigations	Laboratory investigations Allergies
	Medication History	Old Prescription Herbal preparations
MANAGEMENT PLAN AND PERSONNEL	Anaesthetist plan	Pre-anaesthetic Assessment
	Surgeon's	Diagnosis

4.2.3 Patient Data

4.2.3.1 Patient background data

The ever-changing demographic data of patients imposes a significant burden on the surgical team within the perioperative pathways of the patient. The information briefly gathered provides essential characteristics that enable the anaesthetist and the surgical team to offer excellent and humane collaborative care that enhances the client's satisfaction, self-efficacy, and dignity. The demographic information that the tools sought from the patient and family include the patient's name, age, sex, BMI, height, weight, and medication.

Name of patient

The name of the patient was the first item found on the documents. Basic information confers a unique identifier on the individual book for assessment. All the eight documents analysed had the patient's name, giving 100% inclusion. This demonstrates the importance of identifying the right patient with an identifiable disease condition penciled for a specific surgical intervention and procedure.

Patient Age

All the documents provided space for the age of the patient. Age is one such absolute indicator of risk in anaesthesia. Patients at the extremes of age require careful assessment and planning to provide excellent anaesthetic and surgical intervention—pre-operative assessment benchmark age as the basis for routine and additional investigations for optimum surgical outcome. Dosage adjustment of anaesthetic medications is required for safety in paediatrics and frail elderly patients.

Patient Gender

The parameter, gender, was found in all the documents under review. Gender difference has significant implications on the procedure and investigations to be carried out. For instance, the haemoglobin levels of a female in a childbearing age for a day case is likely to be rechecked after the issue has been postponed due to possible menstrual flow, which could affect their haemoglobin levels.

Patient Body Mass Index (BMI)

The variable body mass index brings to the fore some potential cardinal issues concerning anaesthetic management throughout the perioperative continuum. Obese patients mostly have short fat necks with receding chins, making mask ventilation and direct laryngoscopy more problematic. It is evidenced that a BMI of forty-six (46) is associated with a 13% risk of difficult intubation and airway maintenance.

Airway obstruction is likely to occur in the post-operative period, and careful monitoring and extreme vigilance are required by the attending Nurse in a recovery, high dependency and intensive care setting with adequate support services like oxygen administration and application of continuous positive airway pressure when necessary.

Patient Height

The variable height appeared in six out of eight documents under consideration. This translates into a 75% presence. Height is an essential indicator in determining the body mass index of patients. Considering the height of an individual helps determine the dosage of local anaesthetic agents for intrathecal drug administration. A short stature individual will require a lower dose hyperbaric solution to prevent high spinal blocks.

Patient Weight

Weight is an important variable, and all the documents analysed weighted a component. Apart from the fact that it helps to determine other variables like body mass index, it is a significant determinant in medical and anaesthetic management drug administration.

4.2.3.2 Patient Identifiers

These are various variables that are classified as patient hospital identifies. Patient identifiers in the health system are relevant information of a client or patient that directly categorises the individual as the person whom a specific management strategy or a service is intended. This prevents misidentification and near misses where the proper care is always provided to the right patient. The documents under review identified the date of assessment and folder/patient number.

Folder/ Patient Number

Blunders in patient identification have broader consequences for safety, cost of hospitalisation, and data storage, sharing and interoperability. Five of the documents analysed had either folder or patient numbers, mostly used interchangeably in the Ghanaian setting.

4.2.4 Patient History

The history of surgical patients forms the basis for further and strategic management of patients. The document review came up with medical, surgical, anaesthetic history and social history.

4.2.4.1 Medical History

Comprehensive medical history is elicited from surgical patients to shape the course of anaesthetic and surgical intervention. This includes premorbid conditions and last menstrual periods.

Premorbid Conditions

All the eight documents reviewed had questions that sort to demand presence of existing medical conditions that could militate against smooth surgical intervention and anaesthetic provision. Patient optimisation pre-operatively improves safety and outcomes.

Last Menstrual Period (LMP)

The last menstrual period as a variable was isolated on four out of the eight documents analysed. They represent 50%. This is a significant item for a repeat of specific routine laboratory investigations such as haemoglobin level estimation, especially if the presenting condition is such that the patient could bleed before the scheduled operation date. Again, it helps the attending physician rule out possible pregnancy with varying anaesthetic considerations and risk assessment.

4.2.4.2 Surgical History

Details of Surgery

Details of surgery is another layer of information captured on the documents. All the records sampled had it well inscribed. This consisted of key personnel of the surgical team, an anaesthetist and a surgeon; and a history of past surgeries, type of operation intended to be performed, and surgery date.

History of Surgery

The patient's surgical history is documented to guide the surgeon and the entire surgical team. All the documents had this variable.

Type of Surgery

The type of surgery to be performed is documented in the pre-anaesthetic assessment form. This serves as a guide for the entire surgical team members, including scrub nurses, circulating nurses, anaesthetists and surgeons. All the documents analysed had a record of this parameter.

Date of Surgery

The date of surgery found its way in all the documents analysed. This booked date enables the anaesthetist to devise specific and individualised care tailor-made for the patient based on the patient's physiological, physical, and psychological predisposition. This care is ultimately geared towards successful surgical and anaesthetic intervention that tends to return patients to the family.

4.2.4.3 Anaesthetic History

Patient Anaesthesia History

All the eight documents reviewed had patients' anaesthesia history as one cardinal element to be considered. Anaesthesiologists and anaesthesia practitioners determine the suitability and the safety of anaesthetics and the procedure to use. The need to elicit such vital information from clients compliments the safety of anaesthesia and surgical outcomes. The data drawn out include; physical assessment, consent of anaesthesia, family history of anaesthesia, types of anaesthesia, and history of known complications.

Consent of Anaesthesia

Information is gathered as to whether the client has ever consented to anaesthesia in any form or has ever been given anaesthesia in their lifetime.

Family History of Anaesthesia

A family history of anaesthesia is a vital extraction that guides the practitioner on how a family or group tolerates a particular anaesthetic by genetic predisposition. A careful selection of drugs in this regard offers a huge therapeutic safety index for the patient yet to be anaesthetised.

Type of Anaesthesia

The type of anaesthesia received or received is captured correctly in all the reviewed documents. This offers both the client and the provider an excellent platform to choose the most appropriate procedure, technique and anaesthetics based on the surgical intervention to be carried out. The choice of anaesthesia resides with the client, the anaesthesia provider and the Surgeon. Several options are discussed. These include general, local, regional and a combination of any of the procedures as may be considered appropriate depending on the duration of the planned or intended surgical intervention.

History of Known Complications

The documents reviewed looked at complications ever recorded by the client concerning anaesthesia provision. Any notable eventful episode ever encountered is recorded discussed

extensively, and further investigations could be carried out to avoid future occurrences that could jeopardise the client's health.

Social History

The anaesthesiologist or all anaesthesia providers consider the social history of clients undergoing anaesthesia for any surgical intervention critical. In the review, all the documents had captured this as a lifestyle. All the eight documents reviewed were consistent with this parameter. This includes alcohol consumption and quantity, smoking and the number of sticks per day, other substances and the directive to suspend same for 4-6 weeks before surgery.

4.2.4.4 Physical Assessment

The documents reviewed had physical assessment as a criterion to be looked at. The client is physically examined as to whether a notable anaesthesia procedure would not endanger the patient's life. For example, the opening of the mouth, size of the tongue, how easily the neck can be tilted to the back, the curvature of the spine, and the individual's stature are all considered.

American Society of Anaesthesiology Classification (ASA)

The American Society of Anaesthesiology (ASA) physical status classification system is a widely accepted metric of risk stratification that predicts pre-operative risk and holds the key to anaesthetic and surgical safety. It assigns a class range of 1-6 assessing the patient's comorbidity. The level at which a patient's physical status can be classified as a clinical decision based on multiple objective and subjective factors. The ASA classification is as follows:

ASA 1: A regular healthy patient, described as follows:

- Healthy
- Normal body mass index (BMI)
- Non-smoker
- No or minimal alcohol intake/consumption

ASA 2: A patient with a mild systemic disease without significant functional limitation, as follows:

- Active smoker
- Social alcohol consumption
- Pregnancy
- Obesity - BMI 30-40
- Controlled diabetes mellitus (DM) and hypertension
- Mild pulmonary dysfunction

ASA 3: A patient with the severe systemic disease with significant functional limitation, described as follows

- Dependence on alcohol
- Morbid obesity - BMI of more than 40
- Poorly controlled DM and hypertension
- Active hepatitis
- Implanted pacemaker
- Moderate reduction of ejection fraction
- End-stage renal disease - Undergoing regularly scheduled dialysis
- Chronic obstructive pulmonary disease (COPD)
- Premature infant with a post-conceptual age of fewer than 60 weeks
- Myocardial infarction more than three months ago
- Cerebrovascular accident (CVA) or transient ischemic attack (TIA)
- Coronary artery disease (CAD) with stents.

ASA 4: A patient with the severe systemic disease with the constant threat to life, as follows:

- Myocardial infarction less than three months ago
- Cardiovascular Accident (CVA) or Transient Ischemic Attack (TIA)
- CAD with stents
- Ongoing cardiac ischemia or severe valve dysfunction
- Severe reduction of ejection fraction
- Sepsis
- Disseminated intravascular coagulation (DIC)
- ESRD - Not undergoing regularly scheduled dialysis

ASA 5: A moribund patient is not expected to survive without the operation, as follows:

- Ruptured thoracic or abdominal aneurysm
- Massive trauma
- Intracranial bleeding with mass effect
- Ischemic bowel with significant cardiac pathology
- Multiple organs or system dysfunction

ASA 6: A declared brain-dead patient with plans for organ donation

Note: After the classification, the addition of "E" identifies emergency surgery.

Airway Assessment

Effective airway management is vital to the anaesthetists and the conduct of safe anaesthesia. It has primarily remained problematic in envisaging difficult intubation or direct laryngoscopy due to low specificities in predicting values through physical assessment. That notwithstanding, prior recognition of possible indicators that could predispose a patient to be problematic and possibly failed intubation could assist the anaesthetist to prepare adequately by requesting the assistance of a much-experienced colleague and assembling the requisite advanced airway management gadgets to assist in achieving the desired goal. The documents were laced with various variables under airway assessment. These included; crowns and cap, loose tooth, dentures, mobility of the neck and jaw, Mallampati and others.

Mallampati

This form of classification determines the extent to which the base of the tongue or the oropharynx can be visualised. It compares tongue size to the laryngeal size or how the tongue crowds the oropharyngeal area.

Medical Examination

A medical examination was found in each of the eight documents reviewed. This consisted of physical examination, laboratory investigation, medical history, psychological status, and general systems conditions.

4.2.4.5 Physical assessment

The anaesthesiologist examines the client from head to toe to identify any possible abnormality, including curvatures of the spine, varicose veins, state of nutrition (body size (obesity), malnutrition, undernutrition, and scars. The skin colour is also assessed for cyanosis, pallor, jaundice and pigmentation.

Crowns and cap

These are used to cover the teeth of clients. Great care is required in ensuring that the mouth is inspected to prevent accidental dislodge to choke the patient to death during induction of anaesthesia or before recovery from general anaesthesia.

Dentures

All the documents made provision for inquiry about the use of dentures by patients. Dentures if not removed can dislodge and chock a patient to death. A careful assessment is required to observe the usage. If present, they must be removed, labelled and kept safely under lock before administering any form of anaesthesia to enhance patient safety.

Other Features Affecting Airway

All eight documents are laced with other factors that affect the airway.

Neck mobility is one such primary indicator of predicting difficult airway amongst patients upon assessment. The neck movement is classified as good, limited and very limited. A extremely short or long neck, which can affect the thyromental distance, is likewise captured in the documents.

4.2.4.6Diagnostic investigations

All the reviewed documents had various investigations to be carried out before the anaesthetic and the surgical intervention. Some are considered routine and others as specific depending on the complexities of the procedure. The surgical team mainly requests the needed investigations. Where the anaesthesia provider assumes the experiments are

inexhaustive, specific ones could be added in the patient's interest. The underneath examinations were found in the documents:

Laboratory and radiological investigation

The anaesthesiologist inspects various laboratory investigations requested by the surgeon. Further requests could be made if the anaesthesia provider finds any inadequacy in the requested investigations. Results could be routine, or specific laboratory investigations could be ordered depending on the type of surgery. All the reviewed document has this parameter well documented.

Full blood count, including assessment of haemoglobin (Hb) level, white blood cell (WBC), and platelet count mean corpuscle volume (MCV)
creatinine, blood urea electrolytes (BUE), protein, grouping and crossmatching, and sickling is checked. Depending on the condition, other specific tests may also be ordered.

4.2.4.7 Medication history

Medication or drug history is essential information solicited from patients or significant others as the patient's condition may be determined. It offers the health provider a genuine insight into the potential risk of drug interaction establishing criteria for appropriateness in the patient's anaesthetic plan of care that leads to patient safety and optimum anaesthetic intervention. Various drugs of anaesthetic interest were found in the document. Seven out of the eight documents analysed had medication history, meaning practitioners attach importance to this variable. Drugs listed include antihypertensives, triglycerides, digitalis, diuretics, anticoagulants, antidepressants, oral hypoglycaemics, barbiturates and insulin.

Herbal Preparations

Most patients take to herbal medication, either prescribed or non-prescribed. The anaesthetist recognises how herbal medicament can interact with anaesthetics, so a conscious effort is made to elicit helpful information to inform the intraoperative plan.

Patient Allergies

All the documents reviewed made mention of allergy. Knowing all allergies, a client has is helpful in anaesthesia practice. This could range from medication to logistics like latex products and food.

4.2.5 Patient body Systems data

The anaesthetist ensures that vital organs that could be affected by the anaesthetics are adequately assessed to ensure their viability to withstand the rigorous anaesthesia process. The undermentioned systems were well captured in the reviewed document. The ability of anaesthesia practitioners to adequately assess and classify clients to review and isolate predictive pre-operative risk depends on a good appreciation of organ system assessment. The underlisted systems were found in all the documents; respiratory, cardiovascular, neurological, endocrine, gastrointestinal, and urinary/renal

4.2.5.1 Respiratory system

Various parameters under the domain of the respiratory system were reviewed. Clients are assessed for signs of cough, whether dry, unproductive, or productive and ability to expel secretions. Upper respiratory tract infections include bronchitis, pneumonia, tuberculosis, catarrh, chronic obstructive, asthma, dyspnoea on exertion, orthopnoea, and shortness of breath. Most of these are isolated with chest x-ray physical assessment tools like listening to breath sounds through auscultation, percussion, and physical chest movements.

4.2.5.2 Cardiovascular System

Assessment of the cardiovascular system finds space in the current reviewed documents. A healthy cardiovascular system is needed for a patient to withstand the stress of anaesthesia and any surgical intervention, and therefore practical assessment is required. Parameters found in the reviewed documents include; murmurs, palpitation, heartburns, hypertension, heart sounds, hiccups, leg swelling, dizziness, angina pectoralis, easy fatigability, previous or recent myocardial infarction, and chest pain. Electrocardiographs (ECG) and SPO2 assessments were found to be routine. Clients above 50 years are expected to have ECG as a systematic investigation. The presenting sign and the clinical assessment and judgement would determine an additional request for another test to be carried out.

Haematological assessment is also performed. Blood transfusion history is determined. Any belief system concerning acceptance or refusal of transfusion is noted.

The sickling status of the patient is determined. If positive, an electrophoresis confirmation test is performed to elicit the individual's trait. Assessment is also performed to determine if the patient has any bleeding dyscrasias.

4.2.5.3 Neurological System

Neurological assessment was present in all the documents reviewed. They were eliciting such information from clients positions the anaesthesia practitioner to predict possible risks to the patient perioperatively and strategies to deal with them to improve optimum surgical outcomes.

The parameters identified include epilepsy, convulsion, muscle weakness, paralysis, stroke, fainting and level of consciousness.

4.2.5.4 Endocrines System

Under the endocrine system, all the documents looked at thyroid diseases and diabetes mellitus. Deranged parameters of the above condition could pose a significant danger to the patient and the intended anaesthetic and surgical intervention.

4.2.5.5 Gastrointestinal System

Proper functioning of the gastrointestinal system offers a valuable guide to the anaesthesia practitioner and the patient's overall safety during the perioperative trajectory. Most of the anaesthetics are metabolised by the liver; therefore, any condition that affects the normal functioning of the liver must be of concern to the anaesthetist. The documents reviewed showed that patients were assessed for hepatitis, ability to belch, dentures, presence of jaundice, cirrhosis of the liver, nausea and vomiting, bowel obstruction, oesophageal reflux disease, diarrhoea, constipation, and dehydration.

4.2.5.6 Renal/Urinary system

Two out of the eight documents mentioned the system urinary/ renal system.

The variables isolated included urinary tract infection and renal failure. Any renal system disease should be identified and treated for planned surgeries. A healthy kidney is functional in excreting anaesthetics' metabolites; hence, the need to assess its function pre-operatively.

4.2.6 Management plan and personnel

All the reviewed documents had a section for a management plan to document specific identified problems, other medical comorbidities, abnormal findings, and a feedback section to elicit further patient concerns. The pre-anaesthetic and intra-operative management strategies are detailed. The surgeon's diagnosis is similarly captured, followed by the necessary reinforcement of explanation.

4.2.6.1 Anaesthetist's plan

The anaesthetist is responsible for assessing the patient and guiding the patient to choose the appropriate anaesthetic procedure depending on the surgical intervention.

4.2.6.2 Ana esthetic assessment

This includes all forms of assessment conducted before, during and after surgery.

4.2.6.3 Surgeon's plan

The surgeon is the personnel responsible for diagnosing and booking the patient for the surgical intervention and the performer of the surgical intervention to remove the intended insult. One hundred per cent of the sampled documents had it.

Diagnosis

Diagnosis is another variable of interest. All the documents analysed, had it. It communicates the current health status to the service provider and the patient upon which the surgical decision is premised.

4.3 SUMMARY OF FINDINGS FROM DOCUMENT ANALYSIS

The section unravels the content inherent in the assessment process that assists the anaesthesia provider in joint decision making with the patient booked for surgical intervention.

- The document revealed a copious amount of patient biographical information that assists the anaesthesia provider and the surgical team in accurately identifying patients to prevent misidentification that often leads to surgical and anaesthetic errors.
- There was a projection of detailed history, including medical, surgical, anaesthetic and colonial past and present information that assisted the caregivers in identifying risks, previous care rendered, and how it impacted the patient and revision of care strategies. It also helps to prescribe behaviour modification measures to optimise care.
- The document allows the assessment of vital systems of the body. It holds the propensity of helping the healthcare provider to identify any comorbidities that are likely to impact anaesthesia provision and surgical decision adversely. The needed interventions are put in place.
- Medical examinations are performed on the patients, which include a physical examination of possible signs of complex intubation laboratory investigations for any deranged parameters. Any such deviation is corrected before surgery to promote post-operative optimisation.
- The analysis reviewed that patient are quizzed about medications and herbal preparations being taken—this helps to avoid drug incompatibility and safe anaesthetic choices.
- The anaesthesia provider and the surgeon instituted a plan of care based on the outcome of the pre-anaesthetic assessment and the diagnosis, respectively.

CHAPTER 5: EXPLORATORY PHASE - QUALITATIVE

5.1 INTRODUCTION

This chapter presents the findings of data generated from the voices of participants who met the inclusion criteria of this study. It was part of phase one of the study and sought to address objective two of the study to identify the challenges of anaesthetic provision and the use of pre and post-anaesthetic assessment guidelines in Ghana

Four major themes emerged from their narrations as generated through the support of the MAXQDA Software 2020.

5.2 Description of Demographics of Participants

Fifteen anaesthesia practitioners (head of directorates, department, and units) were purposively recruited in this phase of the study and anonymized in Table 5.1. Two representing 13% of the total participants, a specialist, and a senior specialist were anaesthesiologist. The remaining 87% were non-physicians (Certified Registered Anaesthetists). Three of the CRAs, representing 20% of participants, had advanced diplomas in Nurse Anaesthesia. Seven, representing 46.7% of the participants had a Bachelor of Anaesthesia. The remaining three of the CRAs have masters in Occupational Health, Physiology, and Advanced Nursing Practice. In terms of gender, two representing 13% were females, and the remaining 87% were males. All the participants were Christians, 13 (representing 80%) are married, one is divorced, and the other single. The ages range from 35 to 58.

Table 5.1: **Participants interviewed**

PARTICIPANTS	AGE	SEX	RELIGION	MARITAL STATUS	LEVEL OF EDUCATION
PIA1	45	F	Christian	Married	Masters (Advanced Nursing Practice in Anaesthesia)
PIA2	41	M	Christian	Married	BSc (Anaesthesia)
PIA3	45	M	Christian	Married	BSc (Anaesthesia)
PIA4	41	M	Christian	Married	BSc (Anaesthesia)
PIA5	35	M	Christian	Single	BSc (Anaesthesia) MPhil (Physio)
PIA6	43	M	Christian	Married	BSc (Anaesthesia)
PIA7	50	M	Christian	Married	Specialist
PIA8	38	M	Christian	Married	BSc (Anaesthesia)
PIA9	35	M	Christian	Married	BSc (Anaesthesia)
PIA10	44	M	Christian	Married	BSc (Aneesh) Masters in Occupational Health
PIA11	57	M	Christian	Married	Senior Specialist
PIA12	47	M	Christian	Married	Advance Diploma (Anaesthesia)
PIA13	44	F	Christian	Divorced	Advance Diploma (Anaesthesia)
PIA14	44	M	Christian	Married	Advance Diploma (Anaesthesia)
PIA15	38	M	Christian	Married	BSc (Anaesthesia)

5.3 Themes and Sub-Themes

The analysis of the data produced four main categories to illuminate the contextual practices of pre-anaesthetic assessment. These were pre-anaesthetic assessment, safety and practice, post-anaesthetic assessment, and challenges of anaesthesia provision (Table 5.2). Figures 5.1 and 5.2 present word clouds of coded segments in the MAX QDA.

Table 5.2: Themes and sub-themes

Themes	Sub-themes
5.3.1 Pre-anaesthetic Assessment	5.3.1.1 Knowledge and adherence
	5.3.1.2 Assessment setting
	5.3.1.3 Choice of anaesthesia
	5.3.1.4 Merits of Pre-anaesthetic Assessment
	5.3.1.5 Pointers of Pre-anaesthetic Assessment
	5.3.1.6 Re-assessment in Pre-anaesthetic Assessment
	5.3.1.7 Barriers to effective Pre-anaesthetic Assessment
5.3.2 Practice and safety	5.3.2.1 Cadre of Practitioners
	5.3.2.2 Regulation of anaesthesia practice
5.3.3 post-anaesthetic assessment	5.3.3.1 Barriers of Post-anaesthetic assessment
	5.3.3.2 Merits of Post-anaesthetic Assessment



Figure 5.1: Word clouds of coded segments



Figure 5.2: Word clouds of code system

5.3.1 Pre-anaesthetic Assessment

This category describes the initial assessment of surgical clients who are scheduled for operation. Seven sub-categories emerged: knowledge and adherence, Knowledge and adherence, assessment setting, choice of anaesthesia, merits of pre-anaesthetic assessment, pointers of pre-anaesthetic assessment, re-assessment in pre-anaesthetic assessment and barriers to effective pre-anaesthetic assessment.

5.3.1.1 Knowledge and adherence

The participants described Pre-anaesthetic Assessment (PAS) as an assessment *process* conducted on a surgical client regardless of the type of surgery. PAS is *institutionally based* as they are no protocols to guide practitioners in Ghana. During PAS, the anaesthetist assessed the client for *certain allergies and comorbidities* including *hypertension, diabetes, cardiac problems,* and *respiratory problems.*

"PIA8: Pre-anaesthetic assessment is a process that a patient goes through once he has been declared to have surgery… it is institutionally based";

"PIA5: …we normally are looking out for certain comorbidities that the patient may present with… we evaluate whether you have any pre-existing condition like hypertension, diabetes or any cardiac problems";

"PIA9: …is the assessment or review done on the patient coming in for surgery to ascertain whether or not there are any associated risks or comorbidities…possible allergies... various systems like respiratory for instance we look out for infections, coughs, or difficulty in breathing"

Practitioners performed a head-to-toe assessment during PAS to obtain client history including psychological assessment and past surgical operation experience. PAS assists the surgical team to ascertain patient fitness for the scheduled surgery, the type of anaesthesia to administer, and for the client to be informed about the surgery to sign a consent form.

"PIA2: …you assess your patient to ascertain whether he is fit for anaesthesia or not, what type of anaesthesia to administer… with regards to the type of surgery to be performed."

PI12: You need to assess the patient from head to toe, take the patient's history which includes performing a psychological assessment.

PIA1: …for all electives the protocol is they would all have to go through pre-anaesthetic clinic…, they sign a consent before they go into admission."

5.3.1.2 Assessment setting

The participants narrated that they conduct PAS at a designated consulting room at the OPD, anaesthetic clinic, emergency ward, office, and sometimes the theatre. At the clinic, ambulatory patients are assessed from Monday to Friday. Often times, emergency cases are assessed either at the emergency unit, ward or sometimes the corridors of the operating theatre depending on the urgency and the exigencies of the time. Anaesthesiologist may not have the luxury of time to thoroughly assess the patient.

"PIA1: We have a designated consulting room at the OPD where most of the assessment is done";

"PIA5: Yes, we have a designated clinic where we do our assessments from Monday to Friday. Most of the assessments are done in the theatre";
"PIA7: ...we have a clinic where ambulatory patients go for assessment".

However, in most district facilities in Ghana, there are no places for assessment. So, even though the practitioners are willing to perform PAS, the lack of a place is a challenge and demotivating in carrying out such vital practice that holds the propensity of optimising the patient and improving the post-operative surgical and anaesthetic outcome.

> *"PIA2: Currently in the districts, there is no place for assessment. So, if a patient comes for assessment, you will have to now look for a place to assess him/her";*
>
> *"PIA14: frankly, at my unit, we have challenges over a place, we may use an office where our patient will come to the assessment."*

5.3.1.3 Choice of anaesthesia

Participants used PAS to determine the choice of anaesthesia by assessing the previous history of exposure to anaesthesia, certain medications, and underlying conditions including asthmatic, diabetic, hypertensive, ulcer, and epilepsy. During PAS particular attention is given to airway examination as it indicates the drugs to be used for the surgery. Additionally, aged clients are assessed and graded according to their level of strength to withstand anaesthesia. Previous exposure and complications experienced also determine the shift in recommendations. If a previously chosen procedure passed uneventfully, then the anaesthetist can be emboldened to repeat it if the surgical intervention would permit. When the choice of anaesthesia is made, it is then discussed with the patient before the surgery. These are illuminated by the participants in the following extracts:

> *"PIA5: ... previous exposure to anaesthesia and certain medications that the patient is taking might interfere with the anaesthetics because of the drug-drug interactions… to select the most appropriate form of anaesthesia for the patient";*
>
> *"PIA2: The past and present anaesthetic history elicited during the Pre-anaesthetic Assessment will help you to choose the type of anaesthesia and the type of drug…"; "PIA5: the choice of anaesthesia is discussed with the patient. Once you have assessed the patient and you think that you have a certain anaesthetic choice that would be best for the procedure, you discuss that choice with the patient…";*
>
> *"PIA9: Airway examination is done for instance to make the necessary preparations towards the surgery. All these things give us an indication of the drugs to use and the management plans";*

"PIA13: We also look out for underlying conditions in the patient whether the patient is asthmatic, diabetic, hypertensive, ulcer, epileptic all these conditions may or may not contra-indicate administration of anaesthesia. Also, elderly people who are approaching 60 or above 60 years are graded according to their level of strength and their level to withstand anaesthesia …"

5.3.1.4 Merits of Pre-anaesthetic Assessment

One significant merit of PAS is for validation of client data to remove discrepancies so that the data reflect completeness, is factual, and is accurate. This was done via obtaining laboratory tests and comparing with subjective and objective data collected from the patients. The assessment is a planning step for the preparation for anaesthesia and intra- and post-operative management to help improve anaesthesia practice and to avoid accidental anaesthesia mishaps. It further opens the opportunity to explore the comorbidities of the patient and to make a sound judgment. Again, it allows the patient to decide on the surgery. All these permit the surgical team to know their *patients* and *prevent unnecessary delay in theatre.* Because the practitioners can do the necessary *laboratory* and imaging investigations that help *modify the anaesthetic inductions. Overall, PASS provides a documented database for continuity of care as well as evidence for the anaesthetists in the event of any issue* related to the surgery.

"PIA3: validation of client data, because, sometimes in our consulting room we have issues with the laboratory tests…"; "PIA1: … Pre-anaesthetic Assessment is your preparation for anaesthesia … it reduces the high risk for intra-operative, and post-operative management";

"PIA10: ...for us as practitioners' Pre-anaesthetic Assessment helps in our judgment in the choice of technique, drugs and even post-operative management of that patient";

"PIA2: pre-assessment, it allows the patient to decide whether he/she would continue to do the surgery or not… Pre-anaesthetic Assessment will help to improve anaesthesia practice. The reason is that your assessment may help identify and avoid some problems that could have otherwise put you into trouble";

"PIA3: …it is very critical that before a patient is put to bed to sleep all these things must be ascertained to avoid accidental anaesthesia mishaps";

"PIA5: ... you can know your patients; the kind of comorbidities they are presenting with… this practice sorts of prevents unnecessary delay in theatre and possible cancellation";

"PIA7: So, we can sometimes request for more information than what the surgeon provides because once we get the echo findings, we could also modify our anaesthetic inductions as to whether it would be spinal or it would be a GA";

"PIA13: ... assessment in anaesthesia practice helps to get a database or an information for the anaesthesia team for continuity of care of the patient and serves as an evidence for the anaesthetists in case there is any issue and Pre-anaesthetic Assessment documentation enhances practice."

5.3.1.5 Pointers of Pre-anaesthetic Assessment

This describes the exact focus of the anaesthetist during the assessment**.** Mostly, the history of the client's smoking, consumption of alcohol, and use of some medications like warfarin, aspirin, clexane, and other anticoagulants must be stopped; after which the functions of some organs like cardiovascular, respiratory, and kidney are assessed to evaluate any underlying conditions. In some cases, it is the doctor's instruction to review the client for any contraindications and advise accordingly as the past medical history, social history, airway assessment, and current medical state may compel such referrals for PAS to be conducted. Areas assessed include airway for air entry, cardiac activity, cardiac sound, S1, S2, check for murmurs, stomach for scarring, the patient's gait, mobilization, and pain with mobilization.

"PIA1: History is key. You would also have to assess the organs; cardiovascular, respiratory, and kidney function, to have an idea of any underlying condition and to know the drugs that the patient can metabolize or not. Social history; alcohol intake, smoking. Assess the state of the chest, make chest x-rays, airway assessment, some medications that need to be discontinued before surgery is performed. Medications such as warfarin, aspirin, clexane, and other anticoagulants must be stopped because they make an impact during surgery";

"PIA3: Patients come to see us based on doctor's instructions. When the labs are ready and patients come to us we take their history, find out any absolute contraindications, anything that might not need to be postponed, then we ask them to go back and see the doctor";

"PIA4: The past medical history, social history, airway assessment, and current medical state";

"PIA10: We perform airway assessment, Mallampati, neck movements, listen to the chest, air entry, cardiac activity, cardiac sound, S1, S2, check for murmurs, we look at the stomach, check for scarring, the patient's gait, mobilization, pain with mobilization, and that even influences the technique to adapt for the procedure."

5.3.1.6 Re-assessment in Pre-anaesthetic Assessment

Participants narrated that reassessment is conducted on the majority of the patients. Some possible reasons for the re-assessments include postponement of the surgery, low haemoglobin, a special case like diabetes, asthma, hypertension, or any other underlying cause. It also depends on how long the surgery would be postponed. Usually, beyond one month of postponement, the reassessment is performed. Other factors to consider for reassessments before surgery include the type of surgery, history of smoking, and use of some drugs like anticoagulants.

"PIA1: We make reassessments on a majority of the patients depending on the time frame or the gap. So far as the surgery is postponed and the next date is scheduled, you would have to go back and review the patient. A female patient whose haemoglobin is perhaps 10 upon assessment, and has her surgery postponed and is later going back for the surgery, I would have to reassess to know the current haemoglobin levels";

"PIA12: ... a case where the patient is losing blood, he might have lost so much blood within a week and so you do not assume that just because you had already assessed them that you would not have to conduct a re-assessment";

"PIA2: reassessment is done in special cases like DM, hypertension, or any other underlying cause";

"PIA3: It depends on how long the surgery would be postponed, "; "PIA8: Per our institutional policy, if the postponement of the surgery has gone beyond a month the patient would have to go through the pre-anaesthetic assessment again";

"PIA5: ...If it is more than three months then probably we would have to go through the whole process again";

"PIA9: The interval or duration depends on certain factors. For instance, if a patient is assessed through the anaesthesia clinic and is discovered to be a smoker, he would be instructed to stop smoking for a period of 4 to 6 weeks. So, for such a patient he would have to be reassessed";

"PIA4: ...patients with comorbidities, reassessment is very vital. Conditions like diabetic patients and asthmatic attacks can even occur

within those periods where postponement has taken place. So, you would really need to do a reassessment in order to provide safe anaesthesia to them";

"PIA10: reassessment depends on the type of surgery, the patient's case, and the time of reporting. Sometimes cases are rescheduled, and surgeries are done about a week or two after assessment";

"PIA7: I think we have graded a lot of our lab investigations based on international standards, and also looking at the cost constituents. Sometimes, we request for another one based upon previous findings."

5.3.1.7 Barriers to Effective Pre-anaesthetic Assessment

Patients' social history, alcohol intake, smoking, and some medications are considered by the anaesthetists as major barriers to the induction of patients for surgery. Additionally, the limited number of anaesthetists in Ghana poses a challenge to the effective anaesthesia practice. Moreover, there are professional role conflicts between a nurse anaesthetist and physician anaesthetist, which constitute a barrier to the practice of anaesthesia in Ghana. The lack of equipment including SPO2 monitors, ventilators, and anaesthesia machines as well as drugs in some facilities make it difficult for safe anaesthesia practice. Some patients lack money to do the laboratory investigations promptly, which hinders fast and efficient anaesthesia practice. Practitioners want to be well motivated to help augment their strengths to give their best since there are only a few Certified Registered Anaesthetists (CRA) in the country.

"PIA1: Social history; alcohol intake, smoking are some barriers";

"PIA15: the limited number of anaesthetists in Ghana poses a considerable challenge to effective anaesthesia practice and that is a barrier to safe anaesthesia practice. There is a professional role conflict; sometimes some of the surgeons think they know anaesthesia, or they have a little background about anaesthesia so what you are talking about should not be a problem";

"PIA13: patients are safe in the hands of Nurse Anaesthetists as well as physician anaesthetists, but we want those little rivalries and superiority to be eliminated. It will also make the nurses practice comfortably without being looked upon by doctors or feel inferior";

"PIA12: lack of motivation is also another factor that inhibits pre-anaesthetic assessment. Another challenge is patients not having money to

do the required laboratory investigations that would enhance the process and safety";

"PIA11: lack of equipment is a major factor and why most the Physician Anaesthetist is mainly in the cities. The Certified Registered Anaesthetist struggle to work due to these issues, as some lack even the SPO2 monitor";

"PIA9: we are much challenged logistically too especially in the districts where some facilities do not have ventilators and anaesthesia machines are faulty. Finding drugs is a challenge too sometimes."

5.3.2 Practice and safety

This main category illuminates what the practitioners consider the safety of patients in the hands of professionals who conduct induction for surgeries. Two sub-categories emerged from the data: a cadre of practitioners and regulation of anaesthesia practice.

5.3.2.1 Cadre of Practitioners

Doctor Anaesthetists and Certified Registered Anaesthetists (CRAs) are the main cadres of anaesthesia practitioners in Ghana. About 800 of these practitioners are CRAs who are mostly stationed at the district and regionally facilities as well as private health facilities across the country. The CRAs called for more recognition and to remove the friction between them and the Doctor Anaesthetist to help promote anaesthesia practice in Ghana.

"PIA1: Currently in Ghana, we have few Doctor Anaesthetists, and 98% are all Certified Registered Anaesthetists";

"PIA2: I think nurses have shown for a long time now that we can practice anaesthesia. So, I think that we are capable of giving anaesthesia so it should not only be doctors";

"PIA4: And the world over, there is this friction that exists between Physician Anaesthetists and Certified Registered a, and that one alone does not help in our case";

"PIA5: In all I think the non-physician Anaesthetists are close to about 700 practicing in the government institutions. But we have about 100 working in the private facilities. So, in all, there are about 800 Nurse Anaesthetists currently practicing in Ghana."

5.3.2.2 Regulation of anaesthesia practice

The Ghana Medical and Dental Council (MDC) currently regulates the practice of CRAs and Doctor Anaesthetists. A member of the CRAs is represented on the MDC governing board. This provides the opportunity for the voice of the CRAs to be heard relative to national policy-making, regulations, and maintaining standards in the training of anaesthesia in Ghana. However, the CRAs called for the establishment of their own regulatory body to remove the friction and enhance independence in their practice. A regulatory body for CRAs will help defend practitioners as well as define and monitor their scope of profession and carrier progression to deal with the friction between them and the other cadre of practitioners. Participants acknowledged the importance of such regulatory bodies in maintaining the standards and safety of anaesthesia practice in Ghana.

> *"PIA1: CRA's we are being regulated currently by the Medical and Dental Council. We currently have a member of the CRA on the Medical and Dental Council's governing board so we believe that issues relating to CRA's will also be considered in terms of policymaking, regulations, and maintaining standards in the training institutions. It is always good to have your own regulating your own because you understand them better. You can put in structures, policies and things that would affect your people";*
>
> *"PIA2: It is very useful because if you do not have a regulatory body, everybody would try to do whatever he/she wants. A regulatory body would make sure to define what you are supposed to do. If we do not have a regulatory body, someone could just declare himself a surgeon while the person is an anaesthetist";*
>
> *"PIA13: I believe if the nurse anaesthetics have their own regulatory body it would have been better …";*
>
> *"PIA15: the regulatory body is to defend the practitioner in times of difficulties where we have complex cases that are beyond safety, but the risk was taken in other to rescue a patient and it doesn't go well sometimes the relative of the clients puts unnecessary pressure on the practitioner";*
>
> *"PIA14: every profession must have a body that will define your scope of work and when you go wrong that body should be responsible to bring you back to track. The need for a regulatory body is very important so that we will work within our scope of the profession";*
>
> *"PIA6: it would help in upgrading Nurse Anaesthetists because after practice there is a need after knowledge add-up, to progress."*

5.3.3 Post-anaesthetic assessment

This category describes the assessment conducted on patients who have gone through the surgery. Two sub-themes emerged from the data: barriers of post-anaesthetic assessment and merits of post-anaesthetic assessment that is performed for all patients.

5.3.3.1 Barriers of Post-anaesthetic assessment

This is one aspect of anaesthesia practice that is not done partly because of the low number of professional anaesthetists. Then low numbers of professionals coupled with the high number of cases at the facilities usually focused on preparing clients to go through the surgery successfully while very little attention is paid to the post-assessment.

> *"PIA1: It is partly because several Anaesthetists present. Because if I finish with my cases very late, I am exhausted. I would have to rush home to take care of other matters";*
>
> *"PIA3: sometimes as soon as you finish you have another case to attend to so there is no time to go back and assess";*
>
> *"PIA6: The challenges come from a lot of factors. One of them is the limited number of anaesthetists within the system."*

5.3.3.2 Merits of Post-anaesthetic Assessment

One major problem of post-operative clients whilst they are recovering from anaesthesia is severe pain. This can be identified and managed with a good and timely post-anaesthetic assessment. It further provides the anaesthetist an opportunity to evaluate the intra-operative care and know how the patient is responding to the medications served. This promotes the building of experience among the practitioners. Again, when the post-assessment is conducted the team will be able to elicit complications associated with the surgery and manage them immediately. In some cases, the recovery of the patient from anaesthesia is very important before the patient is released to the main surgical ward. Moreover, such assessment forms part of the anaesthetic database that can be useful in informing clinical practice, research, and teaching. For example, previous use of certain drugs for induction will help build practitioners' experiences on its subsequent usage among a different category of clients.

"PIA1: ...you would need to go back to assess your pain management, how your patient responded to any post-operative nausea and vomiting, any reactions to any particular medications that were given, what effects the drugs introduced to the patient produced, and to know if the renal output is adequate...it even gives you better information as a practitioner to learn from past experiences to produce a better outcome";

"PIA15: the anaesthetist will be able to elicit post-operative complications early. In terms of anaesthesia, our aim is more of your recovery from the anaesthesia after surgery, so post-anaesthetic assessment is very important because it helps you to know if your patients have come out of the effects of the drugs you administered successfully";

"PIA13: it is very important being that it will help form another database to help us to review the outcome of anaesthesia that was administered to the client. And to help improve on our practice in especially things that were not done well next time you will do it better and if it did not go well too then next time you will know what to do";

"PIA10: it helps me in my judgment in the care of patients. And you should know that there are no two individuals that are the same. Every patient is different; so technique A for patient A may not end up well as the same technique for patient B."

5.4 SUMMARY OF FINDINGS FROM KEY INFORMANTS' INTERVIEW

This section laid out the main findings from interviews of heads of the directorate, departments, and units of anaesthesia.

- The anaesthetists confirmed that irrespective of the type of surgery pre-anaesthetic assessment is performed for all patients undergoing any surgical intervention. This helps the anaesthetist to identify comorbidities that pose a risk to the patient undergoing surgical intervention.
- Information from the data indicated that a thorough assessment is performed at the designated centre often consulting rooms at all teaching and some regional hospitals, almost all district hospitals lacked designated rooms for anaesthetic assessment. Some resort to anaesthesia offices and wards.
- Participants indicated that pre-anaesthetic assessment affords them the opportunity to know the anaesthetic history of the patient and any medications being taken by the patient so that an appropriate choice of anaesthesia could be considered.

- The anaesthetist intimated that pre-anaesthetic assessment is important because it helps them validate client information to prevent surgical and anaesthetic errors, and helps the patient gain adequate knowledge about the intended intervention and confirmation to undergo the surgery is confirmed.
- The anaesthetist takes a thorough history from the patient including but not limited to the medical, surgical, anaesthetic, and social. Behaviour modifications such as stoppage of smoking and reduction in alcohol consumption are instituted to optimize the patient.
- In event of prolonged postponement or cancellation, a re-assessment regime is put in place for the patient
- The anaesthetists indicated that there are barriers to anaesthesia provision in Ghana. They cited lack of personnel, equipment such as SPO2 monitors, cardiac monitors, anaesthetic machines, and inter-professional conflicts between the two main cadres of anaesthesia providers are some of the challenges.
- Poverty and lack of reliable healthcare financing are identifiable challenges of anaesthesia provision in Ghana, according to the anaesthetists. Patients are unable to fund requisite laboratory investigations to assist their management.
- The major challenge identified by the study was lack of supervision and poor distribution of anaesthesiologists in Ghana. All anaesthesiologists are found in teaching hospitals and in the cities.
- The study found two major cadres of anaesthesia providers in Ghana, Physician Anaesthetists and Certified Registered Anaesthetists. It was reported that the overwhelming majority were CRAs who are evenly distributed across the country and across all levels of care.
- The participants confirmed that Ghana has a solid regulatory and credentialing system for anaesthesia training and certification. Both cadres are regulated by the Medical and Dental Council of Ghana, upholding standards of practice.
- The study found that participants believed post-anaesthetic assessment is vital and could improve practice and patient safety but it is not performed in Ghana because of a shortage of staff and overwhelming case burden.

- The Anaesthetists were unanimous about how post-anaesthetic assessment could detect and manage complications such as pain, nausea and vomiting, bleeding and high spinals.

5.5 CHAPTER SUMMARY

The qualitative study explored and described the pre and post-anaesthetic practices in Ghana. Pre-anaesthetic Assessment (PAS) is an assessment process conducted on a surgical client regardless of the type of surgery. PAS is institutionally based as they are no protocols to guide practitioners in Ghana. During PAS, the anaesthetist assesses the client for certain allergies and comorbidities. Anaesthesiologists conduct pre-operative assessment (PAS) at the OPD, anaesthetic clinic, emergency ward, office, and theatre. PAS assists the surgical team to ascertain patient fitness for the scheduled surgery. It also helps the client to be informed about the surgery and to sign a consent.

The choice of anaesthesia is made by assessing the patient's previous history of exposure to anaesthesia, certain medications, and underlying conditions. During PAS particular attention is given to airway examination as it indicates the drugs to be used for the surgery. Aged clients are assessed and graded according to their level of strength to expand anaesthesia. *The Patient Assessments for Surgery (PAS) is a planning step for the preparation for anaesthesia and intra-post-operative management. PAS helps improve anaesthesia practice and to avoid accidental anaesthesia mishaps. It also allows the surgical team to know their patients and prevent unnecessary delay in theatre.*

A patient's medical history, social history, airway assessment, and current medical state may compel such referrals for PAS. Areas assessed include airway for air entry, cardiac activity, check for murmurs, stomach for scarring, mobilization, and pain with mobilization.

People undergoing heart surgery often undergo re-assessment after postponement of the surgery. Reasons for postponement include low haemoglobin, diabetes, asthma, hypertension, or other underlying cause. Other factors to consider are type of surgery, history of smoking, and use of anticoagulants. Some patients' social history, alcohol intake, smoking, and medications are considered major barriers to the induction of patients for surgery. The limited number of anaesthetists in Ghana poses a challenge to the effective anaesthesia practice.

Some patients lack money to do laboratory investigations promptly, which hinders fast and efficient anaesthesia practices.

Certified Registered Anaesthetists (CRAs) are the main cadres of anaesthesia practitioners in Ghana. The Ghana Medical and Dental Council currently regulates the practice of CRAs and Doctor Anaestheticists. Participants called for the establishment of their own regulatory body to deal with the friction between them and other cadres. A good and timely post-anaesthetic assessment is very important. It gives the anaesthetist an opportunity to evaluate the intra-operative care and know how the patient is responding to the medications served. It also forms part of the anaesthetic database that can be useful in informing clinical practice, research, and teaching.

CHAPTER 6 : EXPLORATORY PHASE - INTEGRATIVE LITERATURE REVIEW

6.1 INTRODUCTION

This thesis section described pre and post-anaesthetic assessment practices through an integrative literature review. Integrative literature reviews are broad systematic approaches to a literature review in which both qualitative and quantitative, peer-reviewed, and grey literature are synthesised to describe a phenomenon (Lubbe et al., 2020; Maree & Schmollgruber, 2014). The detailed integrative literature review methodology is presented in Chapter 2 of this study. The findings from the review are shown below.

6.2REVIEW QUESTION

In the present integrative review, the review question was *"what are the current pre-anaesthetic and post-anaesthetic assessment practices?* This was necessary to elicit the evidence in literature from the global context, so that the evidenced may be synthesised for parsimonious guidelines to be developed.

6.3 STUDIES INCLUDED

Two hundred and eighty (280) papers passed the screening of titles and abstracts as identified from the CINAHL, Science Direct, Scopus, and PubMed computerised search. All the studies were imported into Mendeley reference manager, where 78 duplicates were identified and merged, leaving behind 125 papers. Six documents, including guidelines and pre and post-anaesthetic assessment tools, were identified through hand searches and added to the 125, making 131. 47 papers were excluded by scanning the retrieved papers' titles, leaving 84. After reading the abstracts, 40 papers were further excluded because they did not meet the inclusion criteria. The full articles of the 44 papers left were retrieved and read thoroughly. Six were further excluded: three provided incomplete information; one was on post-operative nursing care; and the last provided information on intraoperative anaesthetic care. 33 empirical studies, four guidelines, and one tool were included in this review. The excluded studies and reasons for exclusion were provided in Table 6.3. Figure 6.1 presents a thematic overview of the search, exclusion, critical appraisal, and final inclusion of papers in this review. Essential information: author, date, the purpose of the study, methodology, sample,

and key findings and recommendations were extracted from the 36 documents included in Table 6.1 and 6.2, respectively. The review process and the results were reported according to the PRISMA Extension for integrative Reviews (PRISMA-ScR) reporting checklist (Tricco et al., 2018).

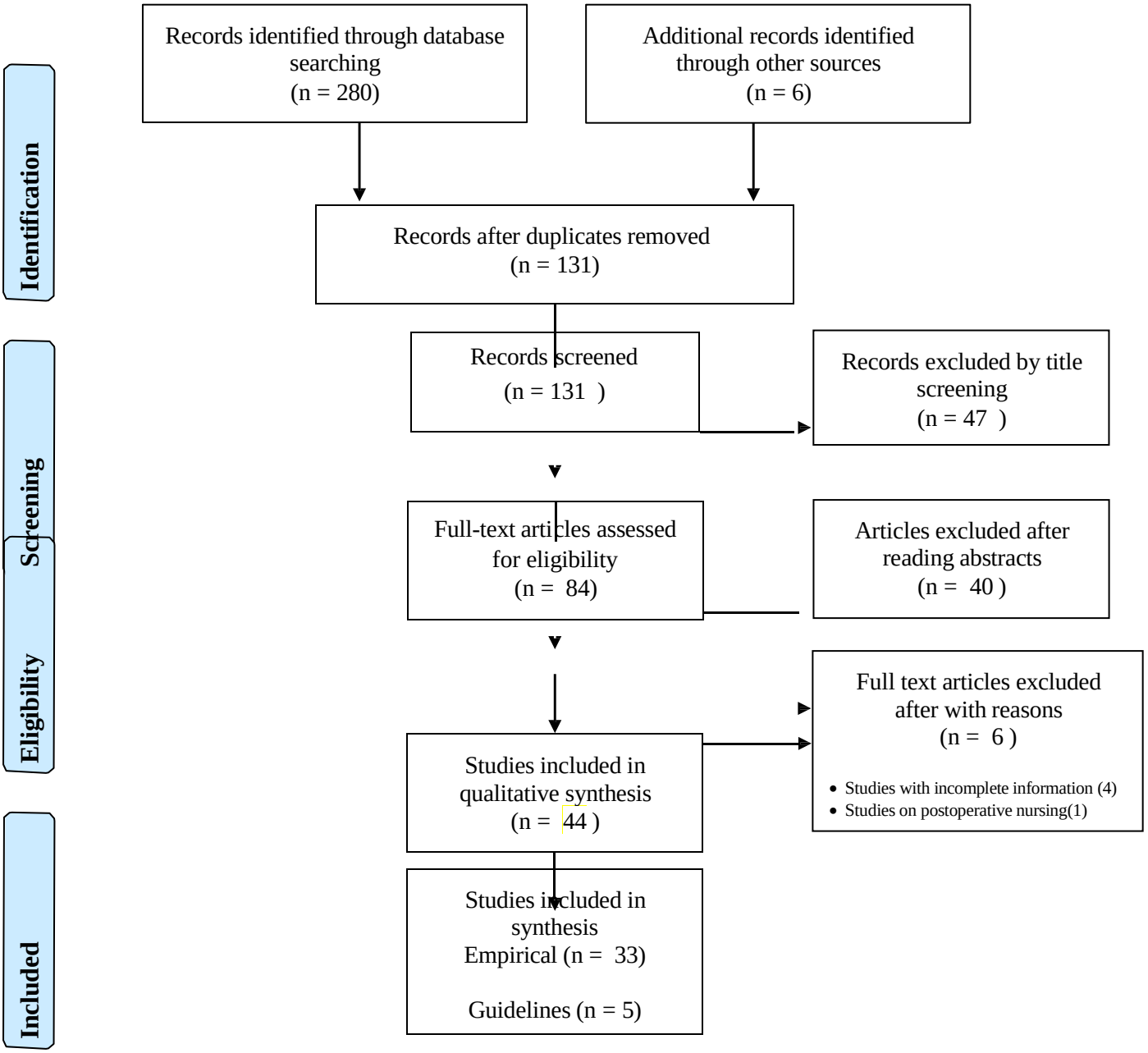


Figure 6.1: **Search and inclusion**

Table 6.1: **Data matrix presenting extracted findings**

			Pre-anaesthetic studies		
No.	**Author, date Country**	**Purpose of the study**	**Methodology**	**Sample**	**Key findings and recommendations**
1.	Okamura et al. (2019) *Japan*	To evaluate the predictive effects of the internal jugular vein during the pre-anaesthetic assessment on the occurrence of hypotension	A cross-sectional study to conduct pre-anaesthetic ultra-sonographic examinations with patients in two different positions: supine and 10°	82 adult patients who had gone for elective surgery at the Yokohama City University	• Significant hypotension was observed among about half of the patients after anaesthetic administration • Pre-anaesthetic examination of patients at 10° Trendelenburg was three times more likely to predict hypotension
2.	Teruel et al. (2020) *United States*	To analyse how practical aged based pre-anaesthetic electrocardiogram evaluation is in predicting adverse	Retrospective cross-sectional study using secondary data retrieved from electronic medical records	Records of 761 patients aged 50 to 59 years	• Age was not a predictor of adverse cardiac outcomes • Instead, medical history and comorbidities were more reliable predictors of adverse cardiac outcomes after surgery • The practice of using age as a determinant of adverse cardiac outcomes after surgery should be substituted

3.	Ashfaq et al. (2017) *Bahrain*	To highlight how pre-anaesthetic evaluation led to the diagnosis of long QT syndrome.	Case study	A case of undiagnosed Long QT Syndrome in a seven-year-old boy	• The anaesthetic team must ensure therapeutic beta-blockade continues as well as ensuring that average electrolyte profile is maintained during both the pre and post-operative stage • Medications to avoid during the pre-operative stage include antiarrhythmic agents; phenothiazine antipsychotics; selective serotonin reuptake inhibitors; macrolides antibiotics; antimalarial agents; antihistamines; and prokinetic agents • ECG monitoring should continue after the surgical procedure
4.	Almeshari et al. (2018) *Saudi Arabia*	To compare the quality of paper-based and electronic pre-anaesthesia assessment forms.	Quasi-experimental using a pre-post-test design without a control group	A total of 500 patient forms (250 paper-based and 250 electronic forms) and 15 anaesthetics	• The electronic-based forms had better quality in all the categories assessed (missing items, errors, and unreadable items) • Anaesthetics were more satisfied using electronic-based forms because it was more convenient and provided better clarity • Anaesthetics should adopt electronic-based forms in pre-anaesthetic assessment
5.	Mohammadi et al. (2016) *Iran*	To compare the ultrasound view of the larynx with the Mallampati classification before anaesthesia and the	Cross-sectional study	47 surgical patients	• Sonographic measurement guidelines are not precise in airway assessments before anaesthesia due to weak correlation between pre-epiglottic space/vocal cords ratio and Cormack-Lehane grade with low sensitivity and specificity

		Cormack-Lehane sort during direct laryngoscopy under general anaesthesia			
6.	Sandal et al. (2019) *Turkey*	To identify high-risk patients during surgical procedures using fuzzy risk evaluation.	Logic decision making using clinical and personal data as functions	Ten patients	• Five main variables consisting of cardiac, pulmonary, renal, or liver disease and diabetes mellitus and three supporting variables consisting of patients' age, body mass index, and cigarette smoking were used to compute a model for the determination of risk classification of patients during surgical procedures • ten patients were used to demonstrate the performance of the model, but further testing is required to examine the universal acceptability of the model
7.	Schnoor et al. (2018) *Germany*	To invent clinically feasible examination for identifying obstructive sleep apnoea in childhood.	Analytical cross-sectional study	53 children	• These three core questions: "Does your child regularly snore at night?"; "Does your child demonstrate laboured breathing during sleep?"; and "Does your child have breathing pauses during sleep?" showed the potential of aiding in the detection of paediatric obstructive sleep apnoea during pre and post-anaesthetic evaluation • The questions resulted in a good sensitivity and moderate specificity • These three questions could be more beneficial than extension questionnaires which do not necessarily give better identification of

					obstructive sleep apnoea in childhood
8.	Weinstein and Aglio (2016) *United States of America*	To debate the significant concerns that should be addressed in every pre-anaesthetic evaluation of patients with deep brain stimulator (DBS)	Editorial	N/A	• Before pre-anaesthetic assessment, patients with DBS should consult their primary doctor to ensure the functional integrity of the device. The patients' primary doctor should provide relevant medical information to the anaesthetic team as well • The brand, model, and device number of the DBS should be identified as a precautionary measure in case an emergency conversation needs to be held with the producer of the device at any point • There is the probability that the DBS is deactivated in case the surgical procedure involves electrocautery, high possibility of defibrillation or cardioversion, cardiac pacemaker device, electroconvulsive therapy, or phacoemulsification to protect the safety of the patient • If the DBS needs to be deactivated, the deactivation should be done by a staff of the manufacturer; otherwise, the surgery should be suspended • Surgical procedures that involve MRI requires that the appropriate radiological expert is sought to set the MRI machine to be consistent with the settings of the DBS
9.	Woldegerima and Kemal (2019)	To assess the documentation practice during pre-anaesthetic	Cross-sectional study	122 pre-anaesthetic evaluation	• None of the 122 PAETs reviewed was fully complete according to pre-determined indicators, thus making the tools sub-standard • Poor documentation was commonly done for the

	Ethiopia	examinations and the completeness of pre-anaesthetic evaluation tools.	tools (PAETs)	anaesthetic plan, vital signs, a name, per-oral status, pre-medication, and age • Training should be given to the anaesthetic team to improve on the practice of documentation during pre-anaesthetic evaluation • Modern methods of documentation such as electronic-based types should be employed during the pre-anaesthetic examination
10	Prabhu and Valchanov (2017) United Kingdom, Europe		Opinion	• A thorough test needs to be performed during pre-anaesthetic evaluation • Pulmonary function tests including the diffusing capacity of the lungs for carbon monoxide (DLCO), arterial blood gas, 6MWT, ventilation-perfusion (V/Q) scan should be performed • Cardiac function test such as pulmonary artery pressures, multiple-uptake gated acquisition scan, coronary angiography, cardiac catheterisation, and suitable heart catheter should be performed • Full blood count blood, ABO blood group, coagulation profile, HLA typing, anti-HLA antibodies, and panel reactive antibodies are examples of laboratory tests that should be performed as well as biochemical tests such as serum electrolytes, blood urea, serum creatinine, liver function tests, blood glucose, lipid profile, and thyroid function tests • Infection screening such as antibiotics susceptibility

					testing should be carried out • Autoimmune screen testing including antinuclear antibody (ANA), extractable nuclear antigens (ENA), deoxyribonucleic acid (DNA) antibody, rheumatoid factor, anti-neutrophil cytoplasmic antibody (ANCA), creatine kinase, and immunoglobulins should be carried out • In the presence of uncontrolled bleeding, significant organ damage, significant chest deformity, high-risk infection, BMI greater than 35 kg/m2, and lack of social support or presence of the psychiatric condition, the pulmonary surgical procedure should be cancelled
11	Aldawoodi et al. (2021) *North-America*	To report on patient experiences of telemedicine pre-anaesthetic assessment	Data of 120 patients were retrospectively analysed	120 patients	• It saved an average of 80 miles or 121 minutes per patient • Telemedicine pre-anaesthesia assessment saves about 46 US$ for patients. • Telemedicine is suitable for patients who are at risk of stress on traveling

12	Wajekar (2017) Asia	To raise concerns on the use of WhatsApp in sharing pre-anaesthetic assessment findings.			• Using WhatsApp in large hospitals may risk misidentification among patients. • WhatsApp should be used for smaller units.
13	Berger-Estilita et al. (2020) *Europe*	To improve the training of medical students for pre-anaesthetic assessment	Randomised control trial	144 fourth-year medical students	• Using simulated patients enhanced medical students learning on pre-anaesthetic assessment. • Explain the procedure and assess for family history, social history, system anaemias, patient history, medical history, ASA status, setting
14	Han et al. (2016) *Asia*	Use of 3d printing to evaluate airway	Case-study	77-year-old patient	• 3D models provide a better view of the change in the airway • 3D is recommended in evaluating difficult airways. • They provide a better guide for pre-anaesthetic care
15	İyilikçi (2021) *Europe*	To assess the level of herbal product use in the pre-anaesthetic assessment.	Survey	257 people	• The top five products included onion, garlic, thyme, cinnamon, and carob. Of the female patients treated with IVF, 62.5% used vitamin supplements, and 48.6% used herbal products. Of the men undergoing the same treatment (partners of the female participants), 37.5% used vitamin supplements and 51.4% used herbal products • Ask about herbal medicine use, which could interact

					with other medications
16	Molin, Rovsing and Meyhoff (2020) *Europe*	To explore the effect of nurse-administered the association between Pre-operative Patient-centred Anaesthesia System (Pre-PAS) and ASA scores.	Prospective descriptive study	487 patients	• The majority of Pre-PAS criteria predicts ASA scores • Pre-PAS helps reduce pre-anaesthetic visits • Pre-PAS helps in pre-anaesthetic triage • Pre-PAS Criteria: Age, BMI, prescription medications, dyspnoea, Diabetes mellitus, need for an interpreter, prescription medications, previous head and neck surgery, blood pressure • -request for pre-anaesthetic assessment
17	Nair et al. (2016) *India*	To report the use of WhatsApp as a tool for communicating pre-anaesthetic reports.	Case report		• WhatsApp group assists the surgical team to know patients approved for anaesthesia by the pre-anaesthetic assessment team. • It allows for timely reference to patient pre-anaesthetic files • Pre-anaesthetic care involves history taking, general and relevant systemic examination, drug allergy check, airway and spine examination, review of patient's medical records (ongoing medications, doses, duration), recording investigations conducted by surgeons, • At times, the anaesthesiologists ask for specialist consultation (cardiology, nephrology, pulmonology, etc.) depending on the severity of the systemic disease.

					• - additional investigations such as pulmonary function test, liver function test, and arterial blood gas on room air. -certified fit under suitable ASA grade
18	Osman et al. (2020) *Europe*	"Design and validation of a patient-administered pre anaesthesia health assessment digital application for gathering medical history relevant to pre anaesthesia assessment"	Iterative mixed-methods	228 patients	• "PreA- anaesthesia Computerized health Assessment (PATCH) application is accepted by patients and reliable when compared with nurse-led assessment.' • What is assessed: allergies, medications and supplements, history of surgical operations, history of dyspnoea, history of echocardiography, history of Electrocardiography, presence of hypertension, history of chest pains, history of heart attacks -swelling in the feet, and treatment of cardiac conditions, history of irregular heartbeats, use of pacemakers, history of heart surgery, history of blood clots in legs and lungs, history of blood transfusion, asthma, cough, long term lung disease, sleep apnoea, snoring, X-rays, heartburn, smoking, history of liver problems, alcohol use, kidney function, stroke, fits/seizures, loss of consciousness, diabetes or pregnancy-related diabetes -hormonal problems such as thyroid, presence of loose teeth, crowns, bridges, veneers or dentures, difficulty in swallowing, opening moth, stiffness of

					back or neck or jaw, previous reaction to anaesthetics, anxiety, depression disorders, and essential medical information
19	Rogers (2020) *North America*	To implements telemedicine pre-anaesthetic assessment	Nonrandomised prospective evidence-based practice project		• It saves time • It saves money • Improves patient satisfaction • Improves provider-patient communication • Increase access to care.
20	Soares et al. (2011) *South America*	Report on the importance of pre-anaesthetic assessment on morbidity	Case report		• 'The pre-anaesthetic outpatient clinic is essential in reducing morbidity as well as mortality of surgical patients." • History • Laboratory examinations • Cardiological evaluation • Physical examination • ASA classification
21	Srivastava et al. (2020) *Asia*	The usefulness of telehealth in pre-anaesthetic assessment	Letter to Editor		• Telemedicine units are an alternative for OPD and pre-anaesthetic assessment • Increased Blood Pressure. • Thyroid Problem • Heart disease • Any breathing problems/asthma • Do you have Sleep apnoea • Any previous surgery

					• Allergy to any medicine • History of tuberculosis • Do you smoke? • Addiction • Chemotherapy • Alcohol
			Post-anaesthetic Studies		
22	Woelfel et al. (2019) *United States of America*	The Emergence Delirium in the Wounded Warrior (ED-WW) Tool will assess the feasibility of adopting a population-specific scale.	Pre-post implementation design	Eight post-anaesthesia care unit nurses	• The nurses were of the view that the ED-WW tool was appropriate for examining delirium • The ED-WW tool should be adopted for the determination of delirium in the post-anaesthesia care unit
23	Williams et al. (2019) *United States of America*	To analyse waste anaesthetic gas (WAG) in the post-anaesthesia care unit (PACU) and the beneficence of the ISO-Gard mask in minimising exposure	Cross-sectional study	125 surgical patients and 24 PACU nurses	• Patients and PACU nurses have opened to the effects of WAG levels >2 ppm during the 1-hour post-operative stage, and the ISO-Gard mask effectually minimised the quantum of WAG sensed in the direct 1-hour post-operative recovery stage

		to WAG			
24	Pereira et al. (2017) *Brazil*	To determine the prevalence of hyperglycaemia and its associated factors in the post-anaesthetic care unit in non-diabetic patients.	Cross-sectional study	837 surgical patients	• Prevalence of hyperglycaemia in the post-operative period was 26.4% • Older age, higher BMI, higher blood pressure, intraoperative use of corticosteroids, and longer duration of surgery were strongly related to hyperglycaemia • However, intraoperative administration of glucose was not significantly associated with hyperglycaemia
25	Aasvang et al. (2017) *Denmark*	To examine the safety issues related to the post-anaesthetic assessment and non-assessment of lower motor limb function of patients who had undergone spinal anaesthetic for the performance of total hip arthroplasty and total knee arthroplasty procedures.	A multicentred, semi-blinded, non-inferiority randomised controlled trial	1,376 surgical patients	• Even though the occurrence of adverse effects within the first 24 hours of the post-anaesthetic period was higher in the group without the assessment of lower limb motor function than those with the assessment of lower motor limb function, the difference was not significant • Assessment of lower limb motor function did not significantly decrease the length of stay in the hospital, but it did reduce the length of stay in the post-anaesthetic unit significantly • Additional safety data needs to be reviewed on patients without the assessment of lower limb motor function before discharge from the post-anaesthetic unit

26	Assefa and Sahile (2019) *Ethiopia*	To measure the prevalence and risk factors of emergence delirium in the post-anaesthesia care unit	Cross-sectional study	306 patients who had undergone surgery	• The prevalence of emergence delirium was 31.7% • Variables that were significantly associated with emergence delirium were older age, substance abuse, pre-operative anxiety, benzodiazepine premedication, excessive blood loss, post-operative pain, and more extended stay in the unit
27	Street et al. (2018) *Australia*	To examine the use of an evidence-based discharge tool, the post-anaesthetic care tool, and its impact on nursing assessment, communication, and management of patients in the post-anaesthetic care unit.	A prospective quasi-experimental design using pre and post data collection method	723 nurses at the initial stage and 694 nurses in the post data collection stage	• The post-anaesthetic care tool increased the likelihood of post-anaesthetic assessment of postoperative patients and responsiveness of nurse to complications such as pain, nausea/vomiting, and hypothermia • The implementation of the post-anaesthetic care tool brought about an increase in completing documentation on patients' conscious state, oxygen saturation, respiratory rate, heart rate, and blood pressure • The structured nature of the post-anaesthetic care tool aided the identification of clinical concerns during the post-anaesthetic period • The post-anaesthetic care tool should be used in delivering thorough post-anaesthetic evaluation
28	Stocki et al. (2018) *Canada*	To improve pain assessment documentation in post-anaesthesia care units through a process improvement intervention and	Retrospective observational study with prospective observational follow-up. These were supplemented with the Plan–Do–Study-	99 patient charts	• Improvement intervention and knowledge translation strategy improved the documentation of pain assessment up to 100% within six months of implementation

		knowledge translation strategy	Act method of quality improvement		
29	Galvez et al. (2019) *United States of America*	To study the utility of the Snoring, Trouble Breathing, and Un-Refreshed (STBUR) questionnaire in the post-anaesthetic evaluation of children	Cross-sectional study	5991 surgical patients (children)	• The STBUR questionnaire could help identify children who are at low risk for a prolonged duration of post-anaesthesia recovery, need for supplemental oxygen therapy as well as unplanned hospital admission, but the questionnaire did not prove to help identify children who were at the high risk of the outcomes above
30	Butz (2018) *United States of America*	To evaluate the validity and reliability of the nonverbal pain scale revised (NVPS-R) and critical care pain observation tool (CPOT) in assessing post-anaesthetic acute pain	Measuring pain in six different time points using a crossover study design	40 surgical patients	• CPOT vocalisation was consistently frequent in patients with significant pain • Vocalization was more frequent at each time point when compared with the physiological and respiratory indicators • Medicating based on acute vital signs alone may be dangerous in the sedated patient

Table 6.2: **Recommendations from selected pre and post-anaesthetic guidelines and tools**

No.	Name of guideline	Purpose	Recommendations
	Bailey et al. (2019)	To present the consensus guidelines from the Association of Anaesthetists of Great Britain and Ireland and the British Association of Day Surgery on the anaesthetic activities before, during and after day surgery.	- Fundamental to safe, efficient, and effective day surgery is anaesthetist-led and nurse-delivered pre-anaesthetic assessment and preparation. - The functional status of a patient must determine its fitness to a surgical procedure, not merely ASA status - Surgeries involving adults and children can be undertaken as day cases - There should be a clinical lead at day surgery units whose responsibilities include developing local policies, clinical guidelines, and governance. - Anaesthetist must be conversant with all techniques and must deliver procedures that lead to lowered stress and maximise comfort to enhance early discharge and recovery, including regional nerve blocks and neuraxial blockade, such as spinal anaesthesia - The multidisciplinary team members must be trained in day surgery practice. - Assessment forms, protocols, and hand-held advice leaflets in place must be of high quality and specific to the procedures. - A dedicated unit or operating theatre must be earmarked for day cases. - There should be quality assurance improvement programmes tailored towards good care for day cases. Appropriate affected person screening and choice with the availability of

No.	Name of guideline	Purpose	Recommendations
			scientific records, both in paper shape or the digital affected person record - Manage emergencies, such as cardiac arrest and principal bleeding, and provide equipment, capsules and professional employees to address headaches simultaneously as the anaesthetist is in theatre. - Robust, examined communications and written provider stage switch agreements among the stand-on my unit, the closest acute hospital, it's in the depth care unit and the ambulance provider - Manage surgical patients who cannot be discharged home - Management of patients with headaches following discharge. There must be clean statistics furnished to sufferers as to wherein to move if headaches occur - Appropriate cover must be instituted till discharge - Teaching, training, supervision, and possibilities for research must be instituted
	Immediate post-anaesthesia recovery 2013 (Whitaker		**POST-ANAESTHETIC ASSESSMENT** • **Transfer and handover of care to the PACU clinical staff.** - Before the transfer of the patient to the PACU, the anaesthetist should be satisfied that the PACU staff have prepared adequately to receive the patient and are competent and

No.	Name of guideline	Purpose	Recommendations
	Chair et al., 2013)		responsible for the patient. If this cannot be assured, the anaesthetist should stay with the patient in the operating theatre or the PACU until the patient is fit to return to the ward. - Handing over of patient must be formally done to a specific PACU staff by the anaesthetist to appropriately trained and registered PACU practitioner. Formal handover checklists can improve the safety of handovers and should be developed for local users based on the facilities' protocol. - Patient should be physiologically stable on departure from the operating theatre, and the anaesthetist must decide on the extent of monitoring during transfer. This will depend on factors such as; proximity to the PACU, patient's level of consciousness, respiratory and cardiovascular status. If the patient's condition is poor, adequate mobile monitoring is required, i.e. a minimum of pulse oximetry and non-invasive blood pressure, ECG and capnography if the trachea is intubated, with the immediate availability of a nerve stimulator, and a means of measuring body temperature. - The anaesthetist is responsible for ensuring that transfer to PACU is accomplished safely - Supplemental oxygen should be administered to all patients during transfer unless the patient did not receive supplemental oxygen during surgery

No.	Name of guideline	Purpose	Recommendations
			- All lines should be flushed to remove any residual anaesthetic drugs if necessary and checked to be patent, adequately secured and protected. Details of any difficulties experienced during intubation or other relevant procedures should be included in the handover • **After planned admission** - Operating sessions must be planned to allow time for the anaesthetist responsible for an individual's care to visit them pre-operatively to; - Establish a rapport - Determine the adequacy of pre-operative assessment - Confirm the plan and discuss anaesthetic and post-operative care - Ensure the patient is aware of any risks particular to that patient or associated with specific anaesthetic procedures. - Ensure the patient understands the nature of the operation and is happy to proceed - Confirm the availability of HDU or intensive care unit beds - If surgery is cancelled, the anaesthetist should: * Explain the reasons for cancellation and announce possible suggested dates for the procedure to the family. * Explain the cancellation to the surgical and pre-operative assessment teams and

No.	Name of guideline	Purpose	Recommendations
			primary care where appropriate. * Document the reason for cancellation and recommendations for optimising the patient's medical notes. * Take steps to allow surgery to proceed safely at a future date. * Address deficiencies in the system to reduce the number of late cancellations that inconvenient staff patient and their significant others. • **Management of patients in the PACU** - Patients must be observed on a one-to-one basis by an anaesthetist, registered PACU practitioner or another adequately trained member of staff until they have regained airway control, respiratory and cardiovascular stability, and can communicate - Minimum information to be recorded for patients in the post-anaesthesia care unit * Level of consciousness * Patency of the airway * Respiratory rate and adequacy * Oxygen saturation * Oxygen administration * Blood pressure * Heart rate and rhythm

No.	Name of guideline	Purpose	Recommendations
			* Pain intensity on an agreed scale * Nausea and vomiting * Intravenous infusions * Drugs administered * Core temperature - Other parameters depending on circumstances, e.g. urinary output, central venous pressure, expired CO2, surgical drainage volume, patients must be kept under clinical observation at all times, and all measurements should be recorded, preferably by an automatic recording system networked with theatre systems. The frequency of words will depend upon the stage of recovery, the nature of the surgery, and the patient's clinical condition. - The frequency of the observations and the quality of record-keeping should not be influenced by staffing levels and the presence or absence of electronic monitoring devices. Every effort should be put in place to ensure safe and effective monitoring - For all patients, the National Patient Safety Agency (NPSA) recommended dataset of their last name, first name, date of birth and NHS number should be recorded in that order, together with their time of admission, time of fitness for discharge, time of release and destination in a central register • **After unplanned admission**

No.	Name of guideline	Purpose	Recommendations
			- The standards and principles for the care of elective patients apply equally to those admitted to an emergency - There must be clear communication between surgeons, anaesthetists and intensivists to avoid ambiguities and carrying out wrong orders - A balance has to be reached between the prevention of deterioration caused by delaying surgery and the benefit of optimising medical conditions pre-operatively. - Include patients and their next of kin in these discussions. - The risks and benefits of surgery should be explained clearly. - These discussions should be documented clearly in the patient's medical notes, mainly when a decision has been made: - To proceed with anaesthesia when potentially essential investigations have been omitted or when the patient's condition has not been optimised. - Not to proceed with surgery when there is a correctable surgical disease. - Patients must be kept under clinical observation at all times, and all measurements should be recorded, preferably by an automatic recording system networked with theatre systems. The frequency of observations will depend upon the stage of recovery, the nature of the surgery, and the patient's clinical condition. - The frequency of the observations and the quality of record-keeping should not be

No.	Name of guideline	Purpose	Recommendations
			influenced by staffing levels. - For all patients, the National Patient Safety Agency (NPSA) recommended dataset of their last name, first name, date of birth and NHS number should be recorded in that order, together with their time of admission, time of fitness for surgery • **Post-anaesthetic Management** - Pain, nausea and vomiting - No patient should be returned to the ward until control of post-operative nausea and vomiting and pain is satisfactory based on approved protocols. - All PACU staff should be specifically trained in managing patients with patient-controlled analgesia, epidurals, spinal and peripheral nerve blockade. Nurse administration of intravenous - Pain, nausea and analgesics, e.g. paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs) and opioids prescribed by the anaesthetists as part of a specific protocol, facilitates rapid and flexible pain - **Minimum indicators for discharge of patients from the post-anaesthesia care unit** The patient is fully conscious, able to maintain a clear airway and has protective airway reflexes - Breathing and oxygenation are satisfactory

No.	Name of guideline	Purpose	Recommendations
			- The cardiovascular system is stable, with no unexplained cardiac irregularity or persistent bleeding. The specific values of pulse and blood pressure should approximate to average pre-operative values or be at an acceptable level, ideally within parameters set by the anaesthetist, and peripheral perfusion should be adequate - Complications such as nausea and vomiting and pain must be adequately controlled with prescribed analgesics and potent antiemetics. - Significant hypothermia and hyperthermia are a clear indication of the unreadiness of the patient to go to the ward. - Prescribed oxygen therapy should be administered when necessary. - Intravenous should be patent, flushed if necessary to ensure removal of any residual anaesthetic drugs and intravenous fluids - should be prescribed if appropriate - All surgical drains and catheters should be checked for patency. - Complete heath records properly and completely • **Tests and investigations** - Electrocardiography: if older than 60; if more aged than 40 and surgical severity at ≥ 3; cardiovascular disease; severe renal disease. - Full blood count: if older than 60 and surgical severity ≥ grade 2; all adults if surgical

No.	Name of guideline	Purpose	Recommendations
			severity ≥ grade 3; severe renal disease. - Urea, electrolytes and creatinine: if older than 40 and surgical severity ≥ grade 3; all adults if surgical severity grade 4; any renal disease; severe cardiovascular disease. - Pregnant women must have a pregnancy test done - Sickle-cell test on families with homozygous disease or heterozygous trait; ancestry of African descent, Afro-Caribbean, Asian, Middle-Eastern, east-Mediterranean and countries where malaria is endemic. - Chest X-ray: patients scheduled for critical care. - There is recent evidence that patients of any age with no significant comorbidities (ASA physical status 1 or 2) presenting for day surgery do not need pre-operative investigations. - Anaemia (< 12 g.dl-1 for women and < 13 g.dl-1 for men) should be investigated and treated before planned surgery, using haematinics such as oral/intravenous iron rather than transfusion. - Evaluation of high-risk patients should estimate cardiovascular risk according to the severity of the systemic disease. - Functional capacity and the grade of the planned surgery. - Tests of functional capacity include exercise ECG, CPX testing and myocardial perfusion scans.

No.	Name of guideline	Purpose	Recommendations
			• **Handing over toward staff** - Suitably trained and qualified professionals must accompany patients to the ward. The anaesthetic record, together with the recovery and prescription charts, must accompany the patient and indicate to the ward staff the details of relevant drugs administered in theatre and PACU, e.g. analgesics and antibiotics - The PACU nurse must ensure that full clinical details are relayed to the ward nurse, with particular emphasis on ongoing problems and the management of infusion - -Develop and utilise local protocols concerning infusion devices and syringe pumps. Formal handover checklists can improve the safety of • **The patient's perspective** - Support all patients as they prepare themselves for surgery. - Identify critical high-risk patients and promote safety. - Reduce the risk to the patient and optimise the patient's condition pre-operatively. - Identify and mitigate potential anaesthetic difficulties. - Provide clear unambiguous. Allay fear, anxiety and lack of understanding through clear explanation, written information and appropriate discussion. • **Post-anaesthetic management** - Local anaesthesia and regional anaesthesia

No.	Name of guideline	Purpose	Recommendations
			- Information given to the PACU staff should include the site and type of local block, drug, dosage, administering time, and anticipated action duration. - Ward staff should be instructed to continue pain medication - Considerations after spinal and epidural anaesthesia include noting the level of analgesia achieved, the time and dose of drug administered, cardiovascular status, bladder care, details of any continuous infusions, degree of motor block and the time of anticipated motor and sensory recovery, including plexus blocks and major nerve trunk blocks • **CHILDREN** - Have designated, separate paediatric recovery area that is child-friendly and staffed by nurses trained in the recovery of babies, children and young people - The area should be kept warm to prevent hypothermia, and provision should be made for a parent or carer to re-join the child in the recovery area as soon as they are awake. - All staff working in PACU should be familiar with the relevant procedures and personnel if there are safeguarding or child protection concerns that arise whilst the child is in theatre. - Equipment must include a full range of sizes of facemasks, breathing systems, airways, nasal prongs and tracheal tubes. Essential monitoring equipment consists of a full range of paediatric non-invasive blood pressure cuffs and small pulse oximeter probes. Capnography should also be available.

No.	Name of guideline	Purpose	Recommendations
			- All drugs, equipment, fluids required for paediatric resuscitation and other emergencies should be immediately available. Consideration should be given to providing a separate dedicated paediatric trolley for this purpose • **Anaesthesia and recovery in particular areas** - Anaesthesia is often administered in obstetric, x-ray, cardiology, dental and psychiatric units, and community hospitals. All standards and guidelines described in this document must be fulfilled entirely at any site in which anaesthesia is administered and immediate post-anaesthesia recovery planned • **Audit and quality control in the PACU** - The data recorded from PACU patients should be compared with national and local benchmarks with the express aim of improving and maintaining the quality of pre-, intra- and post-operative care and measuring compliance with national standards. • **Minimum dataset to be recorded for all patients admitted to a post-anaesthesia care unit** - Last name, first name, date of birth and NHS number - Gender - ASA physical status - Surgical procedure performed

No.	Name of guideline	Purpose	Recommendations
			- Names of anaesthetist and surgeon - Type of anaesthesia - Time of admission - Core temperature on admission to the PACU - Incidence and severity of post-operative nausea and vomiting - Severity of pain experienced in the PACU - Analgesia given in the PACU - Time of fitness for discharge from the PACU - Time of discharge from the PACU - Complication • **Report Underlisted Adverse Findings** - Cardiopulmonary arrest - Major airway complications - Death - Severe pain that is difficult to treat - Prolonged stay (> 2 h) - Significant hypothermia (< 35 °C) - Need to call an anaesthetist to review a patient

No.	Name of guideline	Purpose	Recommendations
			- Need for ventilatory support (CPAP, tracheal intubation, lung ventilation) Table 3 Minimum dataset to be recorded for all patients admitted to a post-anaesthesia care unit. - Last name, first name, date of birth and NHS number • Gender - ASA physical status - Surgical procedure performed - Names of anaesthetist and surgeon - Type of anaesthesia - Time of admission - Core temperature on admission to the PACU - Incidence and severity of post-operative nausea and vomiting - Severity of pain experienced in the PACU - Analgesia given in the PACU - Time of fitness for discharge from the PACU - Time of discharge from the PACU - Complications - Need for cardiovascular support (inotropes, vasoconstrictors, antiarrhythmics) - Return to the operating theatre before discharge from PACU - Inadequate reversal of neuromuscular blocking drugs.

No.	Name of guideline	Purpose	Recommendations
			- Compliance that needs to be monitored to improve patient safety at PACU. These might include: * Being compliant with the checklist * Antibiotics administration * Anticoagulation therapy * Compliance with analgesic and anti-emetic protocols * Completion of post-operative instructions relating to oxygen therapy, pain therapy, fluid management, wound and drain management, restarting of oral intake and other elements of early post-operative care. • **Audit and quality control in the PACU** - The data recorded from PACU patients should be compared with national and local benchmarks with the express aim of improving and maintaining the quality of pre-, intra- and post-operative care and measuring compliance with national standards. - Report Underlisted Adverse Findings * Cardiopulmonary arrest * Major airway complications * Death * Severe pain that is difficult to treat

No.	Name of guideline	Purpose	Recommendations
			* Prolonged stay (> 2 h) * Significant hypothermia (< 35 °C) * Need to call an anaesthetist to review a patient * Need for ventilatory support (CPAP, tracheal intubation, lung ventilation) minimum dataset to be recorded for all patients admitted to a post-anaesthesia care unit. * Last name, first name, date of birth and NHS number • Gender * ASA physical status * Surgical procedure performed * Names of anaesthetist and surgeon * Type of anaesthesia * Time of admission * Core temperature on admission to the PACU * Incidence and severity of post-operative nausea and vomiting * Severity of pain experienced in the PACU * Analgesia given in the PACU * Time of fitness for discharge from the PACU * Compliance with WHO checklist performance

No.	Name of guideline	Purpose	Recommendations
			* Administration of antibiotics * Thrombo-embolic prophylaxis • Compliance with analgesic and anti-emetic protocols • Completion of post-operative instructions relating to oxygen therapy, pain therapy, fluid management, wound and drain management, restarting oral intake and other elements of early post-operative care.
	Guidelines for the Provision of Anaesthetic Services of Postoperative Care 2019 (Kumar et al., 2019)	To describe current best practices for service provision in post-operative patient care following anaesthesia.	• **Post-anaesthetic Management** - Transfer and handover of care to the PACU team - Before transfer, the anaesthetist should be satisfied that the PACU staff are competent and responsible for the patient. If this cannot be assured, the anaesthetist should stay with the patient in the operating theatre or the PACU until the patient is fit to return to the ward. - Formal handover checklists can be developed for local use and may improve the safety of h andovers. - Anaesthetists should formally hand over patient care to a PACU practitioner who is approp riately trained and registered The patient should be physiologically stable on departure from the operating theatre, and the anaesthetist must decide on the extent of monitoring during transfer. This will depend

No.	Name of guideline	Purpose	Recommendations
			on factors such as; proximity to the PACU, patient's level of consciousness, respiratory and cardiovascular status. - For a patient whose condition is poor, adequate mobile monitoring is essential, including pulse oximetry, non-invasive blood pressure measurements, ECG, capnography, and a nerve stimulator if the trachea is intubated, as well to test body temperature - Anaesthetists should ensure that PACU transfers are performed safely, and additional oxygen should be given to all patients at this time if those patients did not receive oxygen during surgery • **Equipment, Services and Facilities** - All patients who have had an anaesthetic affecting central nervous system function and a loss of protective reflexes should remain where anaesthetised until recovered or be transported safely (with care and monitoring as indicated below) to a specifically designated recovery location for post-anaesthesia recovery. - A Post-anaesthesia Care Unit (PACU) should be at the main operating theatre complex). This should be located in the operational theatre department and be separate from the department's admission area and with individual access for transfer of patients to the ward. - Standard design and room sizes of PACU must meet specified recommendations of the

No.	Name of guideline	Purpose	Recommendations
			Ministry of Health and health facilities regulatory agency. - It is recommended that a minimum of two recovery beds per operating theatre be provided, depending on local knowledge of the clinical specialities and the number of patients and available personnel. - The bed spaces should allow unobstructed access for trolleys, x-ray equipment, resuscitation carts and clinical staff. - The facility should be open plan, allowing each recovery bay to be observed but with curtains for patient privacy. - Oxygen and suction should be present in every recovery bay and ideally delivered by pipeline or secured oxygen tanks fastened to the walls - An emergency audible and visible call system should be in place, checked regularly to maintain functionality and be understood by all staff. - Drugs, fluid and equipment required for resuscitation and the management of post-operative complications should be available within three minutes and regularly maintained. - There must be a system for ordering, storing, recording, and auditing controlled drugs in all post-operative areas in which they are used, according to statutory legislation. - An individualised post-anaesthesia care plan should be implemented for each patient. - Careful records including instructions, patient observations and drug administration should

No.	Name of guideline	Purpose	Recommendations
			be maintained (increasingly in electronic form), and recovery staff should be able to interpret the information and initiate appropriate action where necessary - Clinical observations should be supplemented by pulse oximetry and non-invasive blood pressure monitoring until the patient is fully recovered from anaesthesia. An electrocardiograph, nerve stimulator, thermometer, glucometer and capnograph should also be readily available. - Capnography can aid early detection of airway obstruction and should be available in recovery and used in high-risk cases. Continuous capnography should be used if patients remain intubated or have their airways maintained with a supraglottic or another similar airway device. - A brief interruption of monitoring during the transfer of the patient from the theatre is only acceptable if the recovery area is immediately adjacent to the operating theatre. Otherwise, monitoring should be continued during transfer to the same degree as any other intra or inter-hospital transfer. - Supplementary oxygen should be available for transport after general anaesthesia. - Airway adjuncts should be available in the post-anaesthesia care unit to minimise the incidence of upper airway obstruction that may lead to post obstructive pulmonary oedema and severe hypoxaemia.

No.	Name of guideline	Purpose	Recommendations
			- Patient information should be continuously recorded and updated (in electronic or written format). - Anaesthetic Information Management Systems, a specialised form of the electronic health record, should be considered electronic patient charts in the perioperative and recovery period. They provide a more accurate and complete reflection of the patient's perioperative physiologic parameters. - Locally devised protocols should be available for discharge criteria. - Protocols and equipment should be available for the post-operative management of various symptoms, signs and conditions deemed locally appropriate. Such examples include the management of post-operative nausea and vomiting, pain relief of patients with chronic pain, hypothermia, blood transfusion, fluid therapy, diabetes, acute coronary syndrome, the deteriorating and dying patient, delirium, respiratory diseases, hypotension, hypertension and vulnerable adults and children. - If a patient has known visual or hearing impairment or wears dentures, then their corrective lenses/hearing aid/dentures should be readily accessible and available post-operatively

No.	Name of guideline	Purpose	Recommendations
			AREAS OF SPECIAL REQUIREMENT • **Children** - Hospitals should ensure that appropriate pathways and networks exist to enhance the hospital experience for children during the immediate post-operative period. - A designated separate recovery area for children and young people should be available in the paediatric anaesthesia location. This should have sufficient capacity for children to recover, be child friendly and be staffed by suitably trained and qualified - recovery practitioners look after babies, children and young people. - If this is not available, a discrete segregated area in the general PACU should be available without a dedicated PACU for children. - The environment should be made as child friendly as possible. - Children should never be left unattended in the recovery area. - A designated area for parents/guardians should be located close to the theatre where they can be contacted or wait until they are invited by the clinical staff to the recovery area to be reunited with their child as soon as they are awake. - Departments should consider making comforters and favourite toys available for children upon emergence from anaesthesia to reduce anxiety and increase the tendency to play.

No.	Name of guideline	Purpose	Recommendations
			- Children have an increased incidence of post-operative delirium. Recovery staff should have raised awareness, and local protocols should be for its management. - Children with learning difficulties should ideally be recovered in an area with lower noise and lighting levels and a familiar presence, such as their carer. - The presence of learning disability practitioners in recovery when a patient with a learning disability is being recovered should be considered. - All staff working in paediatric recovery should be trained and - competent in protocols, and familiar with the relevant procedures and personnel if there are safeguarding or child protection concerns that - There should be a minimum of one recovery staff member, or an anaesthetist, with advanced training in paediatric life support on duty. All members of recovery staff should have up-to-date paediatric competencies, including resuscitation. - Paediatric equipment to cover all ages should be available in recovery, including a full range of sizes of facemasks, breathing systems, airways, nasal prongs and tracheal tubes - Essential monitoring equipment includes a full range of paediatric non-invasive blood pressure cuffs and small pulse oximeter probes. Capnography should also be available. - Parents and children should be appropriately educated and equipped with information to address common issues they may face post-operatively, in recovery and on discharge. This

No.	Name of guideline	Purpose	Recommendations
			information should include leaflets for standard procedures highlighting risks, and these should be developed locally with support from area networks. - Guidelines and commonly used algorithms for paediatric emergencies should be readily available and regularly rehearsed. - Guidelines for fluid management specific to children, and equipment for accurate fluid delivery, should be available. - Pain assessment tools used should differ, depending on the age and ability of the child. Self-reporting tools should be used where possible, with behavioural or composite tools for those unable to self-report. - Protocols for the use of epidural infusions, morphine infusions, patient-controlled analgesia infusions and nerve catheter local anaesthesia infusions should be available and specific for children. • **Frail, older patients** - Cross speciality teams, including surgeons, anaesthetists, geriatricians and allied health professionals, should be initiated to provide quality post-operative care to frail older surgical patients. - Guidelines should be developed to prevent, recognise, and manage common post-operative geriatric complications and syndromes, including delirium, falls, functional decline, and

No.	Name of guideline	Purpose	Recommendations
			pressure areas. - In elderly patients undergoing surgery, the institution of delirium prevention interventions should be considered. These include early mobilisation, dehydration avoidance, and avoidance of delirium triggering medications. - Provisions should be made to assess and manage pain in older people, specifically those with dementia. - All staff managing patients in the post-operative period must be familiar with the arrangements determining mental capacity in the UK in which they work and pathways of care for patients with dementia. - Mechanisms for the early recognition of patients requiring specialist post-operative input from geriatrician led services and critical care should be developed. These should include patients at risk of or presenting with delirium, multiple medical • **Obese Patient** - In the postoperative period, the safety of obese patients may be improved by supplemental oxygen, non-invasive ventilation (continuous positive airway pressure), monitoring of sedation • **Critically Ill Patients** - When critically ill patients are held in the recovery area because of a lack of availability of

No.	Name of guideline	Purpose	Recommendations
			appropriate facilities elsewhere, this should only occur if recovery staff are appropriately trained, and the recovery area is adequately equipped to enable monitoring and treatment to the standard of a level 3 critical care unit. In some circumstances, such as a flu pandemic or a significant incident involving mass casualties, this may not be possible due to a massive surge in demand, but this should be seen as exceptional rather than the accepted norm. Non-critical transfer to another hospital should be considered where necessary. It cannot be assumed that it is safe to use the recovery facility as an extension of critical care, and local policies and procedures should govern this issue. - Excellent nursing care with prompt access to medical support will ensure that many critical aspects of care are proactively managed to ensure good patient outcomes. Nurse-led, protocol-driven care of frequently occurring problems for high-risk surgical patients (such as pain, fluid imbalance, nutrition and mild cardiorespiratory compromise) can often be provided in a level 2 critical care unit or specifically developed post-anaesthetic care unit (PACU). This can give some organ support treatments available in a level 3 critical care unit, e.g. invasive ventilation low dose inotrope support. - Organ support treatments available in a level 3 critical care unit, e.g. invasive ventilation, low dose inotrope support. - Where the post-operative destination is a level 2 critical care unit, consideration should be

No.	Name of guideline	Purpose	Recommendations
			given to initial care in a standard PACU until the patient has fully regained consciousness. This is particularly important for critical care units that are not staffed with airway trained doctors. - All hospitals should have a clear policy describing the safe triage of surgical patients considered to need post-operative critical care, with guidance on which patients should be admitted immediately to urgent care, and which can wait in a standard PACU for a short period while a vital care bed becomes available. Staff in critical care and PACUs should develop procedures to ensure safe and effective patient care during this transition. While the patient is located in the PACU, their care should be the primary responsibility of the staff and doctors working in that location. - Hospitals should have written policies on managing patients whose surgery is sufficiently urgent to proceed when post-operative critical care is desirable but not available; this situation should be considered exceptional. • **TRAINING AND EDUCATION** - All recovery staff should receive appropriate training recognised for post-anaesthesia care. Training should be tailored to meet the needs of the individual staff member and the PACU. - Continued professional development and the training of other staff should be facilitated by

No.	Name of guideline	Purpose	Recommendations
			activities such as the establishment of lead practitioners. - Members of clinical staff working within the recovery area should be certified to a standard equivalent to immediate life support providers, and training should be provided. - At all times, at least one advanced life support provider or an anaesthetist should be immediately available. - For children, a staff member with an advanced paediatric life support qualification or an anaesthetist with paediatric competencies should be immediately available. - Core competencies should be updated according to local and national guidelines. - Wherever possible, training should be multidisciplinary - Organisation and administration - All institutions should have protocols and the necessary facilities for managing post-operative care and should review and update these regularly. - Immediate post-operative management involves multidisciplinary care, but the overall responsibility is consultant anaesthetists. - There should be a named anaesthetist clinical lead (see glossary) for recovery. - Standardisation of the handover process can improve patient care by ensuring information completeness, accuracy and efficiency (checklists should be considered). Staff should comply with the local standardised handover processes.

No.	Name of guideline	Purpose	Recommendations
			- Staff should complete urgent tasks before information transfer, limiting conversations while performing tasks (adopting a 'sterile cockpit' approach). - If responsibility for care is transferred from one anaesthetist to another, a 'handover protocol' should be followed, during which all relevant information about the patient's history, medical condition, anaesthetic status, and plan should be communicated. - Patients should be transferred to the ward by two staff members, one of whom should be suitably trained to locally agreed standards. The anaesthetic record, recovery and prescription charts, and the post-operative plan, should accompany the patient and be communicated to the receiving ward nurse. - Processes for the communication and implementation of patient safety alerts should be in place • **Research, Audit and Quality Improvement** - Regular revision at the locally agreed timeframe and audit of standards of care, guidelines and protocols, and critical incident reporting is essential in the ongoing development and improvement of post-anaesthetic patient care. - The use of patient-reported outcome measures (PROMs) to assess physiological and other recovery domains after surgery could be considered. - Specific, measurable, attainable, relevant and time-bound (SMART) quality improvement

No.	Name of guideline	Purpose	Recommendations
			initiatives and safety measures could be embraced to improve safety and develop perioperative anaesthesia services. - Nurturing a safety culture, learning from mistakes, preventing harm and working as part of a team are all part of the safety discipline. To this end, shared learning and quality improvement that contribute towards progress in safety, such as critical incident reporting with thematic analysis and communication through morbidity and mortality meetings, could be undertaken. - Anaesthetists should participate in departmental audits throughout a complete audit cycle. This participation should adhere to the standards and principles outlined in the College's Compendium of audit recipes. - Post-operative care audits and quality improvement projects from the College's Compendium of audit recipes could be considered • **Patient Information** - The written and verbal information given to patients before their admission to the hospital should explain the purpose and nature of their recovery and the recovery department. You and your anaesthetic, published by the Royal College of Anaesthetists and the Association of Anaesthetists, are examples of this. - Further details on the information to be given pre-operatively can be found in the chapter

No.	Name of guideline	Purpose	Recommendations
			- Some patients, both adults and children, may need interpreters, parents or other members of their family to be with them. This need is best determined at preassessment to consider sensitivities in the operative process. - Patient information regarding post-operative and post-discharge care, including contact details and protocols, should be provided if complications arise.
	The Post-Operative Handover Assessment Tool (Nagpal et al., 2011)	To assess the completeness of post-operative handover	• **Patient Information** - Patient Name and Age - Medical History - Allergy Status - Name of Procedure - Current status of the patient • **Anaesthetic Information** - Type of Anaesthesia - Intraoperative anaesthetic course and any complications - Anticipated post-operative problems especially bleeding pain and airway - Monitoring and range of physiological parameters such as blood pressure, urine output - Analgesia plan - Plan for IV fluids

No.	Name of guideline	Purpose	Recommendations
			- Post-operative investigations - Contact number of a person in case of anaesthetic problem - Post-operative investigations • **Surgical Information** - Intraoperative surgical course and any complications. - Blood loss - Antibiotics plan - Medication plan (drugs to be restarted) - DVT prophylaxis - Plans for tubes and drains - NG tube and feeding plan - Post-operative investigation - Contact number for any surgical problem.
	The standard for Post-Anaesthesia Care (Committee on	To encourage Quality Patient Care	• **Standard I** - All patients who have received general anaesthesia, regional anaesthesia or monitored anaesthesia care shall receive appropriate post-anaesthesia management - A Post-anaesthesia Care Unit (PACU) or an area that provides equivalent post-anaesthesia care (for example, a Surgical Intensive Care Unit) shall be available to receive patients

No.	Name of guideline	Purpose	Recommendations
	Standards and Practice Parameters, 2019)		after anaesthesia care. All patients who receive anaesthesia care shall be admitted to the PACU or its equivalent except by specific order of the anaesthesiologist responsible for the patient's care. - The medical aspects of care in the PACU (or equivalent area) shall be governed by policies and procedures reviewed and approved by the Department of Anaesthesiology. - The design, equipment and staffing of the PACU shall meet the requirements of the facility's accrediting and licensing bodies. • **Standard II** - A patient transported to the PACU shall be accompanied by a member of the anaesthesia care team who is knowledgeable about the patient's condition. The patient shall be continually evaluated and treated during transport with monitoring and support appropriate to the patient's condition. - The patient's status on arrival in the PACU shall be documented. - Information concerning the pre-operative condition and the surgical/anaesthetic course shall be transmitted to the PACU nurse. - The member of the Anaesthesia Care Team shall remain in the PACU until the PACU nurse accepts responsibility for the nursing care of the patient. • **Standard IV**

No.	Name of guideline	Purpose	Recommendations
			- The patient's condition shall be evaluated continually in the PACU. - The patient shall be observed and monitored by methods appropriate to the patient's medical condition. Particular attention should be given to monitoring oxygenation, ventilation, circulation, level of consciousness and temperature. During recovery from all anaesthetics, a quantitative method of assessing oxygenation such as pulse oximetry shall be employed in the initial phase of recovery. - An accurate written report of the PACU period shall be maintained. Use of an appropriate PACU scoring system is encouraged for each patient on admission, at proper intervals before discharge and at the time of release. - General medical supervision and coordination of patient care in the PACU should be the responsibility of anaesthesiologists. - There shall be a policy to assure the availability in the facility of a physician capable of managing complications and providing cardiopulmonary resuscitation for patients in the PACU • **Standard V** - The patient is discharged to a hospital room, the Intensive Care Unit or a high dependency unit. - A physician is responsible for the patient's discharge from the post-anaesthesia care unit.

No.	Name of guideline	Purpose	Recommendations
			- When discharge criteria are used, they must be approved by the Department of Anaesthesiology and the medical staff. They may vary depending upon whether the ort stay unit or home. - In the absence of the physician responsible for the discharge, the PACU nurse shall determine that the patient meets the discharge criteria. - The name of the physician accepting responsibility for discharge shall be noted on the record. - Under extenuating circumstances, the responsible anaesthesiologist may waive the requirements marked with an asterisk (*); - it is recommended that when this is done, it should be so stated (including the reasons) in a note in the patient's medical record

Table 6.3: Full articles excluded with reasons for exclusion

No	Author, date	Title	Reason for elimination
1.	Blitz (2018)	Inadequate Preanesthetic Evaluation, Airway Trouble	The demographic characteristics, the clinical conditions of the patients, and the clinical procedures carried out were not correctly and defined
2.	Rogers (2020)	Using Telemedicine for Paediatric Preanaesthesia Evaluation: A Pilot Project	Incomplete article
3.	Rina et al. (2018)	Statistical Evaluation of Acepromazine and Midazolam as Pre-anaesthetics to Ketamine in Yak	Failure to demonstrate that treatment groups had identical qualities from the outset
4.	Bisinotto et al. (2016)	The preanaesthetic evaluation for ophthalmic surgery in the elderly is essential? The reality of a public hospital	The outcome variables, as well as the inclusion and exclusion criteria, were poorly defined.
5.	Gómez-Henao and Carreño-Dueñas (2016)	Cardiovascular pre-anaesthesia evaluation in oncological surgery	A criteria for a critical assessment of included literature was absent.
6.	Frost (2017)	Preanesthetic Assessment Clinic: Early Beginnings in the Bronx	The interest of the editorial was not relevant to the general body of anaesthesiology

6.3 FINDINGS

6.3.1 Distribution of Studies Included

Figure 6.2 shows that the number of papers published an increased year after year until 2019 and then decreased from 2020 to 2021. In Figure 6.3, Europe (n=12), North America (n=10), and Asia (6) produced the highest number of studies on pre and post-anaesthetic assessment. Africa recorded two studies that were conducted in Ethiopia. The reviewers found no studies conducted on pre and post-anaesthetic assessment in Ghana.

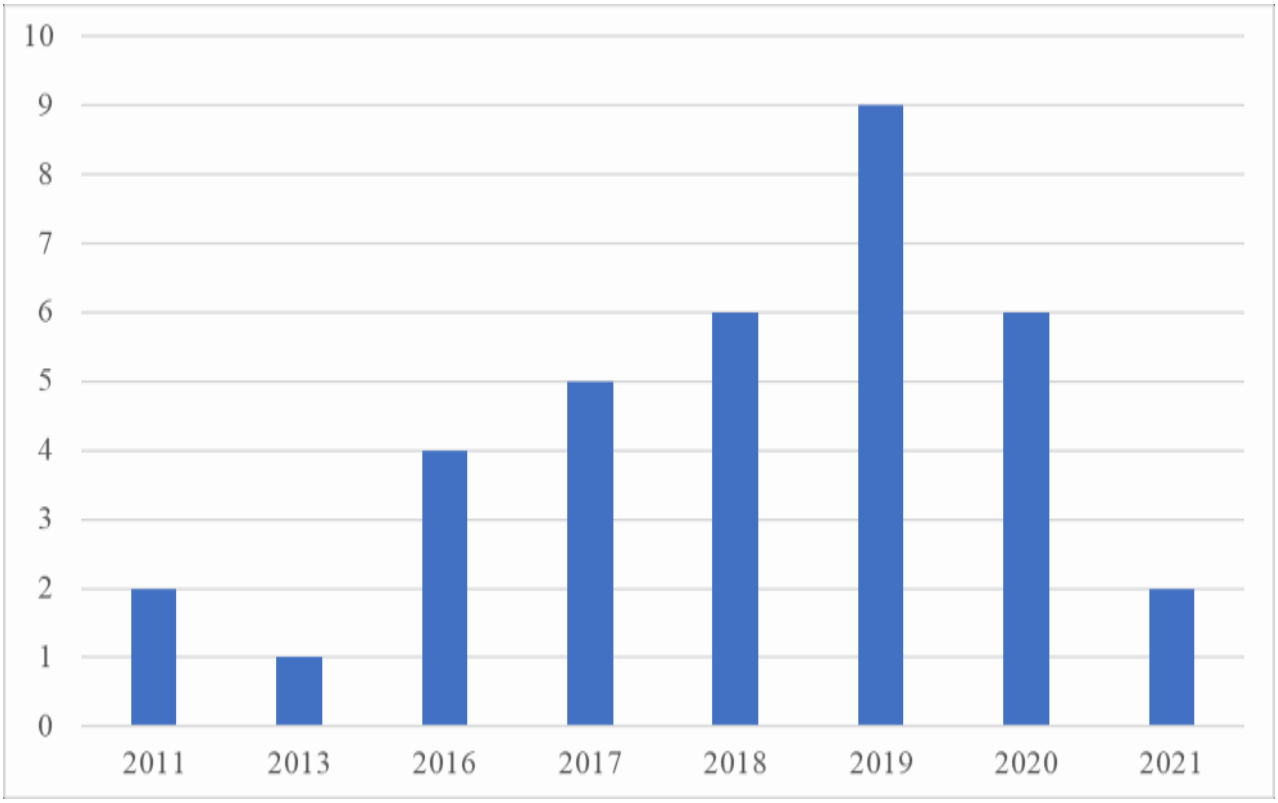


Figure 6.2: Yearly distribution of studies included

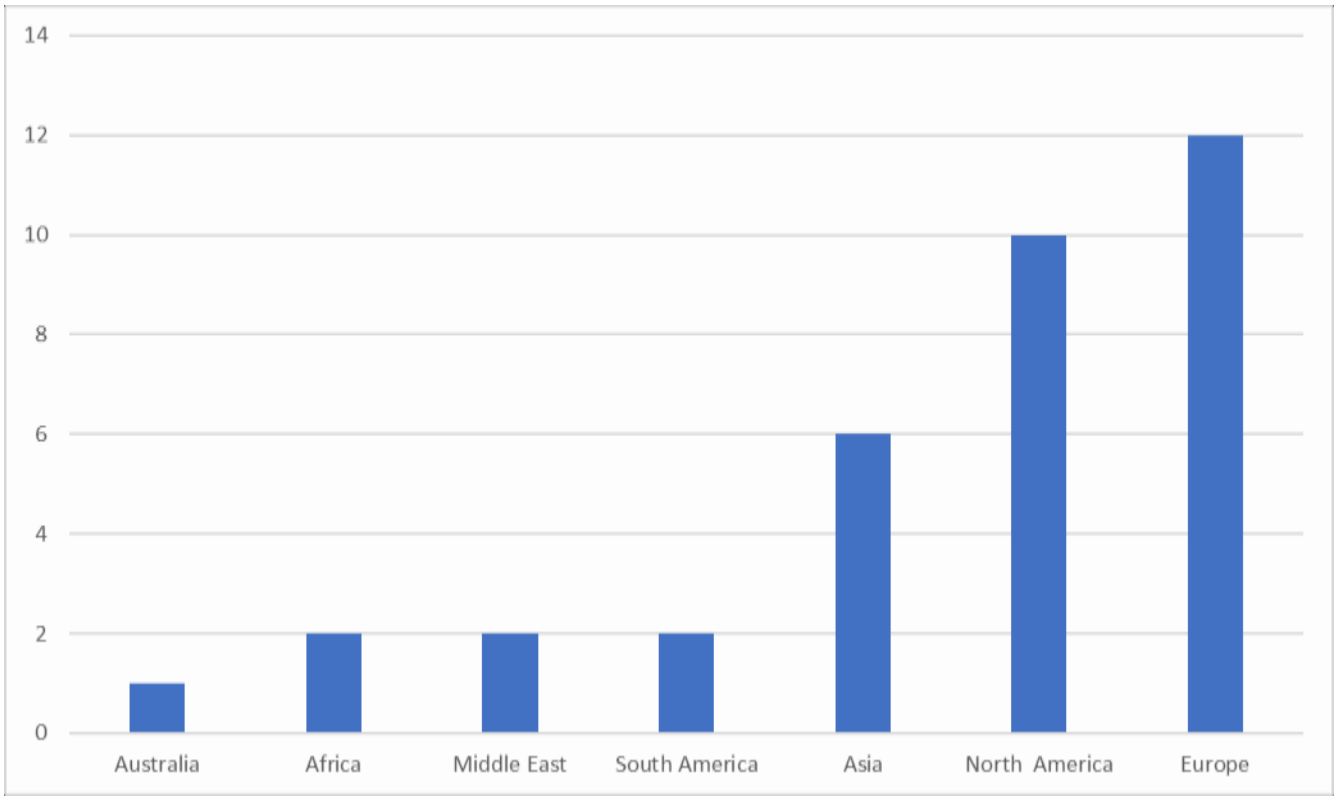


Figure 6.3: Continental distribution of papers included

6.3.2 Pre-anaesthetic assessment

6.3.2.1 Importance of pre-anaesthetic care

Almost all the studies included emphasised the importance of pre-anaesthetic assessment either explicitly or implicitly (Aldawoodi et al., 2021; Bailey et al., 2019; Soares et al., 2011; Vogiatzaki et al., 2015). In the European context, for instance, pre-anaesthetic assessment is considered as a comprehensive assessment of a patient for possible medical and other conditions that contraindicate anaesthesia or certain types of anaesthetic medications and surgical interventions, allowing for patient education, alleviation of anxiety and planning of perioperative care (Bailey et al., 2019; Osman et al., 2020b; Prabhu & Valchanov, 2017). In the United Kingdom, pre-anaesthetic outpatient clinics are instituted for pre-anaesthetic assessment (Bailey et al., 2019; Soares et al., 2011), which has resulted in reducing morbidity as well as mortality of surgical patients (Bailey et al., 2019; Soares et al., 2011).

Poor pre-anaesthetic assessment can lead to poor judgement exposing the client to various anaesthetic complications, which increase intra and post-operative morbidity and mortality (Bailey et al., 2019; Okamura et al., 2019). The poor pre-anaesthetic assessment could be due to lack of necessary equipment, the busy schedule of the anaesthetists and the presentation of the client at odd times (Kumar et al., 2013). The use of standardised pre-anaesthetic guidelines is necessary to provide efficient pre-anaesthetic care (Kumar et al., 2019).

6.3.2.2 What to consider

The preparation before transfer to the surgical theatre (pre-anaesthetic care) involves all the necessary physical examination, radiological investigations, laboratory investigation, history taking and pre-operative optimisations done to ensure the patient can tolerate the anaesthesia and surgical intervention (Aldawoodi et al., 2021; Almeshari et al., 2018; Ashfaq et al., 2017; Bailey et al., 2019; Berger-Estilita et al., 2020; Dramowski et al., 2017; Iyilikci et al., 2021; Molin et al., 2020; Nair et al., 2016; Okamura et al., 2019; Teruel et al., 2020; Weinstein & Aglio, 2016)

History taking

More than a quarter (25.7%) of the study included in the review indicated history training as part of the pre-anaesthetic assessment (Bailey et al., 2019; Berger-Estilita et al., 2020; Nair et al., 2016; Osman et al., 2020b; Prabhu & Valchanov, 2017; Srivastava et al., 2020; Teruel et al., 2020). Patient history, including past medical history, past surgical history and complication of anaesthesia and surgery, social history such as smoking, alcohol consumption and any form of social medications including herbal preparations are gathered (Bailey et al., 2019; Berger-Estilita et al., 2020; Nair et al., 2016; Osman et al., 2020b; Prabhu & Valchanov, 2017; Schnoor et al., 2018; Soares et al., 2011; Srivastava et al., 2020; Teruel et al., 2020).

Physical examination

Physical examination was reported in eight studies (Han et al., 2016; Mohammadi et al., 2016; Prabhu & Valchanov, 2017; Bailey et al., 2019; Sandal et al., 2019; Berger-Estilita et al., 2020; Osman et al., 2020) as crucial procedure during the pre-anaesthetic period. Patients are examined from head to toe for possible anatomical anomalies that may impact

intubation. Physical examination includes assessing for the mobility of the neck, tongue size, thyromental distance, the size of the mouth and the tongue, curvature of the spine, curvature of the patient. Pulmonary function tests include diffusing capacity of the lungs for carbon monoxide studies (Han et al., 2016; Mohammadi et al., 2016; Prabhu & Valchanov, 2017; Bailey et al., 2019; Sandal et al., 2019; Berger-Estilita et al., 2020; Osman et al., 2020).

Patient education

Although no study has explicitly reported patient teaching during the pre-anaesthetic period, it was implicit in their report. For example, Prabhu and Valchanov (2017) stated pulmonary function test as critical pre-anaesthetic assessment. Pulmonary function test included spirometry, which the anaesthetics must teach the patient to use. Reinforce education on the surgical condition and interventions by the surgeon and the anaesthesia process. Patients are encouraged to make contributions, ask questions, and then make choices based on their information. Empower patients to prepare themselves for the surgery and allay fears and anxiety (Ashfaq et al., 2017).

Patients are educated on medications to avoid during the pre-operative stage, which include antiarrhythmic agents; phenothiazine antipsychotics; selective serotonin reuptake inhibitors; macrolides antibiotics; antimalarial agents; anti histamines; and prokinetic agents (Ashfaq et al., 2017).

Premedication

Ten, representing (28.6%) of the studies included, listed premedication as an aspect of pre-anaesthetic assessment (Ahmad et al., 2020; Assefa & Sahile, 2019; Bailey et al., 2019; İyilikçi et al., 2021; Nair et al., 2016; Prabhu & Valchanov, 2017; Srivastava et al., 2020; Weinstein & Aglio, 2016; Woldegerima & Kemal, 2019). Premedication is described as medications that the patient requires to calm down or restore physiological functions for effective surgical procedures are administered by the anaesthetics. The anaesthetic team must ensure therapeutic beta-blockade continues and ensure that normal electrolyte profile is maintained during both the pre and post-operative stage (Ashfaq et al., 2017).

Laboratory and radiological investigations

Various laboratory and radiological investigations were stated as components of pre-anaesthetic assessment in 25.7% of the studies included. These include biochemical tests such as serum electrolytes, blood urea, serum creatinine, liver function tests, blood glucose, lipid profile and thyroid function tests, Magnetic Resonance Imaging (MRI), echocardiogram, electrocardiogram, three-dimensional airway model, complete blood count and other specialised test depending on the disease condition, age of the patient and the type surgery (Ashfaq et al., 2017; Bailey et al., 2019; Han et al., 2016; Mohammadi et al., 2016; Nair et al., 2016; Osman et al., 2020b; Prabhu & Valchanov, 2017; Soares et al., 2011; Weinstein & Aglio, 2016).

6.3.2.3 Predictors of outcomes during pre-anaesthetic assessment

Age was not a predictor of adverse cardiac outcome. However, medical history and comorbidities were more reliable predictors of negative cardiac outcome after surgery (Teruel et al., 2020). This essentially casts doubt on using the age-old criteria of taking age as a determinant of pre-anaesthetic outcome (Teruel et al., 2020). Variables significantly associated with emergence delirium were older age, substance abuse, pre-operative anxiety, benzodiazepine premedication, excessive blood loss, post-operative pain and more extended stay in the unit (Assefa & Sahile, 2019). Vocalisation was more frequent at each time point when compared with the physiological and respiratory indicators (Assefa & Sahile, 2019).

6.3.2.4 Innovations

Telemedicine pre-anaesthetic assessment was touted as a critical innovation in pre-anaesthetic care because of its ability to save patients time, money and stress (Aldawoodi et al., 2021; Rogers, 2020; Srivastava et al., 2020). It was recommended as alternative to out-patient consultations during the pre-anaesthetic period (Srivastava et al., 2020). Rogers (2020) stated that telephone pre-anaesthetic talks could save up to five million United States dollars (US$), which result from unannounced cancellation of surgeries. Additionally, Aldawoodi et al. (2021) reported that telemedicine saves about US$46 per patient and about 80 miles of travel distance to and from the health facility in addition to about 121 minutes of time for the patient and family. Also, the use of a computerised pre-

anaesthetic assessment application, (PATCH) was preferred by patients than nurse-led assessment. This system is able to assess patient status across all systems and conditions including allergies and lifestyle changes.

Using social platforms such as WhatsApp group to share pre-anaesthetic assessment reports among the surgical team provide a timely information for the team to make decisions, and to have the assessment record to evaluate outside the pre-anaesthetic clinic (Nair et al., 2016; Wajekar, 2017).

The use of a three-dimensional (3D) printing to evaluate difficult airway is one of the current innovations in pre-anaesthetic assessment. It is touted to provide a better view of changes and pathological malformations in the airway and enhances anaesthetic decision making (Han et al., 2016). The researchers stated that it is "fast, convenient, and relatively affordable technique".

6.3.3 Post-anaesthetic assessment

These are measures that are put in place from the time patient is transferred to the post-anaesthesia care unit (PACU) until the patient is discharged home or transferred to the ward (Bailey et al., 2019; Whitaker Chair et al., 2013). Older age, higher BMI, higher blood pressure, intraoperative use of corticosteroids and longer duration of surgery were strongly related hyperglycaemia in the post-anaesthetic period (Mohammadi et al., 2016).

6.3.3.1 Importance of post-anaesthetic assessment

Patients require continuous anaesthetic care in order to improve post-operative outcomes. Post-anaesthetic assessment reveals post-operative complications such as difficulty in breathing and hypoglycaemia and early detection could lead to effective management (Galvez et al., 2019; Pereira et al., 2017). Post-anaesthetic assessment improves practice and enhances post-anaesthetic documentation with the use of discharge tool.

Availability of a post-anaesthetic protocol/tool

Four studies emphasize the need for a post-anaesthetic tool for effective post-anaesthetic assessment. Street et al. (2018) found that the availability of post-anaesthetic assessment tool increases the likelihood of the anaesthetist to conduct post-anaesthetic assessment and

to remediate complications such as pain, nausea/vomiting and hypothermia. They also found that the availability of a post-anaesthetic assessment tool/protocol is a strong predictor of documenting post-anaesthetic outcomes (Street et al., 2018). Woelfel et al. (2019) reported that the use of Emergence Delirium in the Wounded Warrior (ED-WW) Tool was effective in assessing for delirium in post-anaesthetic patients; and Nagpal et al. (2011) evaluated the post-operative handover assessment tool developed by the Imperial College London (2011) and found it useful for post-anaesthetic assessment. Lastly, the snoring, trouble breathing, and un-efreshed (STBUR) questionnaire for the children is capable of identifying children who are at risk of prolonged post-anaesthetic recovery and need for oxygen therapy (Galvez et al., 2019)

6.3.3.2 What to consider during post-anaesthetic assessment

Resources needed

There should be a dedicated post-anaesthetic care unit (PACU), which was previously referred to as post-anaesthesia recovery unit (PARU) with the requisite equipment and logistics (Committee on Standards and Practice Parameters, 2019; Kumar et al., 2019; Whitaker Chair et al., 2013). It is also referred to as the recover unit/ward. This is a highly specialized critical care unit that receive patients from the surgical table for monitoring of consciousness and vital signs, oxygenation, pain management and body fluid maintenance (Chekol et al., 2021). Highly trained and motivated anaesthetists are expected to man this unit (Bailey et al., 2019; Kumar et al., 2019; Whitaker Chair et al., 2013). There are specialized nurses who also work in these units. Equipment such as cardiac monitors, pulse-oximeters, capnograph, ventilator, oxygen apparatus and other suppliers such as input and output charts are necessary for effective functioning in this unit. Analgesics and other prescribed medications based on the individual patients' characteristics and disease conditions are likewise made available (Committee on Standards and Practice Parameters, 2019; Kumar et al., 2019; Whitaker Chair et al., 2013) .

Monitoring

Monitor for level of consciousness, vital signs including temperature, pulse rate, respiratory rate, blood pressure, oxygen saturation, wound site and attachments such as wound drainage, venepuncture site for abnormalities, monitor fluid intake and output, level

of patient, electrocardiograph and others (Bailey et al., 2019; Committee on Standards and Practice Parameters, 2019; Kumar et al., 2019; Street et al., 2018; Whitaker Chair et al., 2013).

Body fluid maintenance

Ensure the patient is not dehydrated as they are incapable of drinking. Also, because the functioning of their bladder sphincter and other outlet muscles are affected by the anaesthetic, is the responsibility of the PACU staff to ensure they pass urine and discharge from the surgical site is monitored and restored using prescribed intravenous fluids. Accurate calculations and documentation of inputs and outputs are critical in this phase of the surgical procedure (Committee on Standards and Practice Parameters, 2019; Kumar et al., 2019; Nagpal et al., 2011; Rosenzweig et al., 2019; Whitaker Chair et al., 2013).

Pain management

After the assessment of the level of pain, prescribed analgesics are administered through parenteral drug intramuscular or intravenous (Assefa & Sahile, 2019; Bailey et al., 2019; Kumar et al., 2019; Nagpal et al., 2011; Street et al., 2018; Whitaker Chair et al., 2013) . Generally, patients in the PACU may not be able to verbalize their level of pain, hence appropriate pain management protocols need to be followed and documented (Whitaker Chair et al., 2013).

6.3.4 Documentation during anaesthetic assessment

Documentation is an essential component of pre and post-anaesthetic assessment and care (Aldawoodi et al., 2021; Stocki et al., 2018). Electronic and manual documentation and interventions to improve documentation during anaesthetic assessment were some of the findings retrieved from the papers involved.

6.3.4.1 Electronic vs manual documentation

The electronic based forms had better quality in all the assessed (missing items, errors, and unreadable items) (Almeshari et al., 2018). Thus, anaesthetics should adopt electronic based forms in pre-anaesthetic assessment. Modern methods of documentation such as electronic-based types should be employed during pre-anaesthetic examination (Woldegerima & Kemal, 2019).

6.3.4.2 Interventions to improve documentation during anaesthetic assessment

Improvement intervention and knowledge translation strategy improved the documentation of pain assessment up to 100% within six months of implementation (Stocki et al., 2018). Poor documentation was commonly done for anaesthetic plan, vital signs, a name, per-oral status, pre- medication, and age (Woldegerima & Kemal, 2019). Training should be given to anaesthetic team to improve on the practice of documentation during pre-anaesthetic evaluation (Woldegerima & Kemal, 2019).

6.4 SUMMARY OF FINDINGS OF INTEGRATIVE REVIEW

The two major themes found by the study included pre and post-anaesthetic assessment.

- The study found that pre-anaesthetic assessment is performed and it enhances patient education.
- Pre-anaesthetic assessment affords the anaesthesiologist an opportunity to know the patient, establish rapport and gain the cooperation of the patient.
- It provides avenue for thorough assessment and identification of comorbidities.
- Behaviour modification through relearning, lifestyle changes, exercise etc could be achieved prior to surgery to optimise the patient and enhance anaesthetic and surgical safety.
- The review found that fluid and effective pain management as key strategies for excellent recovery and patient comfort
- The review found that monitoring is vital in enhancing desirable post-operative outcomes.
- The enquiry reviewed medications that must be withheld and those that can be given as premedication to patients booked for surgery.
- The review found laboratory investigations and radiological examination as a key pre-operative enterprise.
- The review found that a pre and post-anaesthetic tool promote documentation and if it is electronic, further enhances complete documentation.

- A patient must be transported to the PACU unit accompanied by an Anaesthetist who has fore knowledge of the case.
- The review found early detection and intervention of complications as fundamental to post-anaesthetic assessment.
- Teaching and knowledge translation was found to improve documentation.
- The review found that there should be post-anaesthesia care unit (PACU) in the precinct of theatre and must have requisite modern equipment and highly trained clinical workforce. Children must be separated from adults.

6.5CHAPTER SUMMARY

This chapter assessed existing literature on the current pre-anaesthetic and post-anaesthetic practices in the global context. The essence of this was to obtain the best evidence from literature and infused the same into the guideline. The review highlights the role of pre-anaesthetic assessment as an importance exercise in determining obstructive sleep apnoea in patients scheduled for surgery. General anaesthesia and sedatives which are usually administered as part of the perioperative process tend to act as precipitating factors of obstructive night-time breathing problems. As such, pre-anaesthetic assessment is crucial in evaluating patient fitness for surgery.

In addition, post-anaesthetic assessment tools identified in the review include Snoring, Trouble Breathing, Un-Refreshed (STBUR) and Emergence Delirium in the Wounded Warrior (ED-WW) tool. The STBUR was aimed at identifying patients who are at risk of adverse respiratory outcome during the course of surgery. The ED-WW tool is used during the post-anaesthetic period. It is useful in the identification of emergence delirium. Failure of patients to fully emerge from their state of unconsciousness, which results from the administration of anaesthesia, is the basis for emergence of delirium. The PACT, composed of two parts, sets the framework for the discharge of patients from the post-anaesthetic ward. It provides a standard and accurate measure for the discharge of these patients.

For instance, the review identified that the prevalence of emergence delirium has been noted to be as low as 5% and as high as 80% with factors such as age, type of surgery and anaesthesia. This underscores the need for proper screening for this to be done during post-

anaesthetic examination. Moreover, the use of certain medications could increase the risk of adverse outcome during surgical procedure. Cardiac complications could be caused by antiarrhythmic agents and antimalarial agents. Mental health complications such as emergence delirium could result from the use of phenothiazine antipsychotics. In some jurisdictions, electronic documentation of anaesthetic procedures and assessments has been shown to be effective and improving on best practices according to a review by the Royal College of Surgeons (RCS). These findings highlight the need for the development of holistic pre-anaesthetic and post-anaesthetic guidelines.

CHAPTER 7 : DEVELOPMENT, VALIDATION, AND APPRAISAL OF THE PRE AND POST-ANAESTHETIC ASSESSMENT CLINICAL GUIDELINE

7.1 INTRODUCTION

This chapter deals with the development, validation, and appraisal of a clinical guideline for pre-and post-anaesthetic assessment in Ghana. A multidisciplinary team of experts made up of an anaesthesiologist, surgeons, certified registered anaesthetists, critical care nurse and patient advocacy group representative were purposely selected to develop the pre and post-anaesthetic assessment guidelines. A two-step validation process was put in place to ensure the credibility and validity of the clinical guidelines. This chapter has three main phases; guidelines development, validation (piloting), and appraisal of the guidelines. The first phase presents the development of the guidelines.

7.2 PHASE ONE: DEVELOPMENT OF THE DRAFT GUIDELINES

A letter of consent in a form of an information sheet was sent to each of the experts after they were purposefully selected to participate in the development of the clinical guidelines. The researcher presented synthesized evidence from the results. An integrative literature review was conducted to synthesize evidence on the current pre and post-anaesthetic assessment practices globally. The researcher could not find any context (Ghana) specific study while those studies found in sub-Saharan African countries were very few. It was necessary, therefore, to consider contextual nuances that may have effect on the guidelines development and implementation processes in Ghana. Three separate studies were conducted on the context: first, a survey of anaesthetists and certified registered anaesthetist was conducted to describe existing pre and post-anaesthetic assessment practices in Ghana; second, a document analysis to explore existing pre and post-assessment protocols used in Ghana; and third, a qualitative exploratory descriptive using semi-structured interviews was conducted to explore the challenges of pre and post-anaesthetic practices in Ghana. The evidence from all these studies delivered to the experts who intend developed the draft guidelines for evaluation.

7.2.1 Multidisciplinary Experts

A total of 15 experts were selected using purposive and snowballing sampling techniques. The researcher decided to separate the participants into two groups so that one group designs the guidelines and the other group appraises the final guidelines according to the AGREE II appraisal tool (Bargeri et al., 2021). Seven multidisciplinary experts (group 1) consented and participated in the development of the clinical guidelines (Table 7.1). Two were females and the remaining five were males. The ages of the experts ranged from 38 to fifty years. One consultant anaesthesiologist with a post-graduate qualification, two certified registered anaesthetists at the rank of deputy chief, and a principal with advanced diploma and master's qualifications, respectively, partook in the exercise. One critical care nurse at the level of a principal was involved. One patient advocate at the rank of deputy chief administrator with a master's degree was part of the team. Two surgeons, both with post-graduate qualifications in general surgery at the rank of consultant and specialist, were involved.

Table 7.1: Demographic characteristics of multidisciplinary experts

Participant	Age	Sex	Professional Cadre/Rank	Years of Working Experience	Level of Education
Expt 1	50	M	Consultant Surgeon	20	Post-graduate
Expt 2	54	M	Consultant Anaesthesiologist	26	Post-graduate
Expt 3	42	F	Principal Critical Nurse	16	First Degree
Expt 4	46	F	Deputy Chief CRA	20	Advanced Diploma
Expt 5	38	M	Principal CRA	15	Masters
Expt 6	38	M	Surgeon (Specialist)	12	Post-graduate
Expt 7	47	M	Deputy Chief Adm (Client Advocate)	21	Masters

7.2.2 Formulation of recommendations

After thorough examination of the evidence, the team outlined key findings on flip charts in bullet points. They studied the findings one after the other and made general comments regarding each of them. The researcher was available to explain any findings that they did not understand or to clarify any issues that they needed more information on. After deliberation, the experts selected the findings that could be formulated into recommendations for pre and post-anaesthetic assessment in Ghana using the 23 AGREE II items as a guide. The findings were triangulated (mapped out) and restated as recommendations as shown in Figure 7.1. Triangulation occurs when data from different sources are combined with the intent of increasing the integrity of the results of the study (Noble & Heale, 2019). Triangulation could be done at the level of data, data triangulation, or researchers (investigator triangulation), theory (theory triangulation) and methods (methodological triangulation) (Heale & Forbes, 2013; Johnson et al., 2017). In guidelines development, various steps are followed (Brouwers et al., 2010; World Health Organization, 2014). Critical among those steps is the synthesis of evidence and assessment of quality of evidence (Montgomery et al., 2019; World Health Organization, 2014).

Figure 7.1 shows the mapping of key findings selected by the experts to be included in the recommendations that constitute the guidelines developed in this study. From Figure 7.1, it could be seen that the key findings from all the phases are given unique colour codes and linked with their respective methodology to the left. These selected findings from the expert group were then re-synthesized into the 21 recommendations. Each recommendation was linked to the key finding that constitute it as shown in Figure 7.1. For example, the arrows converging on recommendation 1(R1) in Figure 7.1 shows that the recommendation was formulated from six key findings.

The 21 recommendations were stated and described with systematic steps in achieving the stated recommendations in the pre and post-anaesthetic guidelines. The developed guideline does not intend to replace the existing international guidelines and professional appraisal of the patient by the anaesthesiologist but to compliment the national delivery of safe and equitable anaesthesia. The AGREE II framework for guidelines development served as the framework for the development and the evaluation.

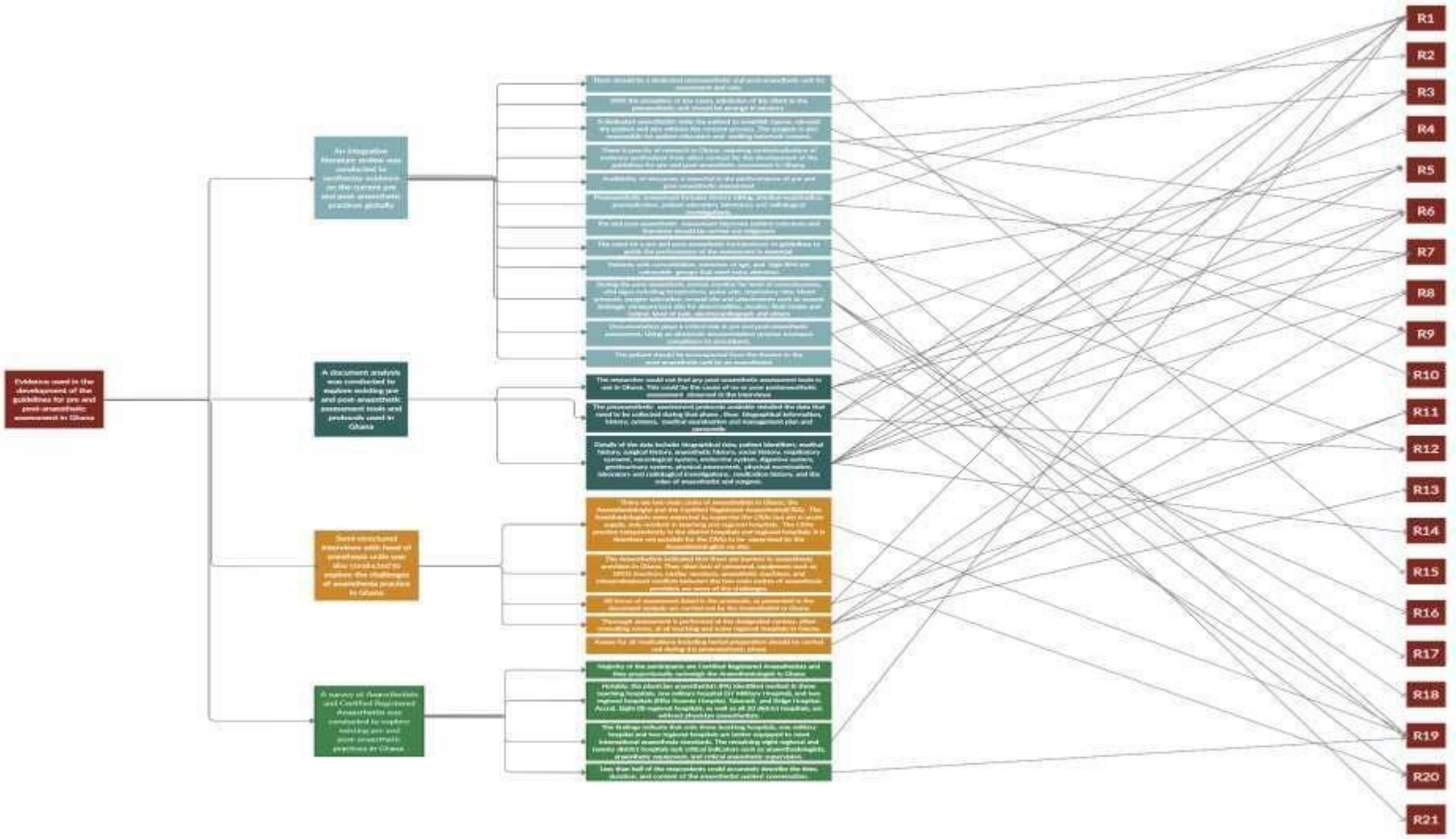


Figure 7.1: The development of pre and post-anaesthetic assessment guidelines for Ghana

Link to a high resolution version of Figure 7.1: https://drive.google.com/file/d/1M_LsyXWg6y3sT76E_CsMBL93KZcWGqzy/view

7.3 RESULT

The draft pre and post-anaesthetic draft clinical guidelines anchor primarily on 13 thematic areas based on the findings of phase one of the study. These included: patient identification, pre-rehabilitation, managing comorbidities, monitoring and supervision, personnel training and certification, communication and documentation, multidisciplinary risk appraisal, health system improvement, equipment and logistics, medication, multimodal pain management approach, post-anaesthesia care unit modalities, and post-anaesthetic visits.

7.4 THE DRAFT FRAMEWORK

7.4.1 Introduction

Clinical guidelines are a set of recommendations that are systematically developed following a rigorous process of synthesized scientific evidence from trusted sources shaped by an internationally approved evaluator guide (Linan et al., 2021). This seeks to inform the arc of perioperative trajectory, direct clinical judgment of practitioners to enhance safety and optimize outcomes for intervention. There is a paucity of evidence in Sub-Sahara Africa (SSA) and Ghana concerning context-driven evidence-based perioperative clinical guidelines with an emphasis on pre and post-anaesthetic assessment (English et al., 2017). Most of the guidelines that direct anaesthesia practice are borrowed from high-income countries (HICs) with different practice settings and organizational structure. Adopting such guidelines without recourse to the myriad of challenges that frustrate practice in low and middle income (LMI) settings can be described as the worst injustice ever perpetrated on anaesthesia practitioners and patients (Maaløe et al., 2021).

Comprehensively mastering the relevant knowledge in a contextually and culturally sensitive practice guideline holds the key to improved practice, and cost-saving, and could constitute an investment in high-value health service due to budgetary constraints and scarcity of resources (Engelman et al., 2019; Leech et al., 2020). In developing such an evidenced-informed guideline for acceptability, applicability, and replicability, one must subject the process to a thorough undertaking that eschews biases, conflict of interest, and a broader stakeholder involvement underpinned by experts' involvement (Linan et al., 2021; Rudolph et al., 2019;

Traversy et al., 2021). For easy applicability, the guideline must be user-friendly. The development of this guideline is premised on the understanding that the surgical disease burden in the sub-Sahara African region is very high with the scarcity of anaesthesiologists. Anaesthesia services are provided largely by non-physician anaesthetists at the baccalaureate level who largely operate at District, Mission health institutions, Military, Regional, Teaching, and a Quaternary hospital with little or no supervision. Adopting such guidelines and error reduction techniques such as protocols and surgical checklists will reduce veritable happenstances in the pursuit of providing safe anaesthesia for both elective/planned and emergency cases.

Lack of recognition, clear-cut academic and professional progression, deficient monitoring systems, and obsolete equipment is serving as a disincentive for the health sector to retain the best brains for the provision of safe and equitable anaesthesia services to their respective citizens. A regulatory and governance framework that protects the interest of the public and demands accountability from practitioners through capacity building and upgrade of knowledge and skill is the sine qua non to service delivery in reducing morbidity and mortality associated with anaesthesia administrations. Some countries have excellent regulatory, licentiate, and credentialing policies; nevertheless, they are constrained by inadequate personnel, equipment, and logistics and a worrying phenomenon of inter-professional conflict between the various cadres of anaesthesia providers that impact adversely on mutual respect and cooperation (Blaise Pascal et al., 2021). This nemesis derails every effort to promote the quality of health of patients. The pre and post-operative anaesthetic assessment guidelines adopted the AGREE II instrument framework of evaluation with special reference to guide the development process.

7.4.2 Source and strength of evidence

Evidence was sourced from a survey of practising anaesthetists in Ghana, key informant interviews of purposefully selected heads of the Department and Directorate of Anaesthesia in Ghana, integrative literature review of current practices of pre and post-anaesthetic assessment, and document analyses of pre and post-anaesthetic assessment tools in Ghana. Experts that developed the guidelines consisted of a panel of the multidisciplinary surgical team and patient

advocates. The experiential inputs of the panel were likewise incorporated. The processes that are undertaken to source the evidence will make the guidelines unique.

7.4.3 Objective / purpose of the guidelines

Surgical intervention and anaesthesia are nightmares for any patient scheduled for either elective or emergency operation. The fear of the unknown agitates the mind of the patient and relatives. A careful explanation of the perioperative trajectory to the patient and the significant others will allay the intractable fear and agony. The overarching objective of these guidelines is to offer evidence-based recommendations that will enable anaesthesia providers to offer an ambient environment to patients to ensure quality care to elicit the necessary information from them to enhance anaesthetic safety through a thorough pre-anaesthetic assessment that will optimize post-anaesthetic outcomes. This is intended for patients of all groups.

Pre and post-anaesthetic assessments are necessary for patients of all age groups in Ghana. In Ghana, at the highest level of care, the quaternary hospitals, and teaching hospitals, surgical patients are separated according to the structure and function of the facility; and sometimes according to the availability of the specialist. For example, paediatrics surgical ward, general surgery, gynaecology, cardiothoracic, neurosurgical unit, orthopaedic surgery, etc.

7.4.4 Target group

The guidelines are intended for all anaesthesia providers with the chief responsibility of providing safe and equitable anaesthesia to patients. They also apply in all clinical settings and facilities where anaesthesia is provided by well-trained health providers. This, however, is not a replacement of well analysed clinical situations since patients could present other clinical manifestations and the exigencies of the time may require a unique professional judgment to optimize patient safety. Peer review amongst practitioners of the guidelines will reveal the audit of usage and monitoring.

7.4.5 Resources mobilization and maintenance

The surgical disease burden imposed by the shortage of surgeons and anaesthesia providers in SSA cannot be overemphasized. The need to reverse this worrying trend by investing in

personnel, equipment and logistics, infrastructure, medicine and the quest to retain skilled manpower must be confronted head-on by anaesthesia and patient advocates.

7.4.5.1 Human resources

- There is an urgent need to train and retain more anaesthesia providers in SSA and Ghana in particular.
- All anaesthesia providers especially CRAs practising at the district, faith-based, regional, and private hospitals without the supervision of an anaesthesiologist should apply the pre and post-anaesthetic guidelines or protocol developed from it judiciously.
- Once the guidelines are placed on the electronic platform for practitioners, not many resources would be required for its printing.

7.4.5.2 Infrastructure

- The government and policymakers must improve budgetary allocation to the health sector with special emphasis on surgical and anaesthesia directorates, departments and units.
- Each health facility from Primary to Quaternary level must be provided with enough theatres, officers' consulting rooms, post-anaesthesia care units, recovery wards, and high dependency and intensive care units based on internationally approved standards.

7.4.5.3 Equipment

State of the art modern equipment must be procured and distributed to all facilities where anaesthesia services are provided. These must include anaesthetic machines, capnography, cardiac monitors, suction machines, oxygen plants in all hospitals, defibrillators, ventilators, infusion pumps, analgesic self-admiration pumps, intubation sets, laryngeal mask airway, fibreoptic intubation sets, all forms of catheters, blood gas analysers, blood warmers.

7.4.5.4 Fiscal resources

Hospitals must use internally generated funds judiciously in procuring vital logistics directed at patient care.

7.4.6 Funding and conflict of interest

The guidelines are fully funded by the researcher, and no entity could influence the content. The developers have no personal or corporate interests.

7.4.7 Strength limitations of the body of evidence

The researcher collated evidence from four studies. The rigorous process of annexing the evidence makes the clinical guidelines evidence-based. However, not all patient groups were involved. Recommendations made, however, were dependent on all the evidence that was appropriately pieced together.

7.4.8 Review of the guidelines

The guidelines are subject to review as new evidence in research and practice emerges. This could be done every five years by a consultative multidisciplinary expert panel.

7.4.9 Pre-anaesthetic assessment

7.4.9.1 Introduction

Pre-anaesthetic assessment forms part of the pre-operative phase of the perioperative pathway. It lies in the domain of the anaesthetic provider. However, jurisdictionally, nurse-led pre-anaesthetic assessment has proven to be efficient and cost-effective (Arun et al., 2021). This is the period where the patient books an appointment to see the anaesthetic provider after the decision of surgery is made. This helps the anaesthesia provider to detect comorbidities and risk factors that can compromise the smooth intraoperative phase leading to post-operative morbidity and mortality (Aitken, Harun, & Maier, 2021; Kristoffersen, Opsal, Tveit, Berg, & Fossum, 2021). A plan of care is instituted to avert any post-anaesthetic catastrophe. It also helps to minimize the cancellation of planned cases.

7.4.9.2 Recommendation 1: Biographical Data and Patient Identifies

Access all necessary biographic information and patient identity to prevent misidentification that leads to medical surgical and anaesthetic errors.

- Use telemedicine to collect history and patient information for individuals at risk of travelling.
- Enter patient data on the hospital's integrated electronic platform (HAMS/DIMS etc)
- Share pre-anaesthetic report on unit WhatsApp platform for all team members based on hospital's data protection policy.

7.4.9.3 Recommendation 2: Before Pre-arranged Admission

The patient must be informed of the diagnosis, the intended surgical intervention and the anaesthetic plan thoroughly discussed for the patient to choose the preferred procedure based on an expert guide.

- The anaesthetic provider must have a frank and open discussion with the patient ready to answer all nagging questions of the patient to gain acceptance and cooperation.
- Risk estimation is performed and the patient is made to appreciate understand his risk profile and possible outcome post-procedure.

7.4.9.4 Recommendation 3: Patient History Information

A piece of thorough cardinal patient information must be obtained. This constitutes medical history, surgical history, anaesthetic history, social history, and allergy, history of blood transfusion and vaccination history.

- The assessor must identify any comorbidity that exists and physiologically optimizes the patient to withstand both the surgical and anaesthetic stress with due consideration to the urgency of the required intervention.
- Patients with a high risk of post-operative morbidity and complications must be identified and appropriate interventions put in place to optimize post-anaesthetic and surgical care. This includes preparing the ICU, HDU PACU and Recovery Unit, and assigning a specific role to key actors for critical care.
- Pre-anaesthetic assessment must be conducted by the most experienced anaesthetist, CRA or anaesthesia provider with a keen interest in assessment.

- Every hospital irrespective of the level of care should aim to provide an appropriately well-furnished consulting room or an appropriate designated centre for the exclusive purpose of pre-anaesthetic assessment.

7.4.9.5 Recommendation 4: Effective Communication and Documentation

As much as practicable, errors must be avoided during pre-anaesthetic assessment sessions. anaesthetists, CRAs or anaesthesia providers must adopt the use of electronic systems which enhance decision analysing key findings. These platforms help in building scientific data for future reference, audit and research.

7.4.9.6 Recommended 5: Pre-operative initial care

Anaesthetists, CRAs and other anaesthesia providers must see to the optimization of patients and promotion of fitness by providing expert advice on;

- Cessation of smoking
- Appropriate exercise regime
- Possible weight reduction
- Managing chronic conditions and bringing titre values to normal or close to normal e.g. managing patient with thyrotoxicosis and bringing him/her to a euthyroid state, blood glucose level etc.
- Building patient's haemoglobin level to the normal range (female 12-16gdl, male 13-18gdl). If the patient cannot build the haemoglobin within a specific time, blood transfusion must be considered taking into consideration the patient's religious and belief system.

7.4.9.7 Recommendation 6: Physical Assessment

Anaesthetists, CRAs and other anaesthesia providers must ensure that physical assessment is performed for all patients. The American Society of Anaesthesiology classification is an internationally accepted domain of stratification of risk assessment that offers useful guidance. Adoption and the use of an assessment tool like Mallampati classification backed by the

patient's clinical presentations will help the practitioner to make the best decision for safe surgery and anaesthesia.

- Other vital parameters must be assessed, including thyromental distance; mobility of neck and jaw; chin-lift and head-tilt manoeuvre; receding chin; edentulous dentition;
- Use 3D printing to evaluate the airway. 3D models provide a better view of changes in the airway and a better guide for pre-anaesthetic
- Use 3D laryngoscopy in difficult intubation
- Use 3D fibreoptic laryngeal intubation in patients with dysmorphic features in conditions like Pitt-Rogers syndrome that presents microcephalia, micrognathia etc.

7.4.9.8 Recommendation 7: Investigations

Routine laboratory investigations must be carried out to confirm clinical indicators. The surgeon, anaesthetist, CRA or the anaesthesia provider must collaborate for further advanced investigations only in the interest of the patient since it could be costly and can discourage the patient from undergoing the surgical intervention.

- Routine investigations such as full blood count, grouping and crossmatching, sickling, kidney and liver function test.
- Further requests can be made based on the clinical appraisal of the patient by the Anaesthetist or the CRA. These include but are not limited to; biochemical assays, haematological studies, immunological studies, microbiological investigations, radiological examinations such as X-rays, CT-Scan, mammograms, MRIs and laboratory investigations before surgery.

7.4.9.9 Recommendation 8: Multidisciplinary Risk Appraisal

The surgical team and the critical care staff must have a joint conference for risk appraisal and strategy of planned management established for high-risk patients. Determining the level of risk will shape the appropriate management approach.

The following variables of interest that predict pre, intra and post-operative morbidity and mortality may be used;

- Age
- Sex
- BMI
- Socioeconomic status
- Fatigue estimation
- Cardiovascular comorbidities- Diagnosed ischaemic heart disease (myocardial infarction and angina pectoralis)
- Diagnosed peripheral arterial disease
- Confirmed deep vein thrombosis (DVT)
- Diagnosed heart failure
- Established serious liver disease (Cirrhosis, Ca Liver)
- Diagnosed ischaemic brain disease (stroke and transient ischaemic attacks)
- Diagnosed kidney failure with derange titre values (BUE, Urea, Creatinine)

7.4.9.10 Recommendation 9: Medication and Supplement

Assess for medications and supplements that the patient may be taking especially the level of a herbal product(s) used during the pre-anaesthetic assessment. This could interact with other medications such as anaesthetics leading to undesirable outcomes.

7.4.9.11 Recommendation 10: After planned admission

Plan operating sessions to facilitate pre-anaesthetic visits by the designated anaesthetist, CRA or the anaesthesia provider responsible for the patient to undertake the underneath;

- Establish a rapport to gain the cooperation of the patient and relatives.
- Reinforce directives and determine the adequacy of pre-anaesthetic assessment
- Confirm the plan and discuss anaesthetic and post-operative care
- Bring to the sharp focus of the patient and relatives or significant other, the potential and actual risk involved in both the anaesthetic provision and surgical intervention, and certify that the patient and the relatives are comfortable with the intended surgical intervention.

- Work with the Intensivist, Critical Nurse leader for the availability of beds at ICU, HDU, PACU or recovery ward depending on the patient's condition, the planned strategy of management and institutional policy
- In the event of postponement or cancellation of the procedure the anaesthetist, CRA or the anaesthesia provider must;
- Immediately communicate to the patient and relatives
- Discontinue the fasting of the patient if appropriate
- Provide convincing reasons for the cancellation to gain future cooperation.
- Bring to the attention of the rest of the surgical team members and the recovery staff the reason for the decision
- Make sure the decision is expressly documented in the patient's E-folder / Folder noting any directive to resuscitation or request for further investigation.
- If the reason is as a result of a shortage of theatre supplies attempts should be made to replenish it from the CSSD or the hospital stores.
- Surgery must be performed on the scheduled date without fail.
- The patient who had his/ her case cancelled must be prioritized.
- All bottlenecks and inefficiencies must be resolved to avoid future postponements.

7.4.9.12 Recommendation 11: Immediate Pre-anaesthetic Care

Check baseline vital signs and record them before the commencement of anaesthesia.

Served prescribed premedication such as Anxiolytics in the evening before day surgery.

7.4.9.13 Recommendation 12: Post-planned Admission

Anaesthetists, CRA and anaesthesia providers should apply all established principles that govern electives to those patients admitted for emergency surgical interventions. Strict adherence to error preventing protocols such as the WHO surgical checklist could be helpful.

- Information sharing between anaesthetists, CRAs or any anaesthesia provider, surgeons and intensivist and critical care providers should be clear and concise without any ambiguity.

- The risks and benefits of surgery should be explained clearly.
- Any decision reached by the surgical team and the patient relatives must be documented in the patient's record books such as;
- The decision to go ahead with the surgical intervention against all odds irrespective of the absence of important laboratory results
- Or not to intervene due to correctable veritable surgical disease
- In trying to resuscitate a patient to optimise them physiologically, careful consideration and a reasonable balance should be struck in achieving that and to avoid unnecessary delays that could jeopardise the life of the patient. A multidisciplinary consensus should be reached for the way forward in the singular interest of the patient.
- Due recognition should be given to patient relatives and significant others. They must be given any useful information that will enable them to participate in decision making in connection with the care of the patient.

7.4.9.14 Recommendation 13: Minors (Before Admission)

Comparatively, the admission of a minor follows the same as an adult. The diagnosis and detailed information of the admission process, surgical intervention and anaesthetic plan is discussed with the parents, paying attention to extreme anxiety and readying to alleviate it. The information must be hand-held and given to the child and the parents. The pre-anaesthetic evaluation should consist of;

- A comprehensive developmental history of the child including the length of gestation and immunization history must be elicited.
- History of the birthing process must be requested
- Medical history
- Surgical history
- Anaesthetic history of the child and the family
- The child should be physically examined for any dysmorphic features or any form of congenital abnormalities.
- Sickling and electrophoresis test should be done

- Airway assessment is extremely important to reveal the presence of loose teeth usually deciduous in nature. Any finding should be documented.

7.4.9.15 Recommendation 14: Minors (Before Admission)

Minors have special needs and therefore the anaesthetist, CRA or the anaesthesia provider must pay attention to detail when eliciting information from the parents. As much as practicable, if the child can speak, questions about feeding should first be put to the child.

- In emergencies, a desperate mother can lie about whether the child has eaten or not. Parents must be cautioned and the dangers of aspiration explained to them.
- The regime of fasting and oral fluid administration should be explained to the parents and the child.

7.4.9.16 Recommendation 15: Minors (Admission)

Privacy of children is important. Under no circumstance should children be mixed up with adults in hospital settings. Adolescents must be separated from children. The anaesthetist, CRA or the anaesthesia provider must visit the child and the parents to confirm the pre-anaesthetic assessment instructions, establish rapport and discuss the mode of anaesthetic delivery and the medication involved. Other carers must ensure the underneath to make the admission process smooth and seamless.

- Parents must sign the consent form for children below sixteen (16) years, however, emancipated or Gillick competent children can consent to their surgery since they live independent lives.
- Parents must accompany the child to the induction unit or the theatre
- The child must be clothed in a dress of his / her choice.
- Topical application of local anaesthetic to deaden pain during venepuncture
- Any laboratory investigation that in the estimation of the surgeon and the anaesthetist or CRA could prove useful must be requested and results inspected.
- The following parameters must be gathered since the anaesthesia provider will depend on it for drug administration

- Age

- Sex
- BMI
- Height
- Weight

7.4.9.17 Patient's Advocacy

- Surgical experience is a fearful episode so patients should be supported to embrace the possible outcomes.
- Risk assessment must be performed for all patients and expand the safety net.
- Pre-operative optimization must be ensured
- Any potential or actual threat that possesses considerable danger to anaesthetic and surgical safety must be eliminated.
- Any intractable anxiety must be allayed through a concerted effort.

7.4.10 Post-anaesthetic assessment

7.4.10.1 Introduction

Post-anaesthetic assessment covers a compendium of activities involved after the completion of the surgical intervention and the concomitant primary anaesthesia at the post-anaesthesia care unit till the patient fully returns to his/her pre-anaesthetic state. It is the responsibility of the Anaesthetic provider to ensure that the patient is safe and all physiological parameters have returned to their baseline figures.

7.4.10.2 Purpose of the Guidelines for Post-anaesthetic Care

The essence of the post-anaesthetic assessment guidelines is to assist anaesthesia providers to champion and be less burdened with the safety and post-anaesthetic optimization of patients who have received any form of anaesthesia ranging from general, regional or conscious sedation to local infiltration. This is achieved by instituting strict and most appropriate evaluation and monitoring strategies as well as assessing the evidence and churning out

recommendations that will enhance post-operative safety, hence outcomes ensuring the quality of life of patients. It is the considered view that the recommendation will be individualised based on the patient's needs and professional clinical evaluation.

7.4.10.3 Focus

Post-operative adverse events are challenges that confront practitioners thereby reducing patient confidence in the health system and post-anaesthetic quality of life. The guidelines focus on standardising post-operative management and criteria of discharge and improving post-anaesthetic quality of life. The guidelines are recommended to all patients of all age groups who have undergone successful surgical intervention and had received anaesthesia of all kinds. The guidelines are open to modifications that are context-driven, patient-directed and practitioner friendly. The principal objective is to help practitioners navigate through the complex web of post-operative pathways leading to enhanced patient safety and swift return to family life.

7.4.10.4 Application

The post-anaesthetic guidelines are intended for practising anaesthetists, Certified Registered anaesthetists or any anaesthesia provider and all healthcare workers who administer any kind of anaesthesia for the exclusive purpose of surgical intervention.

7.4.10.5 Recommendation 1: Post-operative Facility

There should be a designated facility within the precincts of the surgical theatre with standardized bedding and spacing to allow the movement of critical staff and resuscitation. The coordination and general medical supervision of the post-anaesthesia recovery unit (PARU) or Post-anaesthesia care unit (PACU) should be the responsibility of an anaesthesiologist or CRA in the absence of an intensivist or intensive care nurse specialist.

- The PACU must be well ventilated, if possible, mechanically to draw out accumulated air that might contain vaporized anaesthetics from fumes of patients who received general anaesthesia.

- In case an anaesthetic machine is placed in the recovery ward it must have a scavenging system.
- The recovery ward must be well equipped with minimum monitoring devices, oxygen source and resuscitation equipment including Automated External Defibrillator (AED)
- An easy reach area should be designated for spouses or next of kin of all patients in the theatre. A clinical psychologist could be provided to allay their anxiety till they are invited by a theatre organizer or a designated clinical staff to the recovery intermittently.

7.4.10.6 Recommendation 2: Transport and Handing over at PACU

An Anaesthetist or a CRA who is a member of the anaesthetic team and has a fair knowledge of the condition must accompany the patient. The patient must have a pulse oximeter in situ to monitor pulse and oxygen saturation. A patient who received general anaesthesia must be transported on oxygen.

- Handing over of patient must be done by paying attention to detail. The medical personnel receiving the patient must be a registered PACU attendant with certification in Basic and Adv Availability and Strength of Evidenced Life support.
- A minim of two staff members must attend to a patient at the PACU. One of whom must be a registered nurse.
- Any patient who has an endotracheal tube must have it connected to a ventilator, an Ayres T-Piece or an oxygen source by the anaesthetist or the CRA to avoid medical errors.
- The condition of the patient must be re-assessed by the accompanying anaesthetist, CRA or the anaesthesia provider verbally uttered and documented

7.4.10.7 Recommendation 3: Airway Assessment and Monitoring

Evaluate the condition of the patient continues with emphasis on airway patency, level of consciousness, respiration rate, oxygen saturation, temperature, and blood pressure till the patient can attain and maintain cardiopulmonary stability. Depending on the haemodynamic and the general medical condition, the patient's vital signs could be assessed as follows;

- Five minutes for the first 30 minutes. The condition must be assessed and if stable monitored every 15 minutes for one and half hours.
- Minimum information to be recorded for patients in the post-anaesthesia care unit include;
- Level of consciousness
- Patency of the airway
- Respiratory rate and adequacy
- Oxygen saturation
- Oxygen administration
- Blood pressure
- Heart rate and rhythm
- ECG
- Pain intensity on an agreed scale
- Nausea and vomiting
- Intravenous infusions
- Drugs administered
- Core temperature
- Other parameters depending on circumstances, e.g. urinary output and colour, central venous pressure, expired CO2, and surgical drainage volume and colour
- Note however that the frequency of monitoring of these parameters depends on the level of consciousness, the nature of the surgical intervention and the body part involved.
- The post-anaesthesia unit must have airway adjuncts available to lessen the tendency of upper airway obstruction which has the propensity of causing post obstructive pulmonary oedema and severe hypoxemia.

7.4.10.8 Recommendation 4: Pain Assessment and Management

Pain assessment and management of the patient using a locally adopted rating scale, multidiscipline approach and multimodal analgesia pain management is highly recommended. Opioids and other analgesics must be readily available to anaesthetists or CRAs and the head of the department is put to charge for purposes of accountability.

7.4.10.9 Recommendation 19: Anaesthetic Evaluation

Post-anaesthesia or post-operative anaesthetic assessment must be conceptualized and incorporated in the practice of post-operative management. A designated team of anaesthetists, CRAs or anaesthesia providers must assess the patient with a post-anaesthetic assessment tool (PAAT) for effective documentation.

- Patients who received non-depolarizing neuromuscular blocking agents or patients who have any history or family history of neuromuscular dysfunction must have their neuromuscular function evaluated.
- The PAAT, which could be locally developed, could have major variables as follows;
- Patient information
- Anaesthetic data
- Surgical data
- Post-anaesthetic evaluation data
- Anaesthetic instructions

7.4.10.10 Recommendation 20: Complication management

All post-operative care units must have availability of equipment, monitoring devices, medication, protocol and personnel for managing post-operative complications such as difficulty in breathing, hypoxia, nausea and vomiting, hypertensive and hypotensive crises, shivering, hypothermia, malignant hyperthermia and cardiac arrest, as well as systems for pain management, and blood and fluid management in adults and children.

- For effective communication and maintenance of patient dignity, prostheses like hearing aids, dentures and visual aids must be at easy reach in the PACU.
- Medications such as vasoactive, resuscitation drugs, opioid antagonists and dantrolene should be present in all recovery units.
- Actively document all post-anaesthetic complications to guide future induction of anaesthesia.

7.4.10.11 Recommendation 21: Special Patient Groups

Minors have unique needs and must have specialist hospitals with the required specialist to handle them. These include paediatric surgeons and anaesthetists. In event of children patronizing adult hospitals, special areas must be mapped-out for them and their parents for swift attention. On surgical days children should be prioritized over adults.

- Children must have a separate recovery area or a special area within the PACU.
- Parents must be at easy reach and have the opportunity to reunite with the child as soon as the child recovers from anaesthesia.
- Under no circumstances must children be left alone in a recovery ward.
- Paediatric equipment and logistics must be readily available in the recovery room. These include ventilators, Ambu-bags, nasogastric tubes, resuscitation equipment and medications.

Frail elderly patients

- Frail patients require meticulous care and therefore a multidisciplinary team consisting of surgeons, anaesthetists, geriatricians and allied health professionals such as laboratory scientists, physiotherapists and respiratory therapists should be involved to ensure that they get the best of care.
- During the pre-operative preparation, careful consideration should be made in administering anxiolytics and other medications like midazolam or diazepam since these may aggravate delirium post-operatively.
- Chest X-rays and strict cardiopulmonary assessments should be done to isolate lung cancer, especially in patients with a prolonged history of smoking and alcoholism
- Pain assessment and management should be given utmost priority in the elderly especially those with symptoms of senile dementia

Obese patients

- Obese patients must be transported to PACU on supplemental oxygen and pulse oximeter. If possible, it is recommended that the patient is placed on positive pressure ventilation using non-invasive ventilation.
- Patients who received nondepolarizing muscle relaxants should be monitored for possible re-curarization (patient getting re-paralysed).

Critically ill patients

- Critically patients must be admitted to an intensive care unit or high dependency unit.
- If they are admitted to the recovery ward, the attending health professional must be well trained in airway management and resuscitation. Anaesthetists or intensivists must be at easy reach to augment the effort of the clinical officer.

Parturient

- Attending clinical staff must pay attention to Parturient (obstetric) patients under their care in the recovery ward.
- Vital signs should be monitored and documented accurately. Any slight deviation of parameters outside the patient's baseline values should be reported immediately to the attending physician.
- Training of recovery ward staff on obstetric management should be given prime consideration.

7.5 SUMMARY

Phase one comprises the necessary steps taken to develop the draft guidelines for pre and post-anaesthetic assessment in Ghana. In this phase, multidisciplinary experts triangulated results from integrative literature review and the empirical studies conducted to develop recommendations, which constituted the guidelines using the AGREE II framework as a guideline. The next section presents the validation of the guidelines (results of the pilot study).

7.5.1 Phase two: validation of the draft guidelines

This phase solicited the experiential and professional views of three distinguished practitioners on how easily applicable, feasible and useful the draft clinical guidelines could be to practitioners and improve anaesthesia practice in Ghana. The essence of embarking on a pilot study during the implementation of clinical guidelines is to unravel any potential difficulties that may be faced during implementation and so as to review the guidelines to overcome such challenges (Polit, 2017; Beneciuk et al., 2022).

7.5.2The pilot testing process

The developed guidelines were presented to the three experts for pilot testing purpose. The specific feedback from the experts is presented in Table 7.2.

Table 7.2: Specific feedback from anaesthetists

ANAESTHETISTS	FEEDBACK (Comments and recommendations)
ANAES 1	• Required anaesthetic equipment should be of highest standard bearing in mind the cost of equipment in Sub-Saharan Africa • The recommendations are succinct and evidence-based and can easily be adopted. • A post-anaesthetic assessment tool (PAAT) should be created from the guidelines to strengthen post-anaesthetic evaluation and continuous anaesthetic care. • The researcher must keep in copy, the various regulatory agencies for integration in possible training curricula.
ANAES 2	• Incorporate patient fasting guidelines in the pre-anaesthetic phase of the guidelines to prevent over fasting of babies and frail patients. • Indicate clearly if nurses trained to do pre-anaesthetic assessment could use the guidelines. • Minimum time to be spent with a patient at the pre-anaesthetic clinic must be captured to enhance patient satisfaction.

ANAESTHETISTS	FEEDBACK (Comments and recommendations)
ANAES 3	• Providing a separate post-anaesthesia care unit (PACU) for children would be difficult in the district. I suggest the PACU unit be partitioned with transparent material to aid monitoring. • Can the guidelines state the minimum equipment to be provided for safe anaesthesia services? • The stated period for anaesthetic follow-up must be captured. • The guidelines should recommend the closure of theatres that do not meet minimum standard operative care. • Having locally prepared guidelines in the history of Ghana will improve safety, especially for non-physician anaesthetists without supervision.

7.5.3 Changes made

Not many changes were made to the draft framework because most of the comments were supportive, albeit some of them (Table 7.2) were taken into consideration when the guidelines were updated.

7.5.3.1 Creation of a post-anaesthetic assessment tool from the guidelines

A participant stated that a post-anaesthetic tool should be developed to guide practitioners in their post-anaesthetic assessment. These comments were evaluated and added to recommendation 19, thus *"Anaesthetists, CRAs or Anaesthesia providers must assess the patient with a post-anaesthetic assessment tool (PAAT) for effective documentation".*

7.5.3.2 Separate recovery area for children

A participant stated that children should be given a specialised post-anaesthetic care unit or be separated from adults in the PACU. Thus *"Children must have a separate recovery area or a special area within the PACU"* was added to recommendation 21.

7.5.3.3 Incorporation of fasting guidelines

A participant suggested that recommendations for the discontinuation of fasting for patients whose procedures were cancelled or postponed should be incorporated into the guidelines. Thus *"Discontinue the fasting of the patient if appropriate if the case is postponed or cancelled"* was added to recommendation 10.

7.5.3.4 Time spent with the patient at the pre-anaesthetic clinic

Minimum time to be spent with a patient at the pre-anaesthetic clinic must be captured to enhance patient satisfaction.

7.5.3.5 Closure of theatres that do not meet minimum safety requirements

The guidelines should recommend the closure of theatres that do not meet minimum standard operative care.

7.5.3.6 Summary of the section

In this phase, the researcher presented the guidelines to practitioners to use and provide feedback on its applicability. Responses were received from the participants, which were used in improving the guidelines. The next phase presents the adaptation and appraisal of the framework developed.

7.5.4 Phase three: Appraisal and adaptation of guidelines

The section focussed on the appraisal process that eventually culminated into finalization and adaptation of the pre and post-anaesthetic clinical guidelines for Ghana. The AGREE II instrument was utilized to rate the clinical guidelines development's rigour (Hoffmann-Eßer et al., 2018). The purpose of subjecting the draft guidelines to validation by a multidisciplinary team was to verify whether they conform to the 23 items in the six domains and meet international standards. The appraisal method was discussed in detail in the method section.

7.5.4.1 Result of clinical guidelines appraisal

The recommendations included in the clinical guidelines were unanimously endorsed by the specialists who evaluated them and they were deemed appropriate for achieving the desired results. They also expressed their delight with the rigorous development process. The final guidelines accurately recorded and integrated each recommendation and suggestion.

7.5.4.2 Domain 1: Scope and Purpose

The scope and purpose is the first domain of the AGREE II instrument. This looks at whether the overall objectives of the guidelines are specifically described, the health question(s) covered by the guidelines is (are) specifically described and lastly, the population (patients, public, etc) to whom the guidelines are meant to apply is specifically described. Table 7.3 provided the appraisers assessment of the first domain.

Table 7.3: Appraiser's assessment of domain 1

APPRAISER	ITEM 1	ITEM 2	ITEM 3	TOTAL
1	7	7	7	21
2	7	7	7	21
3	7	7	7	21
4	7	7	7	21
5	7	7	7	21
6	7	7	7	21
7	7	7	7	21
TOTAL	49	49	49	147

To demonstrate how to calculate the cumulative scores across the domain based on the seven (7) Appraiser's scores of the three individual items in the first domain in the instrument with the seven-point scale, having 1 as strongly disagree to 7 as strongly agree is given as follows;

Maximum possible score =7(strongly agree) x 3 (scoring items) x 7(Appraisers) = 147
Minimum possible score =1(strongly disagree) x 3 (scoring item) x 7 (Appraisers) 21

The scaled Domain 1 score will be given by:

$$\frac{\text{Obtained score - minimum possible score}}{\text{Maximum possible score – Minimum possible score}} \times 100$$

$$= \frac{147-21}{147-21} = \frac{126}{126} = 1.0 \times 100 = 100\%$$

A cumulative score of 100% was obtained for Domain 1 (scope and purpose)

This shows that in developing the guidelines, the scope and purpose were addressed.

The appraisers were unanimous in concluding that the items in the domain were met. No comment was made.

7.5.4.3 Domain 2: Stakeholder Involvement

Domain 2 of the AGREE II instrument, stakeholder involvement, is also made of three items and covers areas like the guidelines development group includes individuals from all the relevant professional groups, views and preferences of the target population (patients, public, etc) have been sought and lastly, the target users of the guidelines are clearly defined. Table 7.4 presents the scoring results of the appraisers.

Table 7.4: Appraisers' assessment of domain 2, Stakeholders Involvement

APPRAISER	ITEM 4	ITEM 5	ITEM 6	TOTAL
1	7	7	7	21
2	7	7	7	21
3	7	7	7	21
4	7	7	7	21
5	7	7	7	21
6	7	7	7	21
7	7	7	7	21
TOTAL	49	49	49	147

To demonstrate how to calculate the cumulative scores across the domain based on the seven (7) Appraiser's scores of the three individual items in the second domain in the instrument with the seven-point scale, having 1 as strongly disagree to 7 as strongly agree is given as follows;

Maximum possible score =7(strongly agree) x 3 (scoring items) x 7(Appraisers) = 147
Minimum possible score =1(strongly disagree) x 3 (scoring item) x 7 (Appraisers) 21
The scaled Domain 2 score will be given by:

$$\frac{\text{Obtained score - minimum possible score}}{\text{Maximum possible score – Minimum possible score}} \times 100$$

$$= \frac{147-21}{147-21} = \frac{126}{126} = 1.0 \times 100 = 100\%$$

One hundred percent (100%) score was made for domain 2, stakeholder involvement. The expert appraisers were satisfied with the involvement of a multidisciplinary team of surgeons, certified registered anaesthetists, anaesthesiologists, critical care nurses and patient advocacy groups in the development process. Indicating the target population and users would resolve any ambiguity. The score obtained showed how pleased the experts were. No changes were suggested.

7.5.4.4 Domain 3: Rigour of Development

Domain three consists of eight items showing that; systematic methods were used to search for evidence, the criteria for selecting the evidence is clearly described, the strength and limitations of the body of evidence are clearly described, the method for formulating the recommendations are clearly described, the health benefits, side effects and risks have been considered when formulating the recommendations, explicit link between the recommendations and the supporting activities, the overall guidelines have been externally reviewed by experts before publishing and the procedure for updating the guidelines is provided. The items are from 7-14.

Table 7.5 presents appraisers' assessment of the 3rd domain, rigour of development.

Table 7.5: Appraisers' assessment of rigour of development

Appraiser	ITEM 7	ITEM 8	ITEM 9	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	Total
1	**7**	**7**	**7**	**7**	**7**	**7**	**6**	**7**	**55**
2	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**56**
3	**7**	**7**	**7**	**7**	**7**	**7**	**6**	**7**	**55**
4	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**56**
5	**7**	**7**	**7**	**7**	**7**	**6**	**7**	**7**	**55**
6	**7**	**7**	**6**	**7**	**7**	**7**	**7**	**7**	**55**
7	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**56**
Total	**49**	**49**	**48**	**49**	**49**	**48**	**47**	**49**	**388**

Maximum possible score =7(strongly agree) x 8 (scoring items) x 7(Appraisers) = 392

Minimum possible score =1(strongly disagree) x 8 (scoring item) x 7 (Appraisers) =56

The scaled Domain 3 score will be given by:

$$\frac{\text{Obtained score - minimum possible score}}{\text{Maximum possible score – Minimum possible score}} \times 100$$

$$= \frac{833-56}{392-56} = \frac{332}{336} = 0.988 \times 100 = 99\%$$

The cumulative scale score for the third domain, the rigour of development, was 99%. The appraisers approved the guidelines without any modification. However, three of the appraisers have underneath comments;

- The Appraiser 1, under item 13 indicated that he scored six (6) because the guidelines have not been externally reviewed before publishing. The researcher contends that the guidelines have not been published.
- Appraiser three likewise cited that the guidelines have not gone for external review before they were published.

- Appraiser 5, under item 12, indicated that the supporting evidence, although present, must not be embedded in a sentence but must stand alone for easy identification

Notwithstanding the above comments, the experts resolved that the guidelines met the established standards prescribed by AGREE trust and the AGREE II framework of evaluation of clinical guidelines.

7.5.4.5 Domain 4: Clarity of Presentation

Clarity of presentation is the fourth domain of the AGREE II instrument, and it has three items that are concerned with recommendations. It include; being specific and unambiguous, various options for treating the conditions or health status being clearly described, and the ability to quickly identify the most important recommendations. The succinct nature of the recommendation is the centre stage for this domain. The items are from (15-17) of the framework. Table 7.6 has the appraisers' assessment.

Table 7.6: Appraisers' Assessment of domain

Appraiser	Item 15	Item 16	Item 17	Total
1	7	7	7	21
2	6	7	7	20
3	7	7	7	21
4	7	7	7	21
5	7	7	7	21
6	7	7	7	21
7	7	7	7	21
Total	46	49	49	146

Appraiser's scores of the three individual items in the first domain in the instrument with the seven-point scale, having 1 as strongly disagree to 7 as strongly agree is given as follows;

Maximum possible score =7 (strongly agree) x 3 (scoring items) x 7 (Appraisers) = 147

Minimum possible score =1 (strongly disagree) x 3 (scoring item) x 7 (Appraisers) 21

The scaled domain score will be given by:

$$\frac{\text{Obtained score - minimum possible score}}{\text{Maximum possible score – Minimum possible score}} \times 100$$

$$= \frac{146-21}{147-21} = \frac{125}{126} = 0.99 \textbf{ X } 100 = 99\%$$

A cumulative percentage of 99% was scored for domain four.

The appraisers were unanimous in approving this domain. However, appraiser 2 scored 6 for item 15. She averred that although the recommendations are specific and unambiguous, the sentences were too long in her estimation.

It was thus established that the guidelines conform to international standards since the evaluation tool does not frown upon long recommendations so long as they are precise and have clarity.

7.5.4.6 Domain 5: Applicability

This is the fifth domain of the AGREE II instrument and has items that cover how the guidelines describe the facilitators and barriers to application, how the guidelines provide advice matters and /or tools on how the recommendations can be put into practice. It also looks at potential resource implications of applying the recommendations that have been considered and lastly, the guidelines present monitoring and/or auditing. Appraisal of domain five is presented in Table 7.7.

Table 7.7: Appraisers' Assessment

Appraiser	Item 18	Item 19	Item 20	Item 21	Total
1	7	7	7	7	28
2	7	7	7	7	28

Appraiser	Item 18	Item 19	Item 20	Item 21	Total
3	7	7	7	7	28
4	7	7	7	7	28
5	7	7	7	7	28
6	7	7	7	7	28
7	7	7	7	7	28
Total	49	49	49	49	196

Obtained score - minimum possible score

The scaled domain score = Maximum possible score – Minimum possible score x 100

$$= \frac{196-49}{196-49} = \frac{147}{147} = 1 \mathbf{X} 100 = 100\%$$

The total percentage realised for applicability of the pre and post-anaesthetic clinical guidelines was 100%. This confirms that the guidelines are applicable according to the framework of evaluation.

7.5.4.7 Domain 6: Editorial independence

Editorial independence is the last of the six domains of the AGREE II instrument and is made up of two items. This sought to unravel whether the views of the funding body have not influenced the content of the guidelines and as to whether competing interests of guidelines development group members have been recorded and addressed (Table 7.8).

Table 7.8: Appraisers' assessment of domain 6, editorial independence

Appraisal	Item 22	Item 23	Total
1	**7**	**7**	**14**
2	**7**	**6**	**13**
3	**7**	**7**	**14**
4	**7**	**7**	**14**
5	**7**	**7**	**14**

6	**7**	**7**	**14**
7	**7**	**7**	**14**
Total	**49**	**48**	**97**

Scaled domain score of editorial independence = Obtained score – Minimum possible score

Maximum possible score – Minimum possible score

$$= \frac{97 - 14}{98 - 14} = \frac{83}{84} = 0.988 \times 100 = 99\%$$

A score of 99% was obtained for the domain of editorial independence. Six of the appraisers were satisfied. However, the appraiser scored 6 for the 23rd item of the AGREE II instrument. She wondered how all the multidisciplinary members could not have any competing interests. Nevertheless, the document stated expressly that they had no competing interests.

No suggestions were made and the team unanimously approved the domain of having satisfied the principles enshrined in the AGREE II evaluation instrument and the guide.

7.5.4.8 Overall guidelines assessment

The instrument mandates appraisers to rate the overall quality of the clinical guidelines on a scale of 1 to 7. Where 1 denotes the lowest possible quality and 7 is the highest possible quality.

All the appraisers scored 7 meaning that the pre and post-anaesthetic clinical guidelines are of the highest quality and are capable of enhancing surgical safety and optimising post-operative outcomes.

7.5.4.9 Recommendation

All the seven multidisciplinary expert appraisers fully recommended the pre and post-anaesthetic clinical guidelines for use by the intended users and further expanded it to cover

others based on the content, namely nurses, non-physician anaesthesia providers, Certified Registered Anaesthetists, anaesthesiologist, intensivist and critical care nurses.

7.5.4.10 Final Comment

As dictated by the framework, the appraisers were supposed to comment after giving their recommendations for the usage of the guideline:

Appraiser 1- Very instructive and comprehensive piece capable of improving intervention outcomes.

Appraisal 2- Excellent work done it is fit for purpose and Ghana and sub-Saharan Africa would be the better for it.

Appraiser 3- Well done, this will certainly improve the practice of safe anaesthesia and the surgical continuum.

Appraiser 4- The guideline is extensive and perfect.

Appraiser 5- Very good, the guideline was well structured with highly sourced evidence, which is incontrovertible,

Appraiser 6- A very laudable project which must be implemented to improve healthcare outcomes.

Appraiser 7- An excellent clinical guideline with great supporting recommendations capable of improving post-operative outcome and patient safety.

7.6 THE PRE AND POST-ANAESTHETIC ASSESSMENT CLINICAL GUIDELINES FOR GHANA

7.6.1 Pre-anaesthetic assessment

Pre-anaesthetic assessment forms part of the pre-operative phase of the perioperative pathway. It lies in the domain of the anaesthetic provider. However, jurisdictionally, nurse-led pre-

anaesthetic assessment has proven to be efficient and cost-effective (Arun et al., 2021). This is the period where the patient books an appointment to see the anaesthetic provider after the decision of surgery is made. This helps the anaesthesia provider to detect comorbidities and risk factors that can compromise the smooth intraoperative phase leading to post-operative morbidity and mortality (Aitken, Harun, & Maier, 2021; Kristoffersen, Opsal, Tveit, Berg, & Fossum, 2021). A plan of care is instituted to avert any post-anaesthetic catastrophe. It also helps to minimize the cancellation of planned cases.

7.6.1.1 Recommendation 1: Biographical Data and Patient Identifies

Access all necessary biographic information and patient identity to prevent misidentification that leads to medical surgical and anaesthetic errors.

- Use telemedicine to collect history and patient information for individuals at risk of travelling.
- Enter patient data on the hospital's integrated electronic platform (HAMS/DIMS etc)
- Share pre-anaesthetic report on unit WhatsApp platform for all team members based on hospital's data protection policy.

7.6.1.2 Recommendation 2: Before Pre-arranged Admission

The patient must be informed of the diagnosis, the intended surgical intervention and the anaesthetic plan thoroughly discussed for the patient to choose the preferred procedure based on an expert guide.

- The anaesthetic provider must have a frank and open discussion with the patient ready to answer all nagging questions of the patient to gain acceptance and cooperation.
- Risk estimation is performed and the patient is made to appreciate understand his risk profile and possible outcome post-procedure.

7.6.1.3 Recommendation 3: Patient History Information

A piece of thorough cardinal patient information must be obtained. This constitutes medical history, surgical history, anaesthetic history, social history, allergy, history of blood transfusion and vaccination history.

- The assessor must identify any comorbidity which exists and physiologically optimizes the patient to withstand both the surgical and anaesthetic stress with due consideration to the urgency of the required intervention.
- Patients with a high risk of post-operative morbidity and complications must be identified and appropriate interventions put in place to optimize post-anaesthetic and surgical care. This includes preparing the ICU, HDU PACU and Recovery Unit, and assigning a specific role to key actors for critical care.
- Pre-anaesthetic assessment must be conducted by the most experienced anaesthetist, CRA or anaesthesia provider with a keen interest in assessment.
- Every hospital irrespective of the level of care should aim to provide an appropriately well-furnished consulting room or an appropriate designated centre for the exclusive purpose of pre-anaesthetic assessment.

7.6.1.4 Recommendation 4: Effective Communication and Documentation

As much as practicable, errors must be avoided during pre-anaesthetic assessment sessions. Anaesthetists, CRAs or anaesthesia providers must adopt the use of electronic systems which enhance decision analysing key findings. These platforms help in building scientific data for future reference, audit and research.

7.6.1.5 Recommended 5: Pre-operative initial care

Anaesthetists, CRAs and other anaesthesia providers must see to the optimization of patients and promotion of fitness by providing expert advice on;

- Cessation of smoking
- Appropriate exercise regime
- Possible weight reduction
- Managing chronic conditions and bringing titre values to normal or close to normal e.g. managing patient with thyrotoxicosis and bringing him/her to a euthyroid state, blood glucose level etc.
- Building patient's haemoglobin level to the normal range (female 12-16gdl, male 13-18gdl). If the patient cannot build the haemoglobin within a specific time, blood

transfusion must be considered taking into consideration the patient's religious and belief system.

7.6.1.6 Recommendation 6: Physical Assessment

Anaesthetists, CRAs and other anaesthesia providers must ensure that physical assessment is performed for all patients. The American Society of Anaesthesiology classification is an internationally accepted domain of stratification of risk assessment that offers useful guidance. Adoption and the use of an assessment tool like Mallampati classification backed by the patient's clinical presentations will help the practitioner to make the best decision for safe surgery and anaesthesia.

- Other vital parameters must be assessed, including thyromental distance; mobility of neck and jaw; chin-lift and head-tilt manoeuvre; receding chin; edentulous dentition;
- Use 3D printing to evaluate the airway. 3D models provide a better view of changes in the airway and a better guide for pre-anaesthetic
- Use 3D laryngoscopy in difficult intubation
- Use 3D fibreoptic laryngeal intubation in patients with dysmorphic features in conditions like Pitt-Rogers syndrome that presents microcephalia, micrognathia etc.

7.6.1.7 Recommendation 7: Investigations

Routine laboratory investigations must be carried out to confirm clinical indicators. The surgeon, anaesthetist, CRA or the anaesthesia provider must collaborate for further advanced investigations only in the interest of the patient since it could be costly and can discourage the patient from undergoing the surgical intervention.

- Routine investigations such as full blood count, grouping and crossmatching, sickling, kidney and liver function test.
- Further requests can be made based on the clinical appraisal of the patient by the Anaesthetist or the CRA. These include but are not limited to; Biochemical assays, haematological studies, immunological studies, microbiological investigations, radiological examinations such as X-rays, CT-Scan, mammograms, MRIs and laboratory investigations before surgery.

7.6.1.8 Recommendation 8: Multidisciplinary Risk Appraisal

The surgical team and the critical care staff must have a joint conference for risk appraisal and strategy of planned management established for high-risk patients. Determining the level of risk will shape the appropriate management approach. The following variables of interest that predict pre, intra and post-operative morbidity and mortality may be used;

- Age
- Sex
- BMI
- Socioeconomic status
- Fatigue estimation
- Cardiovascular comorbidities- Diagnosed ischaemic heart disease (myocardial infarction and angina pectoralis)
- Diagnosed peripheral arterial disease
- Confirmed DVT
- Diagnosed heart failure
- Established serious liver disease (Cirrhosis, Ca Liver)
- Diagnosed ischaemic brain disease (stroke and transient ischaemic attacks)
- Diagnosed kidney failure with derange titre values (BUE, Urea, Creatinine)

7.6.1.9 Recommendation 9: Medication and Supplement

Assess for medications and supplements that the patient may be taking especially the level of a herbal product(s) used during the pre-anaesthetic assessment. This could interact with other medications such as anaesthetics leading to undesirable outcomes.

7.6.1.10 Recommendation 10: After planned admission

Plan operating sessions to facilitate pre-anaesthetic visits by the designated Anaesthetist, CRA or the anaesthesia provider responsible for the patient to undertake the underneath;

- Establish a rapport to gain the cooperation of the patient and relatives.

- Reinforce directives and determine the adequacy of pre-anaesthetic assessment
- Confirm the plan and discuss anaesthetic and post-operative care
- Bring to the sharp focus of the patient and relatives or significant other, the potential and actual risks involved in both anaesthetic provision and surgical intervention, and certify that the patient and the relatives are comfortable with the intended surgical intervention.
- Work with the Intensivist, Critical Nurse leader for the availability of beds at ICU, HDU, PACU or recovery ward depending on the patient's condition, the planned strategy of management and institutional policy
- In the event of postponement or cancellation of the procedure the anaesthetist, CRA or the anaesthesia provider must;
- Immediately communicate to the patient and relatives
- Discontinue the fasting of the patient if appropriate
- Provide convincing reasons for the cancellation to gain future cooperation.
- Bring to the attention of the rest of the surgical team members and the recovery staff the reason for the decision.
- Make sure the decision is expressly documented in the patient's E-folder / Folder noting any directive to resuscitation or request for further investigation.
- If the reason is as a result of a shortage of theatre supplies attempts should be made to replenish it from the CSSD or the hospital stores.
- Surgery must be performed on the scheduled date without fail.
- The patient who had his/ her case cancelled must be prioritized.
- All bottlenecks and inefficiencies must be resolved to avoid future postponements.

7.6.1.11 Recommendation 11: Immediate Pre-anaesthetic Care

Check baseline vital signs and record them before the commencement of anaesthesia.

Served prescribed premedication such as Anxiolytics in the evening before day surgery.

7.6.1.12 Recommendation 12: Post-planned Admission

Anaesthetists, CRA and Anaesthesia providers should apply all established principles that govern electives to those patients admitted for emergency surgical interventions. Strict adherence to error preventing protocols such as the WHO surgical checklist could be helpful.

- Information sharing between anaesthetists, CRAs or any anaesthesia provider, surgeons and intensivist and critical care providers should be clear and concise without any ambiguity.
- The risks and benefits of surgery should be explained clearly.
- Any decision reached by the surgical team and the patient relatives must be documented in the patient's record books such as;
- The decision to go ahead with the surgical intervention against all odds irrespective of the absence of important laboratory results
- Or not to intervene due to correctable veritable surgical disease
- In trying to resuscitate a patient to optimise them physiologically, careful consideration and a reasonable balance should be struck in achieving that and to avoid unnecessary delays that could jeopardise the life of the patient. A multidisciplinary consensus should be reached for the way forward in the singular interest of the patient.
- Due recognition should be given to patient relatives and significant others. They must be given any useful information that will enable them to participate in decision making in connection with the care of the patient.

7.6.1.13 Recommendation 13: Minors (Before Admission)

Minors have special needs and therefore the anaesthesia provider must pay attention to detail when eliciting information from the parents. As much as practicable, if the child can speak, questions about feeding should first be put to the child. Comparatively, the admission of a minor follows the same as an adult. The diagnosis and detailed information of the admission process, surgical intervention and anaesthetic plan is discussed with the parents, paying attention to extreme anxiety and readying to alleviate it. The information must be hand-held and given to the child and the parents. The pre-anaesthetic evaluation should consist of;

- A comprehensive developmental history of the child including the length of gestation and immunization history must be elicited.
- History of the birthing process must be requested
- Medical history
- Surgical history
- Anaesthetic history of the child and the family
- The child should be physically examined for any dysmorphic features or any form of congenital abnormalities.
- Sickling and electrophoresis test should be done
- Airway assessment is extremely important to reveal the presence of loose teeth usually deciduous in nature. Any finding should be documented
- In emergencies, a desperate mother can lie about whether the child has eaten or not. Parents must be cautioned and the dangers of aspiration explained to them.
- The regime of fasting and oral fluid administration should be explained to the parents and the child.

7.6.1.14 Recommendation 14: Minors (Admission)

Privacy of children is important. Under no circumstance should children be mixed up with adults in hospital settings. Adolescents must be separated from children. The anaesthetist, CRA or the anaesthesia provider must visit the child and the parents to confirm the pre-anaesthetic assessment instructions, establish rapport and discuss the mode of anaesthetic delivery and the medication involved. Other carers must ensure the underneath to make the admission process smooth and seamless.

- Parents must sign the consent form for children below 16 years; however, emancipated or Gillick competent children can consent to their surgery since they live independent lives.
- Parents must accompany the child to the induction unit or the theatre
- The child must be clothed in a dress of his / her choice.
- Topical application of local anaesthetic to deaden pain during venepuncture
- Any laboratory investigation that in the estimation of the surgeon and the anaesthetist or CRA could prove useful must be requested and results inspected.

- The following parameters must be gathered since the anaesthesia provider will depend on it for drug administration
- Age
- Sex
- BMI
- Height
- Weight

7.6.2 Post-anaesthetic assessment

Post-anaesthetic assessment covers a compendium of activities involved after the completion of the surgical intervention and the concomitant primary anaesthesia at the post-anaesthesia care unit till the patient fully returns to his/her pre-anaesthetic state. It is the responsibility of the Anaesthetic provider to ensure that the patient is safe and all physiological parameters have returned to their baseline figures.

7.6.2.1 Purpose of the Guidelines for Post-anaesthetic Care

The essence of the post-anaesthetic assessment guideline is to assist anaesthesia providers to champion and be less burdened with the safety and post-anaesthetic optimization of patients who have received any form of anaesthesia ranging from general, regional or conscious sedation to local infiltration. This is achieved by instituting strict and most appropriate evaluation and monitoring strategies as well as assessing the evidence and churning out recommendations that will enhance post-operative safety, hence outcomes ensuring the quality of life of patients. It is the considered view that the recommendation will be individualised based on the patient's needs and professional clinical evaluation.

7.6.2.2 Focus

Post-operative adverse events are challenges that confront practitioners thereby reducing patient confidence in the health system and post-anaesthetic quality of life. The guideline focuses on standardising post-operative management and criteria of discharge and improving post-anaesthetic quality of life. The guideline is recommended to all patients of all age groups

who have undergone successful surgical intervention and had received anaesthesia of all kinds. The guideline is open to modification that is context-driven, patient-directed and practitioner friendly. The principal objective is to help practitioners navigate through the complex web of post-operative pathways leading to enhanced patient safety and swift return to family life.

7.6.2.3 Application

The post-anaesthetic guideline is intended for practising Anaesthetists, Certified Registered Anaesthetists or any anaesthesia provider and all healthcare workers who administer any kind of anaesthesia for the exclusive purpose of surgical intervention.

7.6.2.4 Recommendation: 1 Post-operative Facility

There should be a designated facility within the precincts of the surgical theatre with standardized bedding and spacing to allow the movement of critical staff and resuscitation. The coordination and general medical supervision of the post-anaesthesia recovery unit (PARU) or Post-anaesthesia care unit (PACU) should be the responsibility of an anaesthesiologist or CRA in the absence of an Intensivist or Intensive Care Nurse Specialist.

- The PACU must be well ventilated, if possible, mechanically to draw out accumulated air that might contain vaporized anaesthetics from fumes of patients who received general anaesthesia.
- In case an anaesthetic machine is placed in the recovery ward it must have a scavenging system.
- The recovery ward must be well equipped with minimum monitoring devices, oxygen source and resuscitation equipment including Automated External Defibrillator (AED)
- An easy reach area should be designated for spouses or next of kin of all patients in the theatre. A clinical psychologist could be provided to allay their anxiety till they are invited by a theatre organizer or a designated clinical staff to the recovery intermittently.

7.6.2.5 Recommendation 2: Transport and Handing over at PACU

An anaesthetist or a CRA who is a member of the anaesthetic team and has a fair knowledge of the condition must accompany the patient. The patient must have a pulse oximeter in situ to

monitor pulse and oxygen saturation. A patient who received general anaesthesia must be transported on oxygen.

- Handing over of patient must be done by paying attention to detail. The medical personnel receiving the patient must be a registered PACU attendant with certification in Basic and Adv Availability and Strength of Evidenced Life support.
- A minim of two staff members must attend to a patient at the PACU. One of whom must be a registered Nurse.
- Any patient who has an endotracheal tube must have it connected to a ventilator, an Ayres T-Piece or an oxygen source by the anaesthetist or the CRA to avoid medical errors.
- The condition of the patient must be re-assessed by the accompanying anaesthetist, CRA or the anaesthesia provider verbally uttered and documented

7.6.2.6 Recommendation 3: Airway Assessment and Monitoring

Evaluate the condition of the patient continues with emphasis on airway patency, level of consciousness, respiration rate, oxygen saturation, temperature, and blood pressure till the patient can attain and maintain cardiopulmonary stability. Depending on the haemodynamic and the general medical condition, the patient's vital signs could be assessed as follows;

- Two minutes 30 seconds for the first 30 minutes. The condition must be assessed and if stable, patient is monitored every Five (5) for 30 minutes 15 minutes till patient is discharged from PACU.
- Minimum information to be recorded for patients in the post-anaesthesia care unit include;
- Level of consciousness
- Patency of the airway
- Respiratory rate and adequacy
- Oxygen saturation
- Oxygen administration
- Blood pressure

- Heart rate and rhythm
- ECG
- Pain intensity on an agreed scale
- Nausea and vomiting
- Intravenous infusions
- Drugs administered
- Core temperature
- Other parameters depending on circumstances, e.g. urinary output and colour, central venous pressure, expired CO2, and surgical drainage volume and colour

- Note however that the frequency of monitoring of these parameters depends on the level of consciousness, the nature of the surgical intervention and the body part involved.
- The post-anaesthesia unit must have airway adjuncts available to lessen the tendency of upper airway obstruction which has the propensity of causing post obstructive pulmonary oedema and severe hypoxemia.

7.6.2.7 Recommendation 4: Pain Assessment and Management

Pain assessment and management of the patient using a locally adopted rating scale, multidiscipline approach and multimodal analgesia pain management is highly recommended. Opioids and other analgesics must be readily available to anaesthetists or CRAs and the head of the department is put to charge for purposes of accountability.

7.6.2.8 Recommendation 5: Anaesthetic Evaluation

Post-anaesthesia or post-operative anaesthetic assessment must be conceptualized and incorporated in the practice of post-operative management. A designated team of anaesthetists, CRAs or anaesthesia providers must assess the patient with a post-anaesthetic assessment tool (PAAT) for effective documentation.

- Train more anaesthesiologist and CRA’s to enhance post-anaesthetic evaluation.

- Patients who received non-depolarizing neuromuscular blocking agents or patients who have any history or family history of neuromuscular dysfunction must have their neuromuscular function evaluated.
- The PAAT, which could be locally developed, could have major variables as follows;
- Patient information
- Anaesthetic data
- Surgical data
- Post-anaesthetic evaluation data
- Anaesthetic Instructions

7.6.2.9 Recommendation 6: Complication management

All post-operative care units must have availability of equipment, monitoring devices, medication, protocol and personnel for managing post-operative complications such as difficulty in breathing, hypoxia, nausea and vomiting, hypertensive and hypotensive crises, shivering, hypothermia, malignant hyperthermia and cardiac arrest, as well as systems for pain management, and blood and fluid management in adults and children.

- For effective communication and maintenance of patient dignity, prostheses like hearing aids, dentures and visual aids must be at easy reach in the PACU.
- Medications such as vasoactive, resuscitation drugs, opioid antagonists and dantrolene should be present in all recovery units.
- Actively document all post-anaesthetic complications to guide future induction of anaesthesia.

7.6.2.10 Recommendation 7: Special Patient Groups

Minors have unique needs and must have specialist hospitals with the required specialist to handle them. These include paediatric surgeons and anaesthetists. In event of children patronizing adult hospitals, special areas must be mapped-out for them and their parents for swift attention. On surgical days children should be prioritized over adults.

- Children must have a separate recovery area or a special area within the PACU.
- Parents must be at easy reach and have the opportunity to reunite with the child as soon as the child recovers from anaesthesia.
- Under no circumstances must children be left alone in a recovery ward.
- Paediatric equipment and logistics must be readily available in the recovery room. These include ventilators, Ambu-bags, nasogastric tubes, resuscitation equipment and medications.

Frail elderly patients

- Frail patients require meticulous care and therefore a multidisciplinary team consisting of surgeons, anaesthetists, geriatricians and allied health professionals such as laboratory scientists, physiotherapists and respiratory therapists should be involved to ensure that they get the best of care.
- During the pre-operative preparation, careful consideration should be made in administering anxiolytics and other medications like midazolam or diazepam since these may aggravate delirium post-operatively.
- Chest X-rays and strict cardiopulmonary assessments should be done to isolate lung cancer, especially in patients with a prolonged history of smoking and alcoholism
- Pain assessment and management should be given utmost priority in the elderly especially those with symptoms of senile dementia

Obese patients

- Obese patients must be transported to PACU on supplemental oxygen and pulse oximeter. If possible, it is recommended that the patient is placed on positive pressure ventilation using non-invasive ventilation.
- Patients who received nondepolarizing muscle relaxants should be monitored for possible paralysis (patient getting re-paralysed).

Critically ill patients

- Critically patients must be admitted to an intensive care unit or high dependency unit.
- If they are admitted to the recovery ward, the attending health professional must be well trained in airway management and resuscitation. Anaesthetists or intensivists must be at easy reach to augment the effort of the clinical officer.

Parturient

- Attending clinical staff must pay attention to Parturient (obstetric) patients under their care in the recovery ward.
- Vital signs should be monitored and documented accurately. Any slight deviation of parameters outside the patient's baseline values should be reported immediately to the attending physician.
- Training of recovery ward staff on obstetric management should be given prime consideration.

Patient's Advocacy

- Surgical experience is a fearful episode so patients should be supported to embrace the possible outcomes.
- Risk assessment must be performed for all patients and expand the safety net.
- Pre-operative optimization must be ensured
- Any potential or actual threat that possesses considerable danger to anaesthetic and surgical safety must be eliminated.
- Any intractable anxiety must be allayed through a concerted effort.

7.7 CHAPTER SUMMARY

This chapter presented the development, validation, and appraisal of the pre-anaesthetic and post-anaesthetic clinical guidelines. The evidence from the qualitative, quantitative, and integrative studies were synthesised and presented to a multidisciplinary experts including surgery, anaesthesia, critical care, and patient advocacy group to develop the guidelines. The

developed guidelines were piloted in all the three levels of care in Ghana including primary, secondary, and tertiary levels of care. Subsequently, the guidelines were appraised by another seven multidisciplinary experts using the AGREE II instrument. The rigorous development and validation process adopted by the research was to give the guidelines a solid academic and practical appearance.

CHAPTER 8 : DISCUSSION

8.1 INTRODUCTION

This chapter contains integrative discussions of the thesis's overall findings. The study's main findings were used to develop clinical guidelines, which are the focus of this discussion. This chapter explains the backdrop for the guidelines and compares them to other clinical guidelines. Additional research directions have also been identified.

8.2 SUMMARY OF MAIN FINDINDS OF THE GUIDELINE

This thesis was designed to develop clinical guidelines to inform pre- and post-anaesthetic assessment of surgical clients in Ghana. It is the considered hope of the researcher that its implementation may enhance surgical safety and optimum post-operative outcomes. The developed pre-and post-anaesthetic clinical assessment guidelines have two main domains i.e., pre-anaesthetic clinical assessment guidelines and post-anaesthetic clinical assessment guidelines. The pre-anaesthetic guidelines have 14 recommendations, and the post anaesthetic guidelines have seven recommendations. Overall, the current clinical guidelines have 21 recommendations developed from this four-phase thesis.

The pre-anaesthetic clinical assessment guidelines, recommends an assessment of surgical patients to include the biographical data and patient identifies; before prearranged admission; patient history information; effective communication and documentation; pre-operative initial care; physical assessment; investigation; multidisciplinary risk appraisal; medication and supplement; after planned admission; immediate pre-anaesthetic care; post-planned admission management; management of minors before admission; and management of minors after admission. The second domain**,** post-anaesthetic clinical assessment guidelines, has seven recommendations: post-operative facility; transport and handing over at PACU; airway assessment and monitoring; pain assessment and management; anaesthetic evaluation; complication management; and special patient groups. These recommendations are developed from the contextual practices of anaesthesia in Ghana. Some of the recommendations are consistent with previous clinical guidelines in anaesthesia practice whilst the majority are contextual. The discussion is presented as per the two main components of the developed clinical guidelines.

8.2.1 Pre-anaesthetic assessment component of the guidelines

The pre-anaesthetic component of the guidelines was discussed in four themes to illuminates the main findings of the guidelines and its clinical implications for anaesthesia practice.

8.2.1.1 Assessment of surgical patients prior to surgery and its implications for anaesthesia practice

Accessing the essential biographic information and patient identifiers should be the first step in the pre-anaesthetic assessment of surgical patients. The patient's name, gender, age, height, and BMI should all be included in these patient identifiers. Similarly, the major component of most anaesthetic clinical guidelines is patient background information (Sternberg et al., 2015). Patient biographic data is thought to be important for proper patient identification in anaesthetic care, which explains the similarity in findings. This research emphasizes the importance of gathering thorough patient data, including background information, to avoid misidentification, which could lead to medical, surgical, and anaesthetic errors. It is recommended that anaesthetists plan and obtain essential patient information to prevent misidentification of their patients and enhance surgical safety. This may help prevent medico-legal suits against anaesthetic practitioners and their facilities.

Pre-arrangement of admittance is recommended by anaesthesiologists. The patient must be fully informed about the diagnosis, surgical intervention, and anaesthetic plan in order for the patient to select the preferred procedure based on expert advice (Omole et al., 2021). This may provide a chance to pre-rehabilitate surgery patients and control their co-morbidities. Conducting a scheduled admission of surgical patients has the clinical relevance of allowing the surgical team to develop a strategic plan of care. Accordingly, anaesthetic providers should plan and conduct prearranged admissions. It is recommended that an anaesthetist should perform a review of surgical patients during a scheduled anaesthetic clinic day at the health facility.

Medical history, surgical history, anaesthesia history, social history, allergy, blood transfusion history, and immunization history are all part of the patient history information. These findings are in line with the findings of a Colombian retrospective study on anaesthetic practice in low- and middle-income nations (Tao et al., 2020). Obtaining patient history

information during pre-anaesthetic check-up is also important, according to a systematic review in India that included 33 studies (Dhakre et al., 2020). Perhaps the most basic information gathered for all medical-surgical patients in a hospital to facilitate care is history- taking. As a result, gathering patient history information allows the anaesthesiologist to learn about their patient's anaesthetic history as well as any drugs they are taking, allowing a suitable choice of anaesthesia to be considered. When social history such as alcoholism and smoking is elicited, it may lead to behavioural changes in surgical patients before to administration and surgical procedures.

Information on the patient's allergies may be useful in determining the anaesthetic and other adjuvants that should be used. In the United States of America, drug allergy information contributed to quality improvement in the health system (Harig et al., 2018). Anaesthetists can use anaesthetic history to help them choose the safest form of anaesthesia for their patients, which improves post-operative outcomes. In our context, a patient's blood transfusion history is crucial since some patients may refuse blood transfusions due to religious beliefs. This will aid the team in making the best possible preparations for any anaemia, such as erythropoietin. The surgical team may be able to design the precise anaesthetic drug for their surgery based on their vaccination history, including adverse events following immunization. In the United Kingdom, for example, the basic information of patient allergy was used to manage at risk patients prior to surgery (Savic et al., 2020). In a pandemic event, such as COVID-19, however, the patient's vaccination status provides assurance to the surgical team. Future research could look into the factors that influence anaesthetic decisions in our setting based on patient data sets.

8.2.1.2 Effective communication and documentation and its implications for anaesthesia practice

During pre-anaesthetic assessment, practicing anaesthetists should employ electronic technologies to properly communicate and document patent information. Similarly, an Ethiopian study suggested that an electronic-based documentation system be implemented to address substandard anaesthetic practice (Woldegerima & Kemal, 2019). Again, efficient communication during pre-anaesthetic assessment is critical to lowering surgical risk and managing post-operative pain (Nag et al., 2018). Perhaps the typical method of storing patient data results in data loss, which could account for this observation. This could help to

eliminate preventable errors during pre-anaesthetic evaluation sessions and make information more accessible to other practitioners. The patient's electronic data can be used as a data bank for research and clinical auditing. As a consequence, anaesthetists, CRAs, and anaesthesia providers may use computerized technologies that help them make better decisions by assessing crucial information. Electronic documentation of anaesthesia practice has shown improved surgical outcomes in the United States (Ahmed et al., 2022). It has the potential to be a comprehensive data source to aid in the education of student anaesthetists and support research.

8.2.1.3 The implications of pre-anaesthetic care for surgical patients for anaesthesia practice

The study findings on the provision of pre-operative initial care to physiologically prepare patients to ensure surgical safety are compatible with the World Health Organization (WHO) recommendations on the classification of surgical patients prior to surgery (McElroy et al., 2016). Smoking cessation, establishing an adequate exercise regimen, weight loss, controlling chronic illnesses, and bringing the patient's haemoglobin to optimal levels before surgery are all part of pre-operative first care. The risk classification of the American Society of Anaesthesiology (ASA) is a valuable clinical guideline for risk stratification of surgical patients to assure their safety and management (Sarikaya et al., 2020). Surgical patients are thought to need to be physiologically stable prior to surgery, which could explain these results. Pre-operative exercise programs aid in the optimization of the patient's physiological state, reducing the risk of cardiovascular and pulmonary problems following surgery. Pre-operative exercises also encourage early patient ambulation and, as a result, faster healing of surgical wounds, as well as early discharge. In a similar vein, surgical patients who lose weight have fewer anaesthesia problems and are less likely to have an infection. Furthermore, it is important to avoid complications in treating chronic illnesses in surgical patients and bringing titre values to an ideal level, particularly establishing a euthyroid state in patients with thyrotoxicosis and maintaining a normal blood glucose level in diabetics. Pre-anaesthetic assessment has been useful in management of surgical patient in the South African context (Omole et al., 2021). It is recommended that future research be conducted to develop a protocol for pre-operative initial care of surgical patients in Ghana.

Physical examinations should be performed on all patients by anaesthesiologists. The American Society of Anaesthesiology's (ASA) classification is a globally recognized domain of risk stratification that provides useful recommendations (Abouleish et al., 2020; Dhakre et al., 2020). Adoption and usage of an assessment instrument such as the Mallampati classification (Detsky et al., 2019; Roth et al., 2018), in conjunction with the patient's clinical presentation, will aid the practitioner in making the optimal decision for safe surgery and anaesthesia. For good anaesthetic practice, physical examination may continue to be an important criterion for risk categorization in surgical patients. A patient with a stable medical state may typically endure anaesthesia and surgical intervention better than one who has co-morbidities. However, anaesthesia providers are scarce in Ghana, affecting the surgical patient's physical assessment. To ensure surgical safety, anaesthesia providers should undertake a comprehensive physical examination of all surgical patients during their pre-anaesthetic assessment.

Laboratory tests must be performed on a regular basis to corroborate clinical indicators (Karim et al., 2021; Omole et al., 2021; Yakubu, 2018). It is in the best interests of a patient for surgeons and anaesthesia providers to collaborate on further advanced investigations (Karim et al., 2021; Omole et al., 2021). This conclusion could be explained by situations where surgeons make lab requests for surgical patients without consulting other members of the team, including anaesthetists. To unify the requisitions, lower the cost of care, and increase quality surgical outcomes, the lab request for surgical patients should ideally be a comprehensive approach involving the surgeons and anaesthetists. In fact, a lack of cooperation in lab requests could lead to duplication in investigations. To avoid these outcomes, it is recommended that practitioners use a multidisciplinary approach to request and review their patients' lab findings.

For high-risk patients, a joint discussion between the surgical team and the critical care personnel is required for risk assessment and strategy planning. Other studies have found that involving a multidisciplinary team in pre-anaesthetic assessment reduces mortality (Kashikar & Arya, 2020). Gender, BMI (Shuyuan et al., 2020), socioeconomic status, fatigue estimation (Steffens et al., 2018), cardiovascular comorbidities (Gómez-Henao & Carreño-Dueñas, 2016), peripheral artery disease, confirmed systemic organ diseases, and confirmed deep vein thrombosis are the relevant variables of interest that predict pre, intra, and post-operative morbidity and mortality. A risk appraisal conference could be beneficial in isolating and

stratifying surgical patients. Finally, such a multidisciplinary meeting is crucial in identifying the level of risk and establishing the best management strategy. It may also be valuable for risk prediction as documented in Canada (Carli & Feldman, 2019). For example, determining a patient's cardiovascular competence can be aided by estimating their exhaustion. Variables such as age, cardiovascular comorbidities, peripheral artery disease, verified systemic organ disorders, and confirmed deep vein thrombosis dictate the surgical therapeutic approach in the hospital. As a result, the surgical team should convene a multidisciplinary meeting to discuss the occurrences listed above. For anaesthetists to share their experiences in patient risk assessment and management, the conference might be organized using virtual platforms within regions. Multi-methods research should be used to produce a risk assessment tool for surgical patients in the future.

During the pre-anaesthetic assessment, anaesthetists should assess the level of drugs and supplements (İyilikçi, 2021) that a patient may be taking, particularly the level of herbal remedies employed. The usage of herbal preparations and other supplements was found to be consistent with a study conducted in Turkey, which looked at the use of herbal preparations while seeking infertility therapy. That study used a single quantitative research paradigm. A mixed-methods study could have yielded far-reaching results. There appears to be a misuse or overreliance on herbal treatments in Ghana, which could explain this conclusion. Plants are frequently used to make orthodox anaesthetics and other pharmacological preparations, including herbal medicines. Other substances, such as potassium-containing pharmaceuticals, may also interfere with suxanmethonium chloride anaesthetics. When baseline data on the patient's use of herbal medications is not correctly acquired prior to anaesthesia, there may be drug interactions following administration (Chandrika & Karunarathna, 2022). Drug interactions with anaesthetics could have unfavourable consequences. A randomized controlled trial on the use of herbal remedies and their effects on anaesthetics could be undertaken.

Plan operating sessions to allow for pre-anaesthetic visits by the patient's designated anaesthetic provider. Establishing rapport, evaluating the adequacy of pre-anaesthetic assessment, confirming the management plan, assessing potential and actual risk, discussing with the intensivists, and communicating with the patient and team members in the event of cancellation and altered care decisions should all be priorities during the visits (Tylee et al., 2020). These findings may be justified in both preparing the patient for the planned operation

and stopping pre-operative preparation if the surgery is postponed. To acquire the participation of the patient and family, as well as obtain genuine informed consent for the surgery, it is critical to build an effective rapport. When anaesthetists analyse the accuracy of pre-anaesthetic evaluation data, it can help them choose the best anaesthetic medications for the surgery. The confirmation of the plan of treatment is crucial for defining the specific procedure that the patient and anaesthetists have agreed on. Every surgical patient's potential and actual risk must be assessed to propose the best course of treatment and avoid complications; and depending on the patient's condition, the planned management strategy, and institutional policy, anaesthetists should discuss the availability of beds in ICU, HDU, PACU, or recovery ward with the intensivist.

8.2.1.4 Management of minors in anaesthetic practice

Before starting anaesthesia, monitor and record baseline vital signs of the patient. In the evening before surgery, serve the prescribed premedication, such as anxiolytics. Prior to any procedure, vital signs may be an important examination of a patient's physiologic health (Anderberg et al., 2021; Zemedkun et al., 2021). This is because some anaesthetics, such as ketamine, can cause a 20% increase in blood pressure and a 25% increase in heart rate. As a result, determining the baseline blood pressure before anaesthesia is critical. Propofol, like other sedatives, lowers blood pressure, thus it is important to use caution when giving it to hypotensive patients. Drug metabolism and oxygen use are both affected by body temperature (Strohmaier et al., 2020). As a result, obtaining a baseline temperature is critical in anaesthesia. A hypothermic patient has a slow metabolism and a limited oxygen reserve, both of which might impede post-surgery recovery. As a result, anaesthetists should take precise baseline temperature measurements and other vital indicators of patients before surgery, according to the study. All known principles governing elective surgery should be applied to patients hospitalized for emergency surgical interventions by anaesthesiologists. Strict adherence to error-prevention standards like the WHO surgical checklist and the pre-anaesthetic assessment form may be beneficial. Adherence to protocols is seen to be important in the anaesthesia profession in order to improve patient safety and surgical outcomes. The WHO surgical checklist covers the patient's diagnosis, consent, surgery location, and procedure before induction, skin incision, and the patient's exit from the operating room (Upadhya et al., 2018).

To guarantee surgical safety, an anaesthetist should cross-check all protocols within the three sub-domains of the surgical checklist prior to operation (Upadhya et al., 2018). Additionally, the pre-anaesthetic evaluation form assists an anaesthesiologist in reviewing the patient identification, physical examination, history, diagnosis, procedure, and planned anaesthetic care before to surgery. Furthermore, any decision reached by the surgical team and the patient's relatives must be documented in the patient's record books, including the decision to proceed with the surgical intervention despite all odds, despite the absence of critical laboratory results, and especially the decision to not intervene due to correctable surgical disease (Ahmed et al., 2022). In order to successfully resuscitate a patient and optimize their physiological state, careful consideration and a suitable balance must be found in order to avoid excessive delays that could jeopardize the patient's life. As a result, a multidisciplinary agreement on the patient's next steps should be obtained. Finally, the patient's family and significant others should be treated with respect and dignity by providing them with meaningful information that allows them to participate in decision-making regarding the patient's care.

A study discovered that managing minors prior to admission is an important pre-anaesthetic intervention that should be implemented in practice (Mccombe & Bogod, 2020). In comparison, a minor's entrance follows the same procedure as an adult. The diagnosis, as well as specific details concerning the admission procedure, surgical intervention and anaesthesia plan, is reviewed with the parents, with special attention paid to the presence of significant anxiety and preparations made to alleviate it. The information must be handed to the child and his or her parents (Mccombe & Bogod, 2020). Perhaps minors have unique requirements based on their developmental history, which are best met by the family. The developmental history, birth history, medical-surgical history, anaesthetic history, congenital anomalies, sickling, and airway assessment of the minor should all be included in the pre-anaesthetic evaluation (Mccombe & Bogod, 2020). As a result, it is critical to include them in the preparation of minors for surgery in order to obtain a thorough grasp of the paediatric procedure. Further research in the Ghanaian setting could focus on specialized anaesthetic preparations for minors in order to inform practice. A course on the impact of minors' dysmorphic characteristics on failure intubation could be beneficial.

Minors should be managed after admission during the pre-anaesthetic examination, according to anaesthetists' specialists (Mccombe & Bogod, 2020). Because minors have unique needs,

anaesthesia providers must be meticulous while gathering information from their parents. If the child is able to communicate, queries about feeding should be directed to the youngster as much as possible. A frantic mother, for example, can lie about whether or not her child has eaten in an emergency. Parents must be warned and informed about the consequences of aspiration. Parents and children should be informed about the fasting and oral fluid administration regimen. Furthermore, children's privacy is vital during pre-anaesthetic evaluation (Mccombe & Bogod, 2020). The paediatric population must be divided from the adult population in order to distinguish children and adolescents. Anaesthetic practitioners must meet with the child and his or her parents to confirm pre-anaesthetic assessment instructions, build rapport, and describe the anaesthetic delivery method and medication used. Other caregivers must make sure that parents sign the consent form, accompany the child to the induction room, adequately attire the child, and serve premeditations. Parents could act as advocates for their children in order to help the admissions process go as smoothly as possible.

8.2.2 Post-anaesthetic assessment component of the guidelines

The post-anaesthetic component of the guidelines was discussed in three themes to illuminates the main findings of the guidelines and its clinical implications for anaesthesia practice.

8.2.2.1 The post-anaesthesia care unit (PACU) setting and its implications for anaesthesia practice

The evidence in the literature suggests that surgical patients should be monitored in the PACU to ensure surgical safety (Wilks & Foran, 2021). The findings of this study also showed that a specific area in the operating theatre, with standardized bedding and space, should be available for critical staff movement and resuscitation. In the absence of an Intensivist or an Intensive Care Nurse Specialist, the coordination and general medical supervision of the PACU should be the duty of an anaesthetic provider (Chekol et al., 2021). Perhaps the primary function of these specialists at the PACU is to assess patients. These findings are particularly important since, in order to maintain surgical safety, hospitals must have a uniform PACU setup with the necessary personnel. These findings suggest that PACU staff

should receive regular in-service training on immediate post-anaesthetic and continuing anaesthetic treatment.

After surgery, a patient must be accompanied to the PACU by an anaesthetic provider who is a member of the anaesthetic team and has a good understanding of the condition. A pulse oximeter must be used to measure the patient's pulse and oxygen saturation. A patient who has had general anaesthesia must be transferred on an oxygen-only basis (Jia et al., 2016). Patient safety is presumably a top focus for anaesthesia practitioners, which could explain these findings. These findings are noteworthy because they will allow for the early diagnosis of problems following surgery. Researchers urge rapid detection and care of frequent post-operative problems in a thematic review on perioperative medicine in the United Kingdom, which corresponds with the researcher's recommendation (Stephenson et al., 2020). More research into the immediate post-operative management of surgical patients could lead to the development of a check list for patient identification and management.

8.4.2 Immediate postoperative assessment and management and its implications for anaesthesia practice

The findings agree with anaesthetic clinical guidelines from the American Association of Anaesthetists on anaesthesia demonstration and surgical patient perioperative surveillance (Klein et al., 2021). Furthermore, the PACU staff should continuously assess the patient's condition, focusing on airway patency, level of consciousness, respiration rate, oxygen saturation, temperature, and blood pressure every five minutes for the first 30 minutes, then every 15 minutes for the next one and half hours, until the patient achieves and maintains cardiopulmonary stability. Perioperative respiratory monitoring, including SPO2 and PaCO2, was found to be important in a Korean study, which is consistent with the findings of this investigation (Kang et al., 2021). This research has highlighted the clinical importance of early diagnosis of hypoventilation and hypoxemia, and as a result, it is suggested for excellent patient care in anaesthetic practice.

The analgesia nociception index (ANI) was recommended by Baroni et al. (2022) for assessing and managing pain. Their findings support the study's recommendations for adopting a locally adopted rating scale for pain evaluation and treatment, a multidisciplinary approach, and multimodal analgesia pain management, including opioids, by anaesthetic

physicians. Inadequate pain treatment might also lead to chronic pain syndrome. As a result, creating a complete pain management strategy is clinically beneficial in the treatment of post-operative pain (Horn & Krame, 2018). Indeed, pain treatment is crucial to anaesthetic practice's relevance, which could explain these results. A multimethod study design could be used by anaesthesiologists and academics to construct a contextual pain evaluation and treatment scale to aid clinical practice.

The concept of post-anaesthetic assessment must be conceptualized and incorporated into post-operative treatment practice. For successful documentation, a designated team of anaesthetic professionals must examine the patient with a post-anaesthetic assessment instrument (PAAT). Similarly, an Australian quasi-experimental study suggested using the post-anaesthetic discharge questionnaire to examine surgical patients in order to reduce risk (Street et al., 2018). Another study emphasizes the importance of a full post-anaesthetic assessment of surgical patients, including pain, blood, and fluid management (Kehlet, 2020). Perhaps the lack of a context-specific tool to guide anaesthesia practice is why the post-anaesthetic assessment isn't done consistently in our setting. As a result, the clinical significance of this finding is that it will help to improve documentation, practice, and patient safety. As a result, future research may focus on the creation of a multiphase mixed method design for a post-anaesthetic assessment tool (PAAT).

8.4.3 Anaesthetic evaluation, post-operative complication management, and their implications for anaesthesia practice

The management of post-operative complications like difficulty breathing, hypoxia, nausea, and vomiting, hypertensive and hypotensive crises, shivering, hypothermia and malignant hyperthermia must all take place in post-operative care units with the availability of equipment, monitoring devices, medication, protocol, and competent staff.. In addition, prior studies in Colombia and Ethiopia recommended that low- and middle-income countries be provided with the necessary monitoring equipment and drugs to improve safe anaesthetic practice (Mihretu, 2021; Tao et al., 2020). According to anecdotal evidence, one of the key concerns of safe and standard anaesthetic practice is the prevention of complications. The importance of the equipment and vital pharmaceuticals is critical in assisting practitioners in monitoring their patients and providing timely interventions to prevent any worsening of their health status. As a result, healthcare executives and policymakers should plan, buy, and

supply appropriate monitoring equipment as well as the necessary medications to support the delivery of safe and equitable anaesthesia.

Minors have distinct needs, which necessitate access to specialized hospitals with the necessary expertise. Paediatric surgeons and anaesthetists are among them (Mccombe & Bogod, 2020). Similarly, because paediatric patients have anatomical and physiological peculiarities, the Royal College of Anaesthetists of Great Britain and Ireland recommends suitable training and expertise for anaesthetists who offer care for them (Royal College of Anaesthetist, 2020). For example, there are legal implications for paediatric consent to anaesthesia and surgery that must be followed in clinical practice (Mccombe & Bogod, 2020). In Ghana, the legal age for anaesthesia and surgery is 18 years, and parents must provide proper informed consent before anaesthesia and operation. In some situations, emancipated minors are permitted to consent to such treatments on their own behalf. In essence, stakeholders may produce and certify anaesthetists for sub-specialization in paediatric anaesthetic practice through training programs (Sen et al., 2021). Furthermore, whenever children visit adult hospitals, separate places must be designated for them and their parents to receive prompt attention. Children should be given priority over adults on surgical days.

8.2.3 Limitations of the Guidelines

Despite the large number of evidence-based suggestions made by these clinical guidelines for anaesthetic practice in Ghana, there are a few flaws to be aware of. The majority of the responders were certified registered anaesthetists, who make up the bulk of Ghana's anaesthetic workforce. This could skew the guidelines' recommendations. The integrative review was limited to a five-year time frame because it was done to gather current findings to support the clinical guidelines that had been developed. It is possible that this omitted important information that would have enhanced the guidelines. Individual interviews were employed to acquire data for the qualitative components. It is possible that including focus group discussions would have supplied more data variety. As a result of the aforementioned limitations, these clinical recommendations should be used with caution.

8.3 CHAPTER SUMMARY

The findings from all phases of the thesis were given in this chapter. The majority of the conclusions were based on previous research, while others were related to anaesthetic practice in Ghana. The rationale behind those conclusions has been emphasized. Recommendations for

future research have been made. The next chapter contains the study's conclusions, evaluation, and limitations, as well as recommendations.

CHAPTER 9 : SUMMARY, RECOMMENDATIONS, LIMITATIONS, AND CONCLUSIONS OF THE STUDY

9.1 INTRODUCTION

This chapter succinctly present a summary of the evaluation of the entire study. It lays out, specifically, how the objectives of the study were achieved as well as the strength of evidence that led to the development, evaluation and pilot testing of the pre and post-anaesthetic assessment clinical guidelines for surgical safety in Ghana. Recommendations, limitations and conclusions of the study were also presented. The first section outlined the evaluation of the study in accordance with the objectives of the study.

9.2 SUMMARY

The main purpose of this study was to develop clinical guidelines to inform pre and post-anaesthetic assessment of surgical clients in Ghana to enhance surgical safety and optimise post-operative outcomes. This goal was met as the clinical guidelines were developed by a multidisciplinary team of experts, pilot tested and appraised by experts. Experiential comments made by the experts were incorporated into the final document. Five specific objectives sprung out of the main objective and were accomplished in four phases. The researcher adopted explanatory sequential mixed method research, using the AGREE II guidelines development framework as the conceptual framework that guided the study.

Chapter one provided an overview of the entire research project with emphasis on the background, problem statement, research objectives, phases, and the methodology adopted to answer the research questions.

The next chapter presented the research methodologies that were employed in the study, which included the study design, study settings, target population, sampling, and sampling methods. The variables studied were described, along with the data collection techniques, data analysis, ethical considerations, and quality controls.

Chapter three forms part of the exploratory phase of the study that sought to describe the existing pre and post-anaesthetic assessment practices in Ghana. A survey of practising anaesthetists in Ghana was undertaken using the Redcap electronic platform. The study took into consideration the two main cadres of anaesthesia providers in Ghana. It also answered objective one of the study. The majority of participants (n=5, 83.3%, p-value=0.006) who reported using EKG monitoring were from Ghana's military hospital. Less than 10% of participants reported that the intensive care nurses at their institution had received intubation or extubation training. Most of the individuals said their post-anaesthesia visits lasted no longer than a week. The number of certified registered anaesthetists and the kind of hospital had no statistically meaningful link. However, pre-anaesthetic evaluation and the typical number of daily surgeries were strongly correlated with hospital types. Nearly half of the participants reported missing the operating room when there were challenging airway carts.

Chapter four illuminated the document analysis. At this phase, pre and post-anaesthetic assessment tools or forms were collected using a qualitative document guide, and was conducted based on the process described by Wach et al. (2013) using criteria; document search; articulating focus of document analysis; coding; verification; and data synthesis. The anaesthetic documents allow the assessment of vital systems of the body. It holds the propensity of helping the healthcare provider to identify any comorbidities that were likely to impact anaesthesia provision and surgical decision adversely. There was a projection of detailed history, including medical, surgical, anaesthetic and colonial past and present information.

Chapter five of the study looked at the qualitative phase where a semi-structured question guide was used in interviewing purposefully selected heads of departments of anaesthesia at various levels of care. This phase of the study identified the challenges of anaesthetic provision and the use of pre and post-anaesthetic assessment guidelines in Ghana. Pre- operative assessments (PAS) are performed by anaesthesiologists in the OPD, anaesthetic clinic, emergency room, office, and theatre. PAS aids in enhancing anaesthesia practice and preventing unintentional anaesthesia errors. Additionally, it enables the surgical team to get to know their patients and avoid needless delays in the operating room. The insufficient supply of anaesthetists in Ghana makes efficient anaesthesia practice difficult. Some patients lack the funds to complete laboratory tests right away, which slows down quick and effective

anaesthesia procedures. The practice of CRAs and Doctor Anaesthetists is now governed by the Ghana Medical and Dental Council.

Chapter six elucidated the results of integrative literature review. The researcher sought to unpacked current pre and postoperative anaesthetic assessment practices globally through an integrative literature review. Evidence was adduced through narrative synthesis from both major paradigms of research as dictated by integrative methodological approach. A review of empirical and grey literature on the current pre and post-anaesthetic assessment practices were sourced from Science Direct, PubMed, Scopus, CINAHL and other relevant institutional websites. Pre-anaesthetic assessment is crucial in evaluating patient fitness for surgery. Failure of patients to fully emerge from their state of unconsciousness that results from the administration of anaesthesia is the basis for emergence delirium. The PACT sets the framework for the discharge of patients from the post-anaesthetic ward. For example, the prevalence of emergence delirium has been noted to be as low as 5% and as high as 80% with factors such as age, type of surgery and anaesthesia. This underscores the need for proper screening for this to be done during post-anaesthetic examination.

Chapter seven of the study is the development and validation of pre and post-anaesthetic assessment guidelines, using a multidisciplinary team of experts. This was achieved in three sub-phases of development, piloting, and appraisal of the guideline. The draft clinical guidelines were pilot-tested by three anaesthesia providers from each of the levels of care in Ghana. That is, teaching, regional and district. The inputs from the three anaesthesia providers were incorporated and the draft was appraised by a team of seven experts. The comments of the appraisers were finally incorporated into the final document of the clinical guidelines for pre and post-anaesthetic assessment for surgical safety in Ghana. There are two primary domains in the developed pre- and post-anaesthetic clinical assessment guidelines. This four-phase thesis resulted in 21 recommendations that are now part of the clinical guidelines. The guideline comprises 14 recommendations for the pre-anaesthetic assessment and seven recommendations for the post-anaesthetic assessment. The ability of these guidelines to combine recommendations for pre- and post-anaesthetic assessment into one cohesive document for simple anaesthesia practice makes it more user-friendly than earlier guidelines. While the majority of the recommendations are contextual, some of them are in line with earlier clinical standards for anaesthesia practice.

Chapter eight was dedicated to the discussions of the findings of the research that culminated in the recommendations in the final clinical guidelines for pre and post-anaesthetic assessment in Ghana. Each of the 21 recommendations were thoroughly discussed with supporting literature, clinical implications, and significance as well as possible recommendation for future research considerations. Possible similarities in the developed clinical guidelines as compared to other established and internationally evaluated guidelines were also shared. The developed clinical guidelines have 21 recommendations. Each of the recommendations had to support itemized actionable pointers to achieve the recommendations in line with international best practices.

Chapter nine is this final chapter that illuminates on the evaluation, summary, limitations, and conclusion of the entire study.

9.3 UNIQUENESS AND SPECIFIC CONTRIBUTION OF THE STUDY TO KNOWLEDGE

The thesis' uniqueness and strength are evident in the four-phase iterative methodological processes it used to develop an evidence-based composite clinical guideline for pre- and post-anesthesia practice. These processes involved physician anesthetists and certified registered anesthetists who are experts in the field of anaesthesia practice. These pre-and-post anaesthetic guidelines may be valuable for anaesthetic practice in low and middle-income countries (LMIC's) including Ghana. However, the evidence-based clinical guidelines are not a replacement for existing evaluated guidelines neither are they intended to substitute physiologically appraised decisions of anaesthetists based on rigorous scientific assessment of patients but to complement and shape the arch of pre and post-anaesthetic assessment trajectory in enhancing patient safety in resource constrained LIMCs.

Contextually, the study found the prevalent use of herbal preparations by many patients prior to accessing surgical services. It is important for practicing anaesthetists to thoroughly assess for the use of herbal preparations to ensure that the herbal preparations used by patients, if any, do not interfere with the anaesthetic. Patient advocacy groups recommend careful selection of and double checking of bupivacaine and adjuvants for intrathecal route drug administration. These guidelines also highly recommend it because of eventful postoperative happenstances of tranexamic acid wrongful administration

The current guidelines' clarity may be helpful to anaesthetists who practice anaesthesia, especially non-physician anaesthetists like Certified Registered anaesthetists and anaesthesia associates who work independently and without direct supervision from physician anaesthetists in environments with limited resources. Prehabilitation of surgery patients, particularly weak ones, has a clear correlation to better results. However, the need for resuscitation and an unnecessary delay in the procedure, which could make the patient's situation, worse, must be balanced carefully.

In order to improve anaesthesia practice, these guidelines may provide the anaesthetists with a uniform pre and post anaesthetic evaluation tool that specifies the pre and post anaesthetic assessment's content, mode of documentation, time, and frequency of visits. In Ghana, it is crucial to rethink post-anaesthetic assessment.

9.4STRENGTH AND LIMITATIONS

It must be stated explicitly that from the commencement of the study until completion, there was no known evidence of locally developed clinical guidelines for either pre or post-anaesthetic assessment in Ghana. Further to this is the fact that the researcher built strong evidence triangulated from scientific literature using an integrated literature review, conducted rigorous document analysis, and capitalized on the unique strength of combining the two main established paradigms of research approach, explanatory sequential mixed method. The finding from individual research found expression in the recommendations that underpinned the evidenced-based clinical guideline. Clinical guidelines require a meticulous and methodological approach and are often commissioned by institutions and funded by organizations with possible interest. The researcher fully funded this work and therefore there is no bias in this study.

This clinical guidelines for anaesthetic practice in Ghana have a substantial number of evidence-based recommendations, but there are several weaknesses that should be noted. Certified registered anaesthetists, who make up the majority of Ghana's anaesthesia workforce, made up the majority of the respondents. This might skew the recommendations given in the guidelines. Because it was conducted to gather recent findings to support the developed clinical guidelines, the integrative review was restricted to a five-year time period. It is likely that crucial information that would have improved the recommendations was left out. To gather information for the qualitative components, individual interviews were used.

There is a chance that having focus group discussions would have provided a wider range of facts. Due to the aforementioned limitations, these clinical recommendations should be used with caution.

Furthermore, only 208 anaesthesia professionals answered the survey's questions. Even if the sample is representative, more practitioners taking part in the study would have been considerably better. Second, the multidisciplinary experts engaged in the creation of the recommendations only comprised seven crucial stakeholder groups. A bigger panel composed of policy and regulatory experts would have been far preferable. There were time and money restrictions that prevented a wider stakeholder involvement. Third, just three practitioners in three facilities carried out the pilot study. If the outcomes were different in other institutions, it remains unknown.

9.5 RECOMMENDATIONS

9.5.1 Practice

- Practitioners and institutions should evaluate these guidelines and develop pre and post-anaesthetic assessment protocols from it for use in their facilities.
- Regulatory bodies should evaluate and enforce the use of the pre and post-anaesthetic guidelines in surgical units in Ghana.
- Post-anaesthetic assessment should be enforced in surgical units in Ghana.

9.5.2 Further research

- Further research should be conducted on the use of the guidelines and their influence on practice, training, and research.

9.5.3 Training

- Anaesthesia colleges in Ghana should adopt these guidelines as part of their teaching resources. This is to ensure anaesthesia providers are exposed to context based guidelines early in their training.
- Further education and training opportunities should be provided for the CRAs so as to make them independent practitioners.
- Clear academic and career paths must be created for Certified Registered Anaesthetists to motivate them, enhance recognition and improve patient safety.

9.6 CONCLUSIONS

This study sought to develop evidence-based clinical guidelines to inform pre and post-anaesthetic assessment of surgical clients in Ghana to enhance surgical safety and optimise postoperative outcomes. Using an explanatory sequential mixed-method design, the researcher was able to develop, evaluate and pilot test the proposed pre and post-anaesthetic guidelines for use in Ghana.

The researcher found that post anaesthetic assessment was not done in the majority of surgical facilities in Ghana. Certified Registered Anaesthetists that are expected to practice under the supervision of an anaesthesiologist are not being supervised because of an acute shortage of anaesthesiologists and a refusal by anaesthesiologists to take up posts in lower-level facilities. The study also found subtle interprofessional conflict between the two main cadres of anaesthesia providers in Ghana affecting collaborative care and affecting continuous professional development processes.

It is concluded that the stakeholders of surgical and anaesthetic services in Ghana should evaluate the guidelines developed and inculcate them into the practice, education and policy on anaesthesia practice in Ghana. As the major providers of anaesthetic services in Ghana, the Certified Registered Anaesthetists should be given the opportunity for further training and recognition as independent practitioners by the Ghana Medical and Dental Council and the Ministry of Health.

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ANNEXURES

Annexure A: Ethical approval from Human Research Ethics Committee (Medical)

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research & Post Graduate Affairs)

TO: Mr D Tenkorang-Twum
School of Therapeutic Sciences
Department of Nursing Education
Medical School
University

E-mail: 2050133@students.wits.ac.za

CC: Supervisor: Professor S Schmollgruber <Shelley.Schmollgruber@wits.ac.za> and <HREC-Medical.ResearchOffice@wits.ac.za>

FROM: Iain Burns
Human Research Ethics Committee (Medical)
Tel: 011 717 1252

E-mail: Iain.Burns@wits.ac.za

DATE: 2019/06/24

REF: *R14/49*

PROTOCOL NO: **M190252** *(This is your ethics application study reference number. Please quote this reference number in all correspondence relating to this study)*

PROJECT TITLE: *Development of clinical guidelines for pre and post-anaesthetic assessment to enhance surgical outcome*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to the Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R14/49 Mr D Tenkorang-Twum

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M190252

NAME: (Principal Investigator)	Mr D Tenkorang-Twum
DEPARTMENT:	School of Therapeutic Sciences Department of Nursing Education Medical School University
PROJECT TITLE:	Development of clinical guidelines for pre and post-anaesthetic assessment to enhance surgical outcome
DATE CONSIDERED:	2019/02/22
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Professor S Schmollgruber
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2019/06/24

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **February** and will therefore reports and re-certification will be due early in the month of **February** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature _____ Date _____

PLEASE QUOTE THE CLEARANCE CERTIFICATE NUMBER IN ALL ENQUIRIES

Annexure B: Ghana Health Service Ethics Review Committee Approval

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
GPS Address: GA-050-3303
Tel: +233-302-681109
Fax + 233-302-685424
Mob + 233- 050-3539896
Email: ethics.research@ghsmail.org

MyRef: GHS/RDD/ERC/Admin/App/19/627
Your Ref. No.

19th November, 2019

David Tenkorang-Twum
Adult Health Department
School of Nursing and Midwifery
College of Health Sciences
University of Ghana

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC003/05/19**
Project Title	Development of a Clinical Guideline for Pre and Post Anaesthetic Assessment to enhance Surgical Safety in Ghana
Approval Date	19th November, 2019
Expiry Date	18th November, 2020
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing
- Submission of a final report **after completion** of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....

Dr. Cynthia Bannerman
(GHS-ERC Chairperson)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

Annexure C: Information Sheets

Information Sheet for Key Informants Interview

Introduction

Hello. My name is David Tenkorang-Twum I am a post-graduate student of University of the Witwatersrand in Johannesburg. I am conducting research that will culminate into the development of a clinical guideline for pre-anaesthetic assessment and postoperative evaluation to enhance surgical safety in Ghana.

Why am I doing the study?

There is little information on pre and postanaesthetic assessment guide for practicing Anaesthetist in Ghana. The majority of anaesthetic providers in Ghana are Certified Registered Anaesthetists who has little or no supervision. Most of them practice independently. The study seeks to ensure standardization and uniformity in practice to enhance patient safety and optimum surgical outcomes. There is also a near forgotten practice of post anaesthesia evaluation in Ghana. I am doing the study to begin to address this gap. Your views on pre and post-anaesthetic assessment and its impact on patient safety will be appreciated.

What am I asking you to do?

I would like to invite you for an interview on anaesthetic practice. The interview will take between 30-40 minutes to complete. Your participation is voluntary. I am interested in your opinions and experiences on the subject- so there is no right or wrong answer. You may refuse to answer any questions that you do not feel comfortable answering or you could withdraw from the interview at any point.

I am also asking for your permission to audiotape the interview because I cannot write as fast as you talk. This will enable me analyse the information your provided accurately.

How do you know that the information you give to me will not get out to others?

The information that you give in the interview will be kept confidential. All interviews and audiotapes (based on your permission) will be assigned a code. The information from all the interviews given will be analysed and reported as group data.

What about permission to do the study?

We have obtained permission for this study from the University of the Witwatersrand Human Research Ethics Committee (HREC-Medical). We have also obtained permission from the Ghana Health Service Human Research Ethics Committee.

Are there any benefits and risks of participation?

Participation in this study is voluntary. There will be no direct benefits or compensation for anyone who complete the interviews. Similarly, there will be no negative consequences for individuals who do not wish to participate in the interview.

Whom do you contact if you want more information?

We will be happy to answer any question you have about this study. If you have any questions about your rights as a study participant, you may contact:

Human Research Ethics Committee (HREC) chair,
The University of the Witwatersrand,
Prof C. Penny
Email: Clement.Penny@wits.ac.za
Tel (011) 717-2301

Ghana Health Service Ethics Committee, Administrator
Ms Hannah Frimpong
+233 507041223

If you have questions about the research, you may also contact me or my supervisor.

David Tenkorang-Twum
Department of Nursing Education
University of the Witwatersrand
Tel. +233 243270396

Professor Shelley Schmollgruber
University of the Witwatersrand
Tel: +27(0) 11 488 4270

Information Sheet for Key Respondents of self-administered Questionnaire

Introduction

Hello. My name is David Tenkorang-Twum I am a post-graduate student of University of the Witwatersrand in Johannesburg. I am conducting research that will culminate into the development of a clinical guideline for pre and postoperative evaluation to enhance surgical safety in Ghana.

Why am I doing the study?

There is little information on pre and postanaesthetic assessment guide for practicing Anaesthetist in Ghana. The majority of anaesthetic providers in Ghana are Certified Registered Anaesthetists who has little or no supervision. Most of them practice independently. The study seeks to ensure standardization and uniformity in practice to enhance patient safety and optimum surgical outcomes. There is also a near forgotten practice of post-anaesthesia evaluation in Ghana. I am doing the study to begin to address this gap. Your views on pre and post-anaesthetic assessment and its impact on patient safety will be appreciated.

What am I asking you to do?

I would like to invite you to provide answers to a self-administered questionnaire on anaesthetic practice in Ghana using the REDcap platform. The questionnaire will take between 15-20 minutes to complete. Your participation is voluntary. I am interested in your pinions and experiences on the subject. You may refuse to answer any questions that you do not feel comfortable answering or you could withdraw from the study at any point.

How do you know that the information you give to me will not get out to others?

The information that you give will be kept confidential. All the information provided on the RedCap platform (based on your permission) will be assigned a pseudonym. The data will be analysed into descriptive and inferential statistics to explain the phenomenon using STATA version 13.

What about permission to do the study?

We have obtained permission for this study from the University of the Witwatersrand Human Research Ethics Committee (HREC-Medical). We have also obtained permission from the Ghana Health Service Human Research Ethics Committee.

Are there any benefits and risks of participation?

Participation in this study is voluntary. There will be no direct benefits or compensation for anyone who complete the questionnaire. Similarly, there will be no negative consequences for individuals who do not wish to participate in the study.

Whom do you contact if you want more information?

We will be happy to answer any question you have about this study. If you have any questions about your rights as a study participant, you may contact:

Human Research Ethics Committee (HREC) chair,	**Ghana Health Service Ethics Committee, Administrator**
The University of the Witwatersrand,	Ms Hannah Frimpong
Prof C. Penny	+233 507041223
Email: Clement.Penny@wits.ac.za	
Tel (011) 717-2301	

If you have questions about the research, you may also contact me or my supervisor.

David Tenkorang-Twum
Department of Nursing Education
University of the Witwatersrand
Tel. +233 243270396

Professor Shelley Schmollgruber
University of the Witwatersrand
Tel: +27(0) 11 488 4270

Information Sheet for Heads of Directorate / Departments/ Unit of Anaesthesia

Introduction

Hello. My name is David Tenkorang-Twum I am a post-graduate student of University of the Witwatersrand in Johannesburg. I am conducting research that will culminate into the development of a clinical guideline for pre-anaesthetic assessment and postoperative evaluation to enhance surgical safety in Ghana.

Why am I doing the study?

There is little information on pre and postanaesthetic assessment guide for practicing Anaesthetist in Ghana. The majority of anaesthetic providers in Ghana are Certified Registered Anaesthetists who has little or no supervision. Most of them practice independently. The study seeks to ensure standardization and uniformity in practice to enhance patient safety and optimum surgical outcomes. There is also a near forgotten practice of post-anaesthesia evaluation in Ghana. I am doing the study to begin to address this gap. Your views on pre and post-anaesthetic assessment and its impact on patient safety will be appreciated.

What am I asking you to do?

I would like to invite you for an interview on anaesthetic practice. The interview will take between 30-40 minutes to complete. Your participation is voluntary. I am interested in your opinions and experiences on the subject- so there is no right or wrong answer. You may

refuse to answer any questions that you do not feel comfortable answering or you could withdraw from the interview at any point.

I am also asking for your permission to audiotape the interview because I cannot write as fast as you talk. This will enable me analyse the information your provided accurately.

How do you know that the information you give to me will not get out to others?

The information that you give in the interview will be kept confidential. All interviews and audiotapes (based on your permission) will be assigned a code. The information from all the interviews given will be analysed and reported as group data.

What about permission to do the study?

We have obtained permission for this study from the University of the Witwatersrand Human Research Ethics Committee (HREC-Medical). We have also obtained permission from the Ghana Health Service Human Research Ethics Committee.

Are there any benefits and risks of participation?

Participation in this study is voluntary. There will be no direct benefits or compensation for anyone who complete the interviews. Similarly, there will be no negative consequences for individuals who do not wish to participate in the interview.

Whom do you contact if you want more information?

We will be happy to answer any question you have about this study. If you have any questions about your rights as a study participant, you may contact:

Human Research Ethics Committee (HREC) chair,

The University of the Witwatersrand,

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Email: Clement.Penny@wits.ac.za

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Ghana Health Service Ethics Committee, Administrator

Ms Hannah Frimpong

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If you have questions about the research, you may also contact me or my supervisor.

David Tenkorang-Twum

Department of Nursing Education

University of the Witwatersrand

Tel. +233 243270396

Professor Shelley Schmollgruber

University of the Witwatersrand

Tel: +27(0) 11 488 4270

Annexure D: Informed consent was sought from participants

Consent Form for Key Informant Interview

I have been given the information sheet on the study entitled: The development of a clinical guideline for pre and post-anaesthetic assessment to enhance surgical safety in Ghana

I have read and understood the Information Sheet and all my questions have been answered satisfactorily.

I understand that it is up to me whether or not I would like to participate in the interview and that there will be no negative consequences if I decide not to participate. I also understand that I do not have to answer any questions that I am uncomfortable with and that I can stop the interview at any time.

I understand that the researchers involved in this project will make every effort to ensure confidentiality and that my name will not be used in the study reports, and that comments that I make will not be reported back to anybody else. I consent voluntarily to participate in the interview for this study. I have been given telephone numbers that I may call if we have any questions or concerns about the research.

Participant's signature/ initial : _____ Date: _____

Interviewer's signature: _____ Date: _____

Consent Form for Key multidisciplinary Experts

I have been invited as an expert in a study entitled: The development of a clinical guideline for pre and post-anaesthetic assessment to enhance surgical safety in Ghana

I have read and understood the Information Sheet and all my questions have been answered satisfactorily.

I understand that it is up to me whether or not I would like to participate in the study and that there will be no negative consequences if I decide not to participate. I also understand that I do not have to answer any questions that I am uncomfortable with and that I can stop at any time.

I understand that the researchers involved in this project will make every effort to ensure confidentiality and that my name will not be used in the study reports, and that comments that I make will not be reported back to anybody else. I consent voluntarily to participate as an expert in this study. I have been given telephone numbers that I may call if we have any questions or concerns about the research.

Expert's signature/ initial : _____ Date: _____

Researcher's signature: _____ Date: _____

Consent Form for Key Respondents for the self-administered questionnaire

I have been given the information sheet on the study entitled: The development of a clinical guideline for pre and post-anaesthetic assessment to enhance surgical safety in Ghana

I have read and understood the Information Sheet and all my questions have been answered satisfactorily.

I understand that it is up to me whether or not I would like to participate in the study and that there will be no negative consequences if I decide not to participate. I also understand that I do not have to answer any questions that I am uncomfortable with and that I can stop at any time.

I understand that the researchers involved in this project will make every effort to ensure confidentiality and that my name will not be used in the study reports, and that comments that I make will not be reported back to anybody else. I consent voluntarily to participate in the study. I have been given telephone numbers that I may call if we have any questions or concerns about the research.

Participant's signature/ initial : _____ Date: _____

Interviewer's signature: _____ Date: _____

Consent Form for Heads of Directorate / Departments /Units of Anaesthesia

I have been given the information sheet on the study entitled: The development of a clinical guideline for pre and post-anaesthetic assessment to enhance surgical safety in Ghana

I have read and understood the Information Sheet and all my questions have been answered satisfactorily.

I understand that it is up to me whether or not I would like to participate in the interview and that there will be no negative consequences if I decide not to participate. I also understand that I do not have to answer any questions that I am uncomfortable with and that I can stop the interview at any time.

I understand that the researchers involved in this project will make every effort to ensure confidentiality and that my name will not be used in the study reports, and that comments that I make will not be reported back to anybody else. I consent voluntarily to participate in the interview for this study. I have been given telephone numbers that I may call if we have any questions or concerns about the research.

Participant's signature/
initial : _____ Date: _____

Interviewer's signature: _____ Date: _____

Informed Consent for Audiotape-Recording of Interview

I have been given the information sheet on the project entitled: The development of a clinical guideline for pre and postanaesthetic assessment to enhance surgical safety in Ghana

I have read and understood the Information Sheet and all my questions have been answered satisfactorily

I understand that I can decide whether or not the interview should be tape-recorded and that there will be no consequences for me if I do not want the interview to be recorded.

I understand that information from the tapes will be transcribed and transcripts will be given a code and my name will not be mentioned. I understand that if the interview is tape-recorded, the tape will be destroyed two years after publication of the findings.

I understand that I can ask the person interviewing me to stop tape recording, and to stop the interview altogether, at any time.

I consent voluntarily for the researcher to record the interview.

Participant signature/initial……. Date: ……..

Interviewer signature…… Date……

Annexure E: Qualitative Document Analysis Guide

1.	Name of document:	
2.	Document type (e.g. Pre-anaesthetic assessment form, intraoperative form post-anaesthetic assessment form)	
3.	Source of document:	
4.	Validity period:	
5.	Other designations	
6.	Name of governance structures	
7.	Legislative mandate (s)	
8.	Roles and responsibilities of the governance structures	
9.	Reference to relationships among these governance structures	
10.	Reference to relationships to front-line Anaesthetist	
11.	Other comments/ observations	

Annexure F: Key Informant Interview Guide

1. **Organisation / Location …….**

2. **Position/ Designation ……..**

3. **Date of interview …….**

4. **Interviewer's name …….**

5. Result codes

01 = Completed, 02 = Respondent not available, 03 = Respondent refused; 04 = Partially completed 05 = Other**……**

NB:

-Circle all that apply

-Write information required on the space provided

Annexure G: Preanaesthetic Assessment Semi-Structured Interview Guide

PART A

1. Age
2. Sex
3. Marital status
4. Religion
5. Level of education a. Advanced Diploma b. First Degree c. Fellowship d. Masters e. PhD
   `
6. How many years have you been practicing anaesthesia?

PART B

1. Where were you trained?
2. In your candid opinion, should only physicians practice anaesthesia? Please explain
3. How do you find the current level of practice of anaesthesia in Ghana? Please explain
4. How useful it is to have a regulatory body? Pleases explain
5. Do you think CRA's need an independent regulatory body? Please explain

PART C

6. How often do you conduct anaesthetic assessment?
7. Do you conduct preanaesthetic assessment for all your patients?
8. Where do you perform the assessment?
9. How long must it take to decide to reassess a patient who has been assessed already and why?
10. Do you request for further laboratory investigations apart from what has been done already under the orders of the surgeon?
11. What do you assess for?

12. Is it important to perform preanaesthetic assessment?
13. How many patients have you assessed for the past week?
14. Please explain how you conduct postanaesthetic assessments?
15. Do you have any guidelines for post-anaesthetic assessment? I
16. Please describe the content of the tool.

Annexure H: Pre and Postanaesthetic Assessment Questionnaire

A. PREANAESTHETIC

We are carrying out a survey to establish the quality of anaesthesia care provided to surgical patients in Ghana. We therefore request you to provide information on the following questions.

Demographic Data

1. Age……
2. Gender……..
3. Physician or Nurse Anaesthetist? .....
4. How many years of experience do you have in anaesthesia? .....
5. Where else do you work? .....

Preanaesthetic care

6. Presence of 24 hr recovery rooms……..
7. Number of anaesthesiologists in hospital…….
8. Number of nurse anaesthetists in hospital……
9. Do you have a pre-anaesthetic surgical checklist on all patients [Yes] [No]
10. Sometimes surgical checklist is not used because [Yes] [No]
11. Number of surgery done in your Hospital per day……..

NO	STATEMENT	YES	NO
12.	Do you know about any International Guidelines for Safe Anaesthesia care for Patients?		
13.	Do you perform pre-anaesthetic evaluation in all surgical cases		
14.	Do you always check patient's preoperative informed consent		
15.	Do you always check patient's identification and type of surgery		
16.	Does your hospital have adequate anaesthesia personnel in your department		
17.	Do you always have an assistant who knows how to give cricoid pressure?		
18.	Is supervision in your department adequate?		
19.	Have you experienced intra-operative cardiac arrest within the past one year?		
20.	Is supervision in your department regarding emergency conditions adequate?		
	EQUIPMENT		
21.	Do you always perform preanesthetic checking of anaesthetic machine and circuit?		
22.	Do you monitor patient with electrocardiography (EKG) in every case?		
23.	Do you use a nerve stimulator on all patients with neuro muscular blockade?		
24.	Do you monitor patients with pulse oximeter?		
25.	Do you use a nerve stimulator on all patients with neuro muscular blockade?		
26.	Do you use the pulse oximeter in every case		
27.	Do you always have suction available for each case		
28.	Do you sometimes experience miscommunication during anaesthetic practice		
29.	Pulse oximeter		
	Automated blood pressure		

	Do you have all these monitors functioning during anaesthesia	monitor		
		Manual Blood Pressure monitor		
		ECG		
		Thermometer		
		Stethoscope		
		Defibrillator		
		Capnograph and end tidal measurement		
30.	Do you have infusion pumps available for use			
31.	Do you have a difficult airway cart, available for emergency difficult airways?			
32.	In the past 3 months, have you experienced medication error?			
33.	Do you always have a nerve stimulator when using neuromuscular blocking drugs?			
34.	Are your patients always taken care of for at least half an hour during postoperative period?			
35.	Are all patients taken care of in a recovery room?			
36.	Do your patients have pain relief 24 hrs, 48 hrs, › 48 hrs after surgery?			
37.	In the past one year, have you experienced at least a case of dental injury?			
38.	Do you have basic ICU services available for monitoring patients post operatively?			

Drugs and Equipment Checklist

No	Drug	Always present	Sometimes present	Never present
39.	Antacid			

40.	Sedatives			
41.	Anti hypertensives			
42.	Vasopressors			
43.	Antibiotics			
44.	Spinal Drugs			
45.	General Anaesthetics I.V			
46.	Gaseous anaesthetics			
47.	Muscle relaxants			
48.	Opioid analgesics			
49.	Non opioid analgesics			
50.	Oxytocics			

Anaesthetic Machine

51.	Machine	Present	Absent	Functioning	Not Functioning
52.	Oxygen source				
53.	Reserve oxygen cylinder				
54.	Inspired oxygen recording				
55.	Oxygen supply failure alarm				

56.	Low oxygen failure alarm				
57.	Oxygen supply failure alarm (Prevent delivery of hypoxic gases)				
58.	Ventilator				
59.	Mechanical Ventilation disconnection alarm				
60.	Scavenging system				
61.	Breathing systems				

B. POSTANAESTHETIC

Please answer the following questions regarding your practice of post-anaesthesia visits for elective, non-ICU patients

1 Please estimate the percentage of patients anesthetized in your hospital in the last year that are visited postoperatively by an anaesthesiologist	
0 – 10 – 20 – 30 – 40 – 50 – 60 – 70 – 80 – 90 – 100%	
There are generally no post-anaesthesia visit in our hospital	
2. Is there a post-anaesthesia service in your hospital that has the duty to perform postanaesthetic visits?	
Yes	No

3. Which information about the post-anaesthesia visit is recorded in the patient chart? Time Contents Duration Documentation is not performed
Time Content
Duration Documentation is not performed
4. Please estimate the percentage of patients anesthetized by yourself in the last year that have received a post-anaesthesia-visit
... by yourself 0 - 10 - 20 - 30 - 40 - 50 - 60 - 70- 80 - 90 – 100%
... by a colleague 0 - 10 - 20 - 30 - 40 - 50 - 60 - 70- 80 - 90 – 100%
5. When do you typically perform post-anaesthesia visit
Within regular working hours ☐ After regular working hours ☐
6. How often have you performed antiasthma visits typically within the last year
Daily Every 2 ☐ 3days
☐ Less than once a week
Only when a member of a post-anaesthesia–service is operated upon
7. How long is your typical post-anaesthesia visit per patient?

< 5 minutes		5 -10 minutes		> 10 minutes	
8. When do you typically perform your post-anaesthesia visits?					
On the day of surgery		On the first postoperative day			
On the second postoperative day		On the third postoperative day or later			
9. Which contents does your typical post-anaesthesia visit have? (multiple answers allowed)					
Questions about the general postoperative condition of the patient					
Specific questions about postoperative problems and complications from patient					
Short physical examination of patient					
Evaluation of the patients chart					
10. Have you ever detected anaesthesia-related complications during your postanaesthetic visits?					
Yes, regularly		Yes, infrequently			
Yes, intermittently		No, never			
11. Do you share the opinion that the regular performance of post-anaesthesia visits may…					
…improve the quality of your own work	Yes		No		
... reduce the incidence of complications	Yes		No		

12. How important are post-anaesthesia visits to you?			
very important		Irrelevant	
Important		Completely irrelevant	
13. Why do not all of your patients receive a post-anaesthesia visit? (multiple answers allowed)			
Lack of time			
Extensive search for the patient necessary			
Long distances to the patient to be covered			
Patients already dismissed home			
I am not interested in post-anaesthesia visits			
14. Please answer the following questions regarding your person, department and position			
Sex	Female		Male
Age < 30	30-39	40-49	50-59 60+
Hospital size			
No hospital (office based)		500-1000 beds	
>1000		250-500 beds	
<250 beds			
Position			

Resident		Certified Registered Anaesthetist	
Specialist/Fellow		Senior Certified Registered Anaesthetist	
Senior Specialist		Principal Certified Registered Anaesthetist	
Consultant		Dept. Chief Certified Registered Anaesthetist	
Head of Department/ Director		Chief Certified Registered Anaesthetist	

Equipments

No	Machine	Present	Absent	Functioning	Not Functioning
15	Difficult airway cart				
	ETT and connectors				
16	Laryngoscope				
17	Face mask				
18	Artificial airways				
19	Ambu bag				
20	Magill's forceps				
21	Suction machine				
22	Oxygen source				
23	Reserve oxygen cylinder				
24	Inspired oxygen recording				

25	Oxygen supply failure alarm				
26	Low oxygen failure alarm				
27	Oxygen supply failure alarm (Prevent delivery of hypoxic gases)				
28	Ventilator				
29	Mechanical Ventilation disconnection alarm				
30	Breathing systems				
31	Stethoscope				
32	ECG				
33	Continuous pulse Display				
34	Temperature monitor				

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18th September, 2022

Faculty of Health Sciences,
University of the Witwatersrand,
Johannesburg,
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Dear Sir/Madam,

Re: PhD Thesis Proofreading & Editorial Cleaning

This is to certify that **David Tenkorang-Twum's** PhD thesis titled "Development of Clinical Guidelines for Pre and Post-Anaesthetic Assessment in Ghana" has been proofread by Ms Bib Hughes of Ella Carver Hughes Ltd Editorial Services and has undergone editorial cleaning.

If you have any queries please do not hesitate to contact the writer.

Yours faithfully,



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