UNIVERSITY OF NAIROBI

KNOWLEDGE, ATTITUDE AND PRACTICE OF OUT OF THEATRE SEDATION BY ANAESTHESIA PROVIDERS AT THE KENYATTA NATIONAL HOSPITAL

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STUDENT'S DECLARATION

I declare that this dissertation is my own work and has not been submitted for a degree award in this or any other university. All resources cited have duly been acknowledged by referencing.

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DEDICATION

I dedicate this thesis to my children Asher Tera Kenani and the late Liana Adah Boyani for being the wind beneath my wings.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ASA	American Society of Anaesthesiologists
ASOS	African Surgical Outcomes Study
CT	Computed Tomography
ECG	Electrocardiography
ICU	Intensive Care Unit
IQR	Interquartile Range
KNH	Kenyatta National Hospital
MAC	Monitored Anaesthesia Care
MRI	Magnetic Resonance Imaging
OORA	Out of Operating Room Anaesthesia
SD	Standard Deviation
UON	University of Nairobi
PSA	Procedural Sedation and Analgesia
SOAPME	Suction Oxygen Airway Pharmacy Monitors Equipment

DEFINITION OF OPERATIONAL TERMS

Anaesthesia Provider: This is an individual who is in charge of the patient's safety and wellbeing before, during and after surgery while providing general anaesthesia, regional anaesthesia or sedation and analgesia. For this study it will include Physician Anaesthesiologists from The University of Nairobi and Kenyatta National Hospital, Anaesthesia Residents from UoN and Registered Clinical Officers in KNH.

Sedation: Sedation is a process whereby drugs are used to depress a patient's level of consciousness and inhibit their response to a noxious stimulus.

Out of Theatre: This are clinical areas or radiological imaging units in the hospital but not in designate surgical operating suites where various diagnostic and therapeutic procedures are carried out .

ABSTRACT

Background: Sedation is a process whereby drugs are used to depress a person's level of consciousness and inhibit their response to a noxious stimulus. It enables both therapeutic and diagnostic procedures to be done while ensuring the patient is comfortable. Sedation is increasingly being carried out in units within the hospital but outside the standard operating theatres. The same standards and quality of care is applied as that in theatre. Patient safety and that of the anaesthesia providers should be guaranteed.

Objective: To assess the Knowledge, Attitude, and Practice (KAP) of sedation out of theatre by anaesthesia providers.

Study Design: Cross sectional descriptive study.

Study Setting: This study was carried out in Kenyatta National Hospital.

Methodology: This study involved 94 Anaesthesia Providers practicing in Kenyatta National Hospital. It included Consultant Anaesthesiologists, Registered Clinical Officers in Anesthesia and Anaesthesia Residents. They answered an online questionnaire. To increase response rates, reminder emails and messages were sent to participants twice weekly during the period of data collection. The data collection covered a period of 1 month.

Data Management: An online questionnaire was sent to the participants. Data collected was analyzed using SPSS version 24. and presented as frequencies and proportions.

Utility of Study: The study will establish a baseline for anaesthesia Providers' practices and knowledge to be able to extrapolate safe practices and protocols for the patient population in Kenyatta National Hospital.

Results: There was a 100% response rate. The mean age of respondents was 37.0 years. Female respondents were more at 54.3% than male at 45.7%. 51.1% of the Anaesthesia Providers were Anaesthesia Residents, 25.5% Consultant Anaesthesiologists and 23.4% Registered Clinical Officers. There was an equal number of respondents affiliated to both KNH and UoN at 50% each. In relation to knowledge, 76.6% correctly noted that KNH does not have guidelines on sedation out of theatre. All equipment listed were required for sedation out of theatre however most favored were oxygen 98.9%, pulse oximeter 98.9% and suction 95.7%. The most preferred drugs required for sedation out of theatre were ketamine 98.9%, midazolam 97.9%and propofol 92.6 %. The gold standard for monitoring ventilation was correctly identified as capnography 72.3 %. 88.3% of the respondents agreed that the same fasting guidelines apply for sedation out of theatre as those for patients undergoing anaesthesia in theatre.

96% of the anaesthesia providers strongly agreed and 4% agreed that the introduction of protocols would improve the practice of sedation out of theatre. The respondents also thought that trainings, seminars and CMEs were very important 92% and important 8% in the practice of sedation out of theatre. 43% of the respondents disagreed that the units were well equipped to handle emergencies during sedation out of theatre, 19% strongly disagreed and 21% were neutral. 36% of the respondents were satisfied with the availability of drugs, 50% were dissatisfied with the availability of equipment, 49% were dissatisfied with team preparedness during emergencies and 33% were dissatisfied with availability of help/ assistance during emergencies. Majority of the anaesthesia providers had provided sedation services in the MRI/CT scan, endoscopy, clinic 66 and eye theatre. The units least frequented by the respondents were the wards, Cardiac Catheterization Lab and Casualty.

On drug choice for sedation outside theatre 95% chose according to what was available and 90% according to the type of procedure being done. The least chosen determining factors were route of administration 66% and side effects 68%.

Drug availability was used to assess availability of emergency drugs and antidotes used when adverse events occur when carrying out sedation out of theatre. Atropine and adrenaline were readily available at 99% and 96% respectively. Naloxone was not readily available at18%.

Challenges experienced by the anaesthesia providers when carrying out sedation out of theatre. 83% of the respondents identified unfamiliar rooms and environment hence not knowing where drugs and equipment are kept as a challenge. Lack of sedation protocols 72% , inexperienced/ inadequate staff 70% and lack of a trained assistant 69%.

Conclusion: The knowledge of the anaesthesia providers on various items on sedation out of theatre was good. Majority of the anaesthesia providers felt that the units where sedation is carried out are not well equipped to handle emergencies. The anaesthesia providers were dissatisfied with the availability of equipment, team preparedness during emergencies and availability of help/ assistance during emergencies. Drugs for use during sedation were chosen according to what was available and the procedure being done. Emergency drugs were readily available but the antagonist drugs were not readily available. The major challenges experienced when carrying out sedation out of theatre were unfamiliar rooms, lack of sedation protocols and inadequate/ inexperienced staff.

1.0 CHAPTER ONE: INTRODUCTION

1.1 Background Information

Sedation is a process whereby drugs are used to depress a patient's level of consciousness and inhibit their response to a noxious stimulus. It enables procedures both therapeutic and diagnostic to be done while ensuring the patient is comfortable and free from pain (1). By alleviating anxiety, discomfort and pain patients are able to tolerate various procedures (2). Sedation is also quite useful in patients who are not cooperative, cannot follow instructions and the pediatric population.

Sedation differs from the routine practice of anaesthesia in the operating theatres. Ideally, sedation is used for procedures and imaging whereby patient is not required to be fully unconscious. Anaesthesia on the other hand is practiced in the operating theatres for procedures requiring the patient to be unconscious or where regional anaesthesia techniques are employed. There are well prescribed sedation guidelines that anaesthesia providers should follow when practicing sedation out of theatre.

Medical procedures are no longer limited to the operating theatres and have now been diversified to other remote sites in the hospital such as CT and MRI. Procedural sedation is a vital component in quite a number of these procedures to ensure good outcomes.

Units within KNH outside the standard operating theatres where sedation is carried out include:

- Radiology – CT, MRI, Interventional Radiology
- Cardiac Catheterization Lab
- Radiation Oncology
- Burns Unit
- Day Care/ Clinic 66
- Eye Clinic.
- Critical Care Units
- Accident and Emergency
- Endoscopy Unit

The same standards and quality of care should be applied as that in theatre (3) . Patient safety should be guaranteed as well as that of the anaesthesia providers. The anaesthesia providers include Physician Anaesthesiologists, Registered Clinical Officers in Anaesthesia and Anaesthesia Residents. The main objective of this study is to elucidate knowledge, attitude and practice of out of theatre sedation by anaesthesia providers in KNH.

Anaesthesia providers are increasingly being called upon to provide sedation services in remote sites in KNH. This study will provide baseline information on our current sedation practices and knowledge. This can then be used as a stepping stone to develop institutional protocols and practices that are geared towards enhancing patient safety and good outcomes. Out of theatre sedation is a practice that is common all around the world including Kenya. There are conclusive protocols guiding the same worldwide (4) (5) (6). However, there are no Kenyan nor KNH institutional guidelines on sedation out of theatre.

2.0 CHAPTER TWO: LITERATURE REVIEW

2.1 Definition of Sedation

The American Society of Anaesthesiologists defines sedation as a continuum of depth of sedation as ranging from minimal sedation or anxiolysis, moderate sedation/conscious sedation, deep sedation and general anaesthesia (7).

Table 1:Continuum of Depth of Sedation

	Minimal Sedation Anxiolysis	Moderate Sedation/Analgesia ("Conscious Sedation")	Deep Sedation/Analgesia	General Anaesthesia
Responsiveness	Normal response to verbal stimulation	Purposeful response to verbal or tactile stimulation	Purposeful response following repeated or painful stimulation	Unarousable even with painful stimuli
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous Ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular Function	Unaffected	Usually maintained	Usually maintained	May be impaired

2.2 Monitored Anaesthesia Care

MAC – Monitored Anaesthesia Care describes anaesthesia provided by an anaesthesia provider for a therapeutic or diagnostic procedure (8). It is done where sedation levels deeper than moderate sedation are required with the possibility of converting to general or regional anesthesia. It also includes other aspects of anaesthesia where the patient is assessed preoperatively and optimized. The anaesthesia provider manages any problems that may arise, ensures haemodynamic stability, management of the airway and any periprocedural issues related with the patients' comorbidities. The anaesthesia provider is responsible for administration of any medications including analgesics, anaesthetic agents, sedatives or any drugs that may be required. Patient safety and comfort is also taken into consideration (8).

One can use the same sedative agent and achieve different levels of sedation depending on the dose used. One can also titrate the level of sedation required depending on the level of pain anticipated, anxiety, the type of procedure and the patient's ability to tolerate the procedure. Since sedation is a continuum, and patients respond differently, the anaesthesia provider should be able to secure the patient if they go into deeper levels of sedation than intended. Deep sedation and general anaesthesia will require a person who is competent in monitoring the patient and can manage the airway. Cardiorespiratory depression should be recognized

promptly and managed effectively to avoid hypoxic brain injury, cardiac arrest and death (9). Personnel in the room should be able to carry out cardiopulmonary resuscitation if the need arises.

2.3 Procedural Sedation and Analgesia

Procedural Sedation and Analgesia(PSA)is defined as the use of hypnotic and/or analgesic medications to enable therapeutic or diagnostic procedures to be carried out effectively while the patient is observed for adverse effects(1).

Sedation services can be carried out by non anaesthesiologist whereby ASA I and ASA II patients can be given mild to moderate sedation. An anaesthesiologist or anaesthesia provider will be required for ASA III and ASA IV patients who are considered high risk.

Table 2:ASA Physical Classification System: (10)

ASA Classification	Definition
I	A normal healthy patient
II	A patient with mild systemic disease
III	A patient with severe systemic disease
IV	A patient with severe systemic disease that is a constant threat to life
V	A moribund patient who is not expected to survive without the operation
VI	A declared brain-dead patient whose organs are being removed for donor purposes

2.4 Objectives for Procedural Sedation

Procedural sedation aims at minimizing pain and discomfort, allaying the patients anxiety and fear (11) (12) as well as reducing psychological stress and trauma. It is expected to enhance the patient's safety while undergoing procedures. (11) (13) and ensure the patient can be discharged safely. Effective control of pain, maintenance of airway patency, with decrease awareness (12) (14) and induction amnesia (15) are hallmarks of safety in sedation practice.

2.5 Pre-Procedure Assessment

Since sedation entails pharmacological intervention in the presence of other medical procedures, adequate and appropriate clinical care is imperative. Elderly patients for example tend to have numerous comorbidities and require incisive history and optimization before being subjected to any interventions . Patients may also have a history of cardiac disease, lung disease, liver and kidney disease or cerebrovascular disease. All these may pose as risk factors during sedation and the anaesthesia provider will need to know and plan accordingly (2).

History of prior exposure to sedation or anaesthesia and any adverse events thereafter. History of known food and drug allergies or treatment and medications the patient is currently taking so as to forestall any drug interactions that may occur. Previous history of a difficult airway, hypoventilation, sleep apnoea and snoring may help the anaesthesia provider prepare adequately with the right equipment and adjuncts if required to manage the airway during the procedure. History of alcohol use and substance use may impact the choice of technique and drugs used as well (9) (12) (14).

An appropriate evaluation of vital signs, physical examination and airway assessment should be done. The anaesthesia provider may be able to pick out a cardiac murmur or organomegaly that was previously not known to the patient. Thereafter they can be able to plan accordingly and ensure the patients safety is taken into consideration. If it is not safe to proceed with sedation for the planned procedure the anaesthesia provider can indicate so and send the patient for further investigations and optimization and defer the procedure to another day when it will be favorable for the patient.

There should be informed consent signed by the patient or parent/guardian if the patient is a minor prior to sedation starting. It is important to have the patient or guardian understand, the procedure, the type of sedation they will receive, what to expect and possible adverse outcomes and attendant risks (14).

2.6 Fasting Guidelines

Fasting guidelines apply when planning to sedate a patient. The ASA preoperative fasting guidelines are a good reference (16).

Table 3:ASA Fasting Recommendations

Ingested Material	Minimum Fasting Period
Clear liquids	2h
Breast milk	4h
Infant formula	6h
Non-human milk	6h
Light meal	6h
Fried foods, fatty foods or meat	8h

Preoperative fasting is imperative so as to circumvent pulmonary aspiration of stomach contents (16) (17). Sedative drugs may cause loss of protective airway reflexes.

2.7 Monitoring

The patient safety is anchored in vigilance and appropriate intervention. Physiological vital sign monitoring encompassing , pulse oximetry, ECG and non-invasive arterial blood pressure are basic minimum. Pulse oximetry can detect hypoxia and episodes of desaturation but has as delay in detecting respiratory suppression. Capnography can detect hypoventilation earlier (18) (19) (20) and is considered gold-standard for ventilation monitoring. It can be achieved using a nasal canula and side stream analysis (8). Capnography provides an accurate recording of the expired carbon dioxide and is more accurate in detecting respiratory depression than pulse oximetry (21).

Depending of the level of sedation, patient verbal contact may form part of the monitoring protocol. If the patient is not capable of responding verbally the patient may be asked to nod or give a thumbs up in response to verbal or light touch (9). The patient should be monitored in recovery until they are ready for discharge with an appropriately qualified team member present .

2.8 Equipment

In order for sedation to be carried out safely outside theatre, the unit should be appropriately equipped. It is also prudent to have staff that are familiar with the area with easy accessibility to the various apparatus, drugs and resuscitation equipment (14). The ASA has as statement on Non-operating Room Anaesthetizing Locations that elucidates the various requirements for providing anaesthesia in nonoperating room environment (4)

2.9 Statement on Non-operating Room Anaesthetizing Locations.

1. Availability of a reliable source of oxygen that is adequate for the length of procedure and also backup in case of failure of the one provided.
2. An adequate and reliable source of suction with the necessary apparatus.
3. In the setting where inhaled volatile agents are used there should be a working scavenging system for waste anaesthetic gases.
4. Availability of
    a) A self-inflating hand resuscitator bag capable of administering 90% oxygen.
    b) Adequate anaesthesia drugs, supplies and equipment for the intended anaesthesia care.
    c) Adequate monitoring equipment.
    d) Anaesthetic machine in areas where you intend to use inhalational anaesthesia.

5. Electrical outlets adequate for the anaesthesia machine and monitoring equipment.
6. Adequate lighting of the patient, anaesthesia machine if present and monitoring equipment.
7. Enough space to accommodate all the necessary equipment, personnel and allow quick access to the patient, anaesthesia machine and monitoring equipment.
8. Emergency cart with a defibrillator, emergency drugs and other equipment for cardiopulmonary resuscitation.
9. Adequate staff trained to support the anaesthesiologist.
10. All applicable building, safety codes and facility standards.
11. Appropriate post anaesthesia management together with staff and equipment available to safely transport patient to post anaesthesia care unit.

The American Association of Paediatrics and the American Academy of Paediatric Dentistry have a joint update in 2019 which recommends a checklist with the acronyms SOAPME to be available in case an emergency occurs (22) .

Table 4: SOAPME Checklist

S (suction)	Size appropriate catheters together with functional suctioning apparatus.
O(oxygen)	Adequate oxygen supply and properly functioning flow meters or devices for its delivery.
A(airway)	Size appropriate airway equipment.
P(pharmacy)	Drugs for life support and antagonist.
M(monitors)	Standard monitors (size appropriate pulse oximeter, end tidal carbon dioxide, ECG, blood pressure)
E(equipment)	Equipment such as defibrillators

Adapted from (23)

Size appropriate airway equipment should be readily available they include bag-valve mask, nasopharyngeal and oropharyngeal airways, laryngeal mask airways, laryngoscope blades(functioning), endotracheal tubes, stylets and facemasks (11).

The anaesthesia provider when carrying out sedation out of theatre should be given adequate time to prepare and check that all the necessary equipment is available. Dysfunctional equipment, nonoptimal working space and inadequate support should as of need be serviced or

removed from these critical areas. (24). Size appropriate equipment should be availed, adult and paediatric (25). The patients safety is paramount thus one should prepare adequately for the cases, familiarize with the environment and equipment. (26). All anaesthesia related equipment should be serviced regularly, ensure ready supply of rescue drugs and also have safety protocols in place. Anticipate adverse events and prepare accordingly (24).

Tembo did a study on knowledge, attitude and practice of sedation outside operating theaters at Muhimbili National Hospital and found that most of the sedation providers had poor knowledge and poor practice. Only two sedation sites had all the required equipment for resuscitation (27).

Omisore et al in 2016 did a study to elucidate knowledge , attitude and practice of Nigerian radiology residents on sedation in radiology practice. Most of the residents knew about sedation in radiology. More than half had done at least one procedure with sedation per week. They also found the residents knowledge to be inadequate in sedation drugs used, monitoring, resuscitation and management of attendant complications (28).

Wood-Thompson et al did a study to establish sedation practices in emergency centres in Gauteng, South Africa. All 17 hospitals that took part in the study carried out sedation in their emergency centres. Resuscitation and monitoring equipment, drugs and protocols were available in 70% of the centres (29).

2.10 Drugs

The choice of drug would depend on the dose required to achieve an acceptable level of sedation without causing an adverse event (1). One may use a single drug or a combination of two or more drugs. The ideal drug should have a rapid onset and offset and a short duration of action. It should also maintain stable haemodynamic patient profile and not cause cardiorespiratory depression. Knowledge of each drugs onset time, duration of action and peak response is important (11). Titration to effect is also important in practice. It is easier to titrate to effect a single drug than a combination of drugs. One may combine drugs whose effects are synergistic. Other drug combinations may have different times to onset and peak hence difficult to titrate (2). When administered intravenously, drugs can be given in small incremental doses, infusions or titrated to a desired endpoint using boluses (9). When using non intravenous methods for example; rectal, transmucosal, rectal or oral, sufficient time must be given for absorption of the previous dose before supplemental administration to avoid overdose and untoward deeper sedation (18).

When carrying out sedation out of theatre in KNH, different units have varying practices with regards to stocking of drugs. Some units have in stock several sedative and analgesic drugs whereby the anaesthesia provider can pick their preferred agents. Some units do not stock drugs or have minimal drugs and the anaesthesia provider has to prescribe specific drugs per patient on their individual treatment sheet. The drugs can then be sourced from the nearest pharmacy or the theatre pharmacy.

2.10.1 Midazolam

It is the most frequently used benzodiazepine due to its rapid onset and short duration of action (18). It is also easily titratable (30). It is a good anxiolytic and also provides anterograde amnesia. Elderly patients require a lower dose which may still tend to have a longer duration of action. It depresses the Central Nervous System and requires close monitoring.
It has no analgesic effect hence will need to be used in combination with appropriate control in painful interventions . When combined with an opioid patient may have a greater risk of respiratory depression and hypotension. Some patients may exhibit paradoxical reactions that include hallucinations, agitation or uncontrolled aggression (18).

2.10.2 Propofol

Has a rapid onset and short duration of action. It also has as smooth recovery. It has no analgesic effect hence has to be used with an analgesic, either an opioid or any other appropriate analgesic. Propofol can be administered as a continuous infusion or small boluses. Propofol has a narrow therapeutic index, patient may go into deep sedation which may result in airway obstruction and apnoea (6). It can also be used in combination with ketamine (18). It works very well in combination with ketamine in that ketamine counters the cardiorespiratory effect of propofol . The analgesic effect of ketamine may also reduce the pain experienced when injecting propofol. Due to cardiorespiratory depression with concomitant hypotension, one must be vigilant in the elderly patients, high ASA class or unstable patients. Side effect profile includes hypotension and apnoea.

2.10.3 Dexmedetomidine

It is referred to as the ideal sedative because it does not cause respiratory depression, patients are easily rousable and closely mimics natural sleep compared to other sedatives (6). It is an α2 receptor agonist. Dexmedetomidine has analgesic, sedative and anxiolytic properties; in low dosage, patients can cooperate and follow instructions. Its analgesic property is an added advantage and can reduce the need for adding opioids (18). It does not have a rapid onset of

action, and is used in combination with other agents to achieve adequate levels of sedation especially at procedural initiation . It is administered as a continuous infusion intravenously. The side effects include; hypotension and bradycardia (31).

2.10.4 Opioids

They provide potent analgesic properties. When opioids are used together with other agents, they can cause respiratory depression and appropriate patient monitoring is required.

Fentanyl is short acting and has the potential for cardiac or respiratory depression especially when used in combination with other sedative agents.

Remifentanil is ultrashort acting and is used as a continuous intravenous infusion. It is metabolized rapidly by tissue and red cell esterases. Side effects of opioid include bradycardia and bradypnoea.

2.10.5 Ketamine

It is a phencyclidine derivative and acts as an antagonist at the N-methyl-D-aspartate receptor. The patient experiences dissociative anaesthesia. It is also known to induce psychomimetic effects like hallucinations and dysphoria. There may also be transient hypertension and tachycardia. Ketamine is known to preserve airway reflexes and respiration. It also leads to an increase in oral and tracheobronchial secretions. Prophylactic administration of antimuscarinic agents such as atropine or glycopyrrolate may attenuate the secretions (6). Midazolam may be co-administered with ketamine to reduce the incidence of delirium. Ketamine can be given orally, intravenous, intramuscular, rectal or nasal.

2.10.6 Nitrous Oxide

It is an anaesthetic agent that has analgesic properties. It is used together with oxygen. Has a rapid onset and offset with a good safety profile. May cause myocardial depression in a patient with myocardial disease and in respiratory disease an altered response to hypoxia. It should not be used in cases where there are trapped air spaces as it diffuses into air filled cavities and expands them. A scavenging system should be available. One should continue use of supplemental oxygen after switching off nitrous oxide to avoid diffusion hypoxia.

2.11 Antidotes

2.11.1 Flumazenil

It reverses the sedation and respiratory depression produced by benzodiazepines. Its duration of action is one hour and a repeat dose may be required if a large dose had been given. Flumazenil may also be used in cases of severe paradoxical reactions.

2.11.2 Naloxone

It is an opioid antagonist used to reverse the respiratory depression produced by opioids. It should be readily available whenever opioids are used. It has a short duration of action and additional doses may be required. Usually given intravenously but can be given intramuscularly during an emergency with no venous access. Once the patient has responded to the intravenous dose given, an additional dose may be given (total effective dose) intramuscularly, where it acts as a depot of the dug and minimizes the risk of respiratory depression recurring (6).

2.11.3 Local Anaesthetics

Local anaesthetics may be used for nerve blocks and local infiltration. They manage pain effectively and can be used for analgesia or anaesthesia. It is important to calculate the doses and give the appropriate dose as local anaesthetic toxicity is a possible adverse event. Local anaesthetics are commonly used as adjuncts to sedation.

2.12 Paediatric Sedation

Sedation out of theatre in the paediatric population is generally safe. The anaesthesia provider should be well equipped and ready to handle any challenges that may arise for example airway compromise (obstruction, aspiration or apnoea). There should be a capability to fully monitor the child as per the ASA specifications. The drugs used are the same drugs used for adults. The anaesthesia provider should be careful to use the appropriate dose and titrate to the effect desired.

Challenges may arise and there are special considerations in some circumstances. Former prematures are at risk of developing apnoea during the postoperative period and appropriate monitoring is imperative. Congenital anomalies causing structural abnormalities may have an increased risk of a difficult airway. The anaesthesia provider should be well equipped with the necessary equipment and adjuncts for airway management. Congenital heart disease may necessitate adequate investigation and optimization prior to providing sedation in a remote site away from theatre.

Active / recent upper airway respiratory tract infections or reactive airway disease may make the child more susceptible to stridor, laryngospasms and bronchospasms. Temperature regulation is an important aspect in the care of paediatric patients. Active heating devices may be used. Difficult intravenous access in some of the patients which may in turn increase anxiety and agitation in the patient especially if not able to give an inhalational agent to necessitate cannulation.

2.13 Challenges experienced when carrying out sedation out of theatre

Anaesthesia providers experience various challenges when carrying out sedation in units other than designated and purpose built surgical and operating theatre suites Some of these areas are remote from the service and support areas of the hospital such as laboratories and pharmacy. They may also far from other anaesthesia providers/ staff and theatre supplies.

a) Equipment

The anaesthesia equipment available may be old and not in good working condition. There may also be some equipment that are not readily available.

b) Scheduling of Cases

There may be a high turnover of cases. Sometimes one may be required to do emergencies in these units. Cases can be added up to the last minute and the anaesthesia provider may not have enough time to evaluate the patient well.

c) Shared spaces and small spaces

These units may be small and crowded and have inadequate space to be able to access the patient and also carry out the procedure. There may be inadequate storage for the anaesthesia equipment. Few power outlets for the anaesthesia machines and equipment to be shared with the other team carrying out the procedure. There may be poor lighting and visualization of the patient for purposes of monitoring.

d) Accessibility

The patient may not be accessible for example in CT and MRI suites. The patient will be monitored remotely. The anaesthesia provider may not be familiar with how the unit is arranged, the staff and the workflow.

d) Staff

These areas may have inexperienced staff who are not able to assist effectively during complications and emergencies. Therefore, one must ensure there is a way to communicate and call a colleague from theatre in case assistance is needed.

e) **Patient Characteristics**

Patients who are extremes of age may be challenging. Patients with comorbidities and increasing ASA Classification may also be challenging to provide sedation in a setting outside theatre. Complex cases may also prove to be challenging.

f) **Inadequate Resources**

They may be required to share resources with the Operating Theatres which may include equipment, staff, drugs and other airway equipment.

g) **Inadequate temperature regulation** cold units that are not well ventilated or heated .

h) **Exposure to radiation** for example CT and Intervention Radiology .

i) **Noisy environment** for example in the MRI suite. (24) (30) (26) (32) (33) (34)

j) **MRI Suite** – the patient is required to be very still during imaging as any movement will result in distortion and a poor image. Sedation helps patients who cannot stay still to do so. The MRI uses magnetic fields. As such, ferromagnetic materials may be attracted to the scanner, this can potentially be dangerous as these objects can become projectiles and injure the patient and the staff. The unit is divided into zones and prescribes the limit to what can reach a certain zone (keys, phones, stethoscopes should not go beyond a certain point).

The MRI suite also has special inbuilt oxygen ports, MRI compatible monitors and ventilators to be used that are not affected by the magnetic field.

Some pacemakers, implanted heart valves, cochlear implants, intracranial aneurysm clips and metallic foreign bodies may also cause challenges in the MRI Suite.

2.14 Adverse Events

In any setting of medical intervention and pharmacological manipulation of the central nervous system , unexpected adverse outcomes may occur. Some may be anticipated due to the underlying condition which has brought the patient for medical attention, nature of intervention or the interaction with the therapeutic agents in application.

Significant in anaesthesia , cardiorespiratory compromise represents the biggest threat to safe outcomes in sedation practice and intervention. There may be airway compromise together with or without respiratory depression which may in turn lead to airway obstruction and eventual harmful hypoxic injury (11). Respiratory depression due to a reduction in depth and / or rate of ventilation can be attributed to suppression of central hypercapnic and peripheral hypoxic drives (1). Airway obstruction may result from foreign bodies, anatomical abnormalities and laryngospasm. Inadequate sedation may make the patient inadvertently

aware and reduce cooperation making it difficult to carry out the intended procedure. Failed sedation could lead to the procedure being cancelled and rescheduled to another date or venue.. (35)

Unplanned admission to the hospital or to the Intensive Care Unit (14) (36) . This may be due to prolonged sedation, cardiorespiratory complications, oversedation or protracted emesis. Patients with attendant comorbidities are more at risk to have an unplanned admission following sedation depending on the nature of the comorbidity for example hypertension. This has a cost implication to the family especially if unplanned and if the procedure had complications requiring the procedure to be postponed or redone on a later date. Advanced age was noted to have a significant relationship with oversedation and the use of reversal agents (37).

Allergic reactions (1) (13) (14) These are allergic reactions to the various pharmacological agents used. Allergic reactions may range from a minor reaction that is localized to an anaphylactic reaction that leads to hypotension and shock. The offending allergen needs to be stopped, mange the airway appropriately, give fluids for hypotension, antihistamine, hydrocortisone and adrenaline if required. Local anaesthesia toxicity may occur if an overdose is given or inadvertent intravascular injection (38)This may lead to seizures and cardiac arrest. Nausea and vomiting which may be due to the sedative drugs given for the procedure Antiemetics can be considered to prevent this from occurring.

Aspiration of gastric contents due to loss of protective airway reflexes during sedation . This may also be seen during endoscopy procedures complicated by bleeding and consumption of copious amounts of bowel preparation agents prior to the procedure (36).

Hypotension due to prolonged fasting time leading to dehydration and use of sedative drugs (39) .

Hypertension due to hypoanalgesia or stress induced release of catecholamines (40).

A study was done on adverse events during sedation or anaesthesia led by Anaesthesiologists for diagnostic imaging in children in Mahidol University, Bangkok, Thailand. They reported respiratory complications comprising of airway obstruction, apnoea, desaturation and laryngospasm. Cardiovascular complications that included hypotension and arrythmia. There was also reported prolonged sedation and drug allergy (41).

Soyalp et al did a survey to assess the attitude of Anaesthesiologists towards paediatric anaesthesia outside the operating room in Turkey. The study revealed they carried out sedation mostly in the MRI suite, for biopsies, endoscopy and paediatric angiography. The most

common adverse event was desaturation. Pulse oximetry and ECG were the most commonly used method of monitoring (42) .

2.15 Training

Out of Operating Room Anaesthesia is a practice in anaesthesia that is increasing exponentially. Several sites in the hospital are now requiring anaesthesia providers to provide these services. The Accreditation Council for Graduate Medical Education, USA in 2016 included a mandatory 2 weeks training on Out of Operating Room Anaesthesia for anaesthesiologists. The Royal College of Anaesthetists in the United Kingdom also prescribed some curriculum requirements in the training of OORA (43). In our Anaesthesia residency program at The University of Nairobi, there is a prescribed rotation in sedation out of theatre. Training ensures there is a pool of qualified personnel to meet the increasing demand of anaesthesia providers to carry sedation out of theatre.

Karin et al assessed the level of awareness of procedural sedation and analgesia among non anaesthesiologists at an Academic Hospital in Johannesburg, South Africa. A low percentage of doctors had training in procedural sedation and analgesia. A majority doctors did however think that there was a high benefit in training on procedural sedation and analgesia (44).

In KNH non anaesthesia providers working in areas that provide sedation out of theatre do not have formal training in sedation / anaesthesia. Some of the staff are medical staff with formal medical training and may be conversant with some of the drugs used. It would be of benefit if these personnel have training in Basic Life Support at bare minimum and if possible Advanced Cardiac Life Support.

2.16 Guidelines

The Royal College of Anaesthetists, United Kingdom has “Guidelines for the Provision of Anaesthesia Services in the Non-theatre environment 2021” (5). It covers paediatric patients, gastroenterology, radiology and interventional radiology, anaesthesia for electroconvulsive therapy, direct current cardioversion and radiotherapy. It also includes sedation and general anaesthesia for dental procedures.

The American Society of Anaesthesiologists has a “Statement on Nonoperating Room Anaesthetizing Locations” that elucidates the minimum requirements for safely carrying out anaesthesia in such areas (4).

The South African Society of Anaesthesiologists has “Guidelines for the safe use of procedural sedation and analgesia for diagnostic and therapeutic procedures in adults: 2020 – 2025” (45)

and " Guidelines for the safe use of procedural sedation and analgesia for diagnostic and therapeutic procedures in children: 2021 – 2026" (6). Both of these guidelines provide elaborate information on the conduct of procedural sedation out of theatre. Kenya currently does not have guidelines for anaesthesia and sedation in non-operating room environment.

2.17 Study Justification

Medical procedures are no longer limited to the surgical suites or operating theatres and have been diversified to other units in hospitals such as radiology for CT and MRI, radiation oncology and clinic 66 among others in KNH. Procedural sedation is essential in quite a number of these interventions to facilitate successful outcomes and safety . Sedation out of theatre for some procedures is more cost friendly to the patient as it avoids prolonged hospital stay. Anaesthesia providers are increasingly required to administer sedation in settings that are outside the dedicated and purpose built and equipped operating theatre.

The operating theatre provides a safety net that is otherwise not availed in remote locations , but the need to ensure safe sedation for all patients remains central . There are detailed guidelines in other areas of the world that guide the practice of sedation out of theatre. Currently there are no local Kenyan guidelines for sedation out of theatre. There is data paucity regarding sedation practices and protocol in KNH and also the country at large. It is possible that delivery of sedation has wide inter-provider variation influenced by knowledge, exposure, as well as attitude and adopted sedation techniques.

The lack of and need to design out of theatre sedation protocols for the various areas warrants a study that establishes a baseline for the anaesthesia provider practices and knowledge to be able to extrapolate safe practices and protocols for the patient population in KNH.

2.18 Objectives

2.18.1 Broad Objectives

To assess the knowledge attitude and practice of sedation out of theatre by anaesthesia providers in Kenyatta National Hospital.

2.18.2 SPECIFIC OBJECTIVES

a) To evaluate the knowledge of anaesthesia providers on sedation out of theatre.
b) To determine the challenges experienced by anaesthesia providers when providing sedation services out of theatre.
c) To evaluate the attitude of anaesthesia providers towards sedation out of theatre.
d) To survey the practice of sedation out of theatre by anaesthesia providers.

3.0 CHAPTER THREE: METHODOLOGY

3.1 Study Design

This was a cross sectional descriptive study.

3.2 Study Area

This study took place in Kenyatta National Hospital.

3.3 Study Setting

This study was conducted in KNH. Areas in KNH where sedation out of theatre is done commonly include: Radiation Oncology, CT, MRI, Eye Clinic, Clinic 66, Burns unit, Cardiac Catheterization Lab, Endoscopy Unit, Accident and Emergency and the various Critical Care Units. An online based questionnaire was administered to KNH anaesthesia providers

3.4 Study Population

Study population were all anaesthesia providers practicing at the Kenyatta National Hospital. There are 25 Consultant Anaesthesiologists in KNH, 6 Consultant Anaesthesiologists from the University of Nairobi, 50 Anaesthesia Residents from the University of Nairobi and 42 Registered Clinical Officers – Anaesthesia from KNH.

3.5 Sample Population

Anaesthesia providers sedating patients in settings outside theatres.

3.8 Eligibility Criteria

3.8.1 Inclusion Criteria

Anaesthesia providers practicing in KNH consenting to participate in study.

3.8.2 Exclusion Criteria

Anaesthesia providers at KNH who declined consent to participate in the study.
Questionnaires that were partially filled were excluded.

3.9 Sample Size Calculation

The desired sample size was calculated using Fisher's formula.

$$n = \frac{Z^2 x\ P(1-P)}{d^2}$$

Where,

n = Desired sample size

Z = value from standard normal distribution corresponding to desired confidence level (Z=1.96 for 95% CI)

P = the proportion in the target population estimated to have the characteristics being measured i.e., anaesthesia providers (the proportion is not known and will be estimated to be 50%, hence 0.5)

d = desired precision (0.05)

$$\frac{1.96^2 \; x \; 0.5 \; x \; 0.5}{0.05^2}$$

n = 384

The sample size in this study is less than 10,000 hence we will calculate an adjusted sample size.

Adjusting the sample size for finite populations less than 10,000

$$nf = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Where:

nf = desired sample size when the population is less than 10,000

n_0 = desired sample size when the population is more than 10,000 = 384 as calculated above

N = estimated sample size (the anaesthesia providers in Kenyatta National Hospital) = 123

$$nf = \frac{384}{1 + \frac{384 - 1}{123}}$$

nf = 93.43 rounded off to **93**

The study thus required 94 participants of which it will divided proportionately. The number required for each is calculated as the number available for the participant type divided by the total number available, and then multiplied by the study sample size.

Table 5: Participant type, Number available and Number required

Participant type	**Number available**	**Number required**
Consultant Anaesthesiologists (KNH)	25	19
Consultant Anaesthesiologists (UoN)	6	4
Anaesthesia Residents (UoN)	50	38
Registered Clinical Officers (KNH)	42	32
Total	**123**	**93**

3.10 Sampling Method

The sample population was sampled consecutively. An online questionnaire was availed to the participants. Informed consent was sought prior and once consented the participant proceeded to fill in the questionnaire online.

3.11 Data Management

3.11.1 Data Collection Procedures

The procedure for data collection started once the researcher was given a letter of approval by the Ethics and Research Committee. Online questionnaire written in English and hosted on Google Forms was sent to anaesthesia providers and anaesthesia residents via emails and to relevant WhatsApp. The participants signed online consent forms before they proceeded to the questionnaire. To minimize bias, every computer IP was only allowed to give one response. Participants were also advised not to fill the questionnaire more than once by using a different device as the IP may be different. To increase response rates, reminder emails and messages were sent to participants twice weekly during the period of data collection. The data collection was done over a period of 1 month.

An 18 - item anonymized questionnaire was administered, which included:

- 9 questions on demographics and knowledge of anaesthesia providers on sedation out of theatre .
- 4 questions part 2 on the attitude of anaesthesia providers on sedation out of theatre. Involved use of a 5-point Likert scale.
- 4 questions part 3 on the practice of sedation out of theatre.
- 1 question part 4 on the challenges experiences by anaesthesia providers when providing sedation out of theatre.

3.12 Variables

Table 6:Showing exposure variables and outcome variables

Exposure Variables	Outcome variables
Gender **Age** **Level of qualification**	Rate of usage of certain drugs Opinions on sedation out of theatre Practice of sedation out of theatre

3.13 Data Analysis

The data collected was entered, cleaned and analyzed using the statistical package for social studies version IBM (SPSS) Statistics version 24. Data was analysed and presented as numbers, percentages, medians and ranges together with bar charts, tables and pie charts.

3.14 Ethics Consideration

Approval to do the study was granted by the KNH UoN Ethics and Research Committee after departmental review.

The participants were enrolled voluntarily after obtaining an informed consent.

All information obtained is stored in a password protected laptop only accessible by the researcher and the research assistant to ensure confidentiality.

There was no cost or risk to the study participants.

3.15 Study Results Dissemination

The results of this study will be presented to the Anaesthesia Department of Kenyatta National Hospital and University of Nairobi

3.16 Study Limitations

Some anaesthesia providers may not be actively or regularly providing sedation services out of theatre.

4.0 CHAPTER FOUR: RESULTS

4.1 Enrollment Procedure

An online questionnaire was sent to Anaesthesia Providers via WhatsApp. Those who gave an informed consent were enrolled into the study. Data was collected from 27th October to 28th November. The sample size of 93 respondents was attained with a total of 94 respondents by the end of the study duration.

4.2 Sociodemographic Characteristics

The mean age of the respondents was 37.0 (SD 7.7) years where the minimum age observed was 28.0 years and the maximum was 59.0 years. The median age was 35.5 (IQR 31.0 – 43.0) years. There were more female respondents at 54.3% and male at 45.7%. 51.1% of the Anaesthesia Providers were Anaesthesia Residents, 25.5% Consultant Anaesthesiologists and 23.4% were Registered Clinical Officers. There were an equal number of respondents affiliated to both Kenyatta National Hospital and the University of Nairobi at 50% each.

Table 7:Demographic characteristics

	Frequency, *(n=94)*	**Percent**
Age		
≤30	18	19.1
31 – 40	48	51.1
41 – 50	21	22.3
>50	7	7.4
Gender		
Male	43	45.7
Female	51	54.3
Cadre		
Registered Clinical Officer	22	23.4
Anaesthesia Resident	48	51.1
Consultant Anaesthesiologist	24	25.5
Institution		
Kenyatta National Hospital	47	50.0
University of Nairobi	47	50.0

4.3 To Evaluate the Knowledge of Anaesthesia Providers on Sedation Out of Theatre.

The respondents were asked if there were KNH guidelines on the practice of sedation out of theatre, and majority of the respondents said no (76.6%, n=72). The majority were correct in that there are no KNH institutional guidelines on sedation out of theatre. The results are as shown on Table 8.

Table 8:Availability of guidelines on the practice of sedation out of theatre

	Frequency, *(n=94)*	**Percent**
Yes	22	23.4
No	72	76.6

The respondents were asked to choose equipment required when carrying out sedation out of theatre from a list, and their responses were as shown on Table 9. All the equipment may be used when carrying out sedation out of theatre. Majority of the respondents picked oxygen (98.9%), pulse oximeter (98.9%), suction (95.7%), supraglottic airway (89.4%) and endotracheal tube (78.7%). Infusion pump (48.9%) was the least chosen equipment.

Table 9:Equipment required when carrying out sedation out of theatre

Equipment	**Frequency**	**Percent of respondents,** *(n=94)*
Oxygen port (piped or cylinder)	93	98.9%
Pulse oximeter	93	98.9%
Suction machine	90	95.7%
Supraglottic airway	84	89.4%
Endotracheal tube	74	78.7%
Defibrillator	58	61.7%
Capnograph	52	55.3%
Infusion pump	46	48.9%

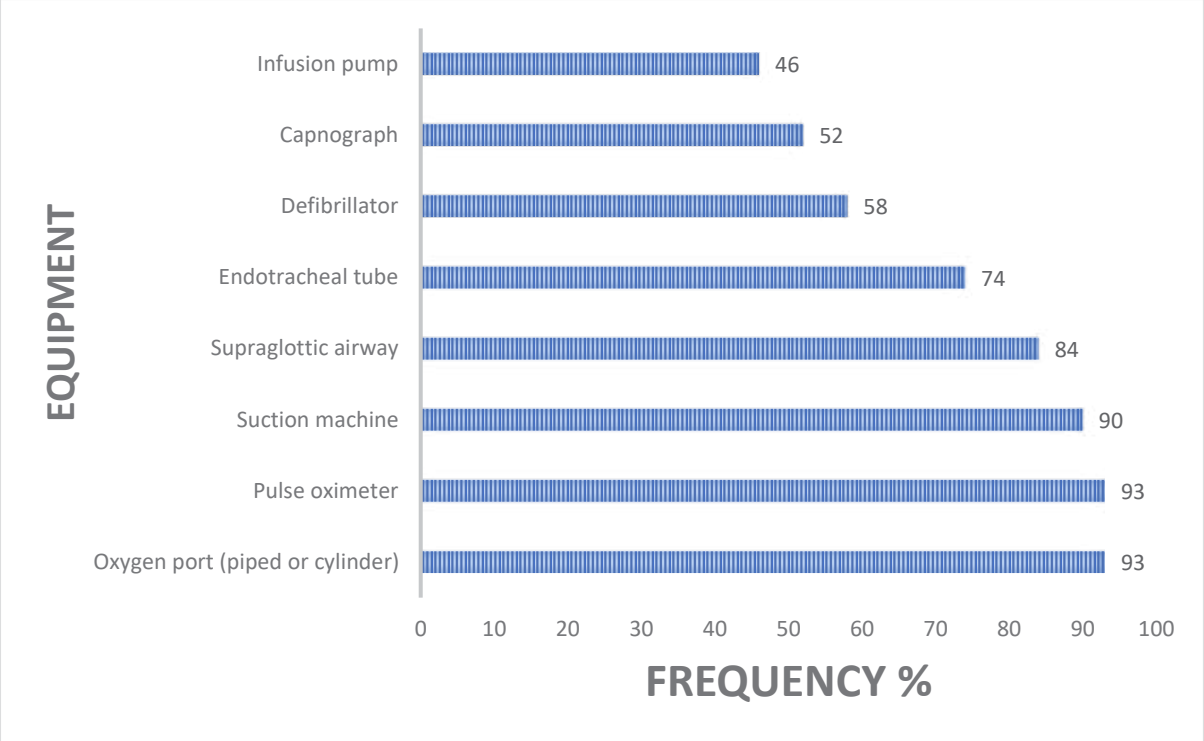

Figure 1:Equipment required when carrying out sedation out of theatre

The respondents were asked to choose drugs for sedation out of theatre from a list, and their responses were as shown on Table 10 The drugs in the list are readily available in KNH theatres. All the drugs which include a range of anaesthetic agents and analgesics can potentially be used to carry out sedation out of theatre. Majority of the respondents picked Ketamine (98.9%), midazolam (97.9%), and propofol (92.6%). Fentanyl was favoured by (76.6%) of the population and dexmedetomidine (69.1%). The least picked drug was dexketoprofen (11%).

Table 10:Drugs required when carrying out sedation out of theatre

Drugs	**Frequency**	**Percent of respondents,** *(n=94)*
Ketamine	93	98.9%
Midazolam	92	97.9%
Propofol	87	92.6%
Fentanyl	72	76.6%
Dexmedetomidine	65	69.1%
Sevoflurane	26	27.7%
Nitrous oxide	25	26.6%
Paracetamol	23	24.5%
Isoflurane	20	21.3%
Dexketoprofen	11	11.7%

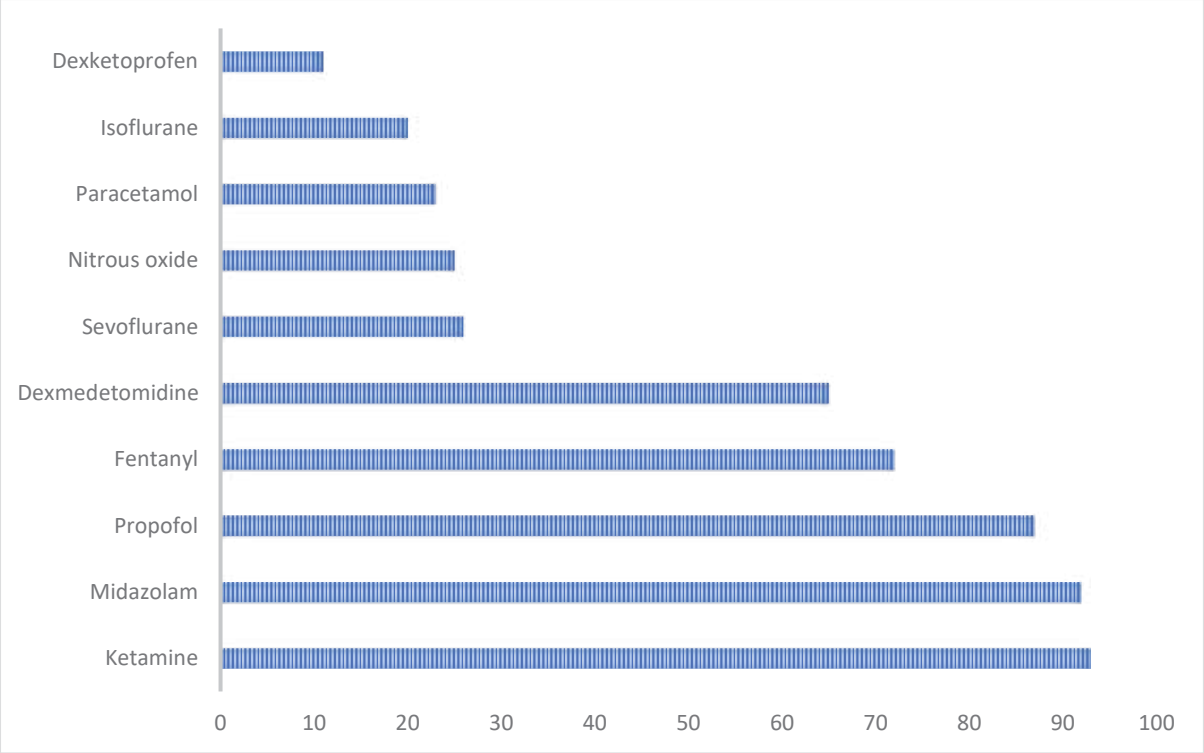

Figure 2:Drugs required when carrying out sedation out of theatre

The respondents were asked what the gold standard for monitoring ventilation, and their response is as shown on Table 11. Majority of the anaesthesia providers chose capnography as the gold standard for monitoring ventilation (72.3%).

Table 11: Gold standard for monitoring ventilation

	Frequency, *(n=94)*	**Percent**
Capnography	68	72.3
Pulse oximetry	26	27.7

The respondents were asked if fasting guidelines apply for patients undergoing sedation out of theatre as those undergoing surgery in the operating theatres, and their response is as shown on Table 12. Most of the anaesthesia providers (88.3%) identified that the same fasting guidelines apply for patients undergoing sedation out of theatre as those undergoing surgery in the operating theatres.

Table 12:Fasting guidelines application

	Frequency, *(n=94)*	**Percent**
Yes	83	88.3
No	11	11.7

4.4 To Evaluate the Attitude of Anaesthesia Providers Towards Sedation Out of Theatre

The respondents were asked if the introduction of protocols will improve how the practice of sedation out of theatre, and their response is as shown on Table 7. 95.7% of the anaesthesia providers strongly agree and 4.3% agree that introduction of protocols will improve the practice of sedation out of theatre.

Table 13:Introduction of protocols improves practice of sedation out of theatre

	Frequency, *(n=94)*	**Percent**
Strongly agree	90	95.7
Agree	4	4.3

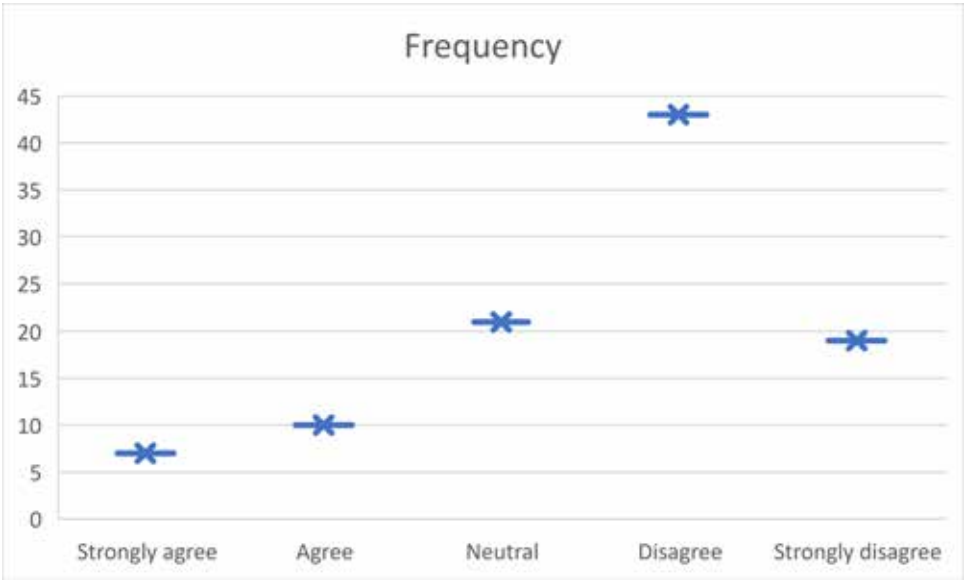

Figure 3:Introduction of protocols improves practice of sedation out of theatre

The respondents were asked if trainings, seminars or CME's will be useful in the practice of sedation out of theatre, and their response is as shown on Table 14. Trainings, seminars and CMEs were found to be very important (91.5%) and important (8.5%) of the anaesthesia providers.

Table 14:Trainings, seminars and CMEs are useful for practice of sedation out of theatre

	Frequency, *(n=94)*	**Percent**
Very important	86	91.5
Important	8	8.5

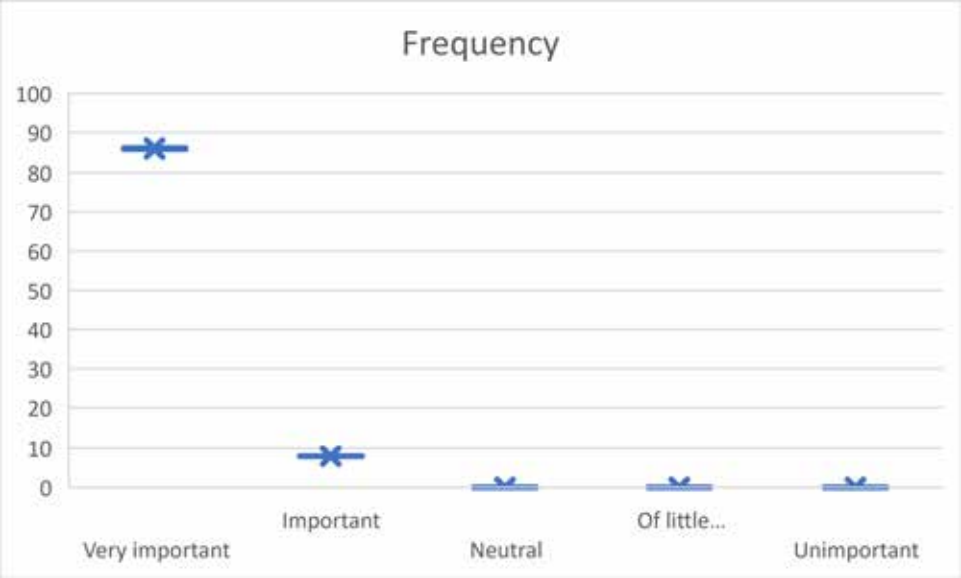

Figure 4:Trainings, seminars and CMEs are useful for practice of sedation out of theatre

The respondents were asked if units are well equipped to handle emergencies that arise during sedation out of theatre, and their response is as shown on Table 9. 42.6% disagree that the units are well equipped to handle emergencies and 19.1% strongly disagree that the units are well equipped. 21.3% were neutral.

Table 15:Units are well equipped to handle emergencies during sedation out of theatre

	Frequency, *(n=94)*	**Percent**
Strongly agree	7	7.4
Agree	9	9.6
Neutral	20	21.3
Disagree	40	42.6
Strongly disagree	18	19.1

The respondents were asked to state their level of satisfaction on various items when providing sedation out of theatre, and their responses are as shown on Table 16. 36.2% of the anaesthesia providers were satisfied with the availability of drugs in provision of sedation out of theatre. 50% of the respondents were dissatisfied with the availability of equipment. 48.9% of the anaesthesia providers were dissatisfied with the team preparedness during emergencies. 33% of the respondents were dissatisfied with availability of help when calling for help during an emergency.

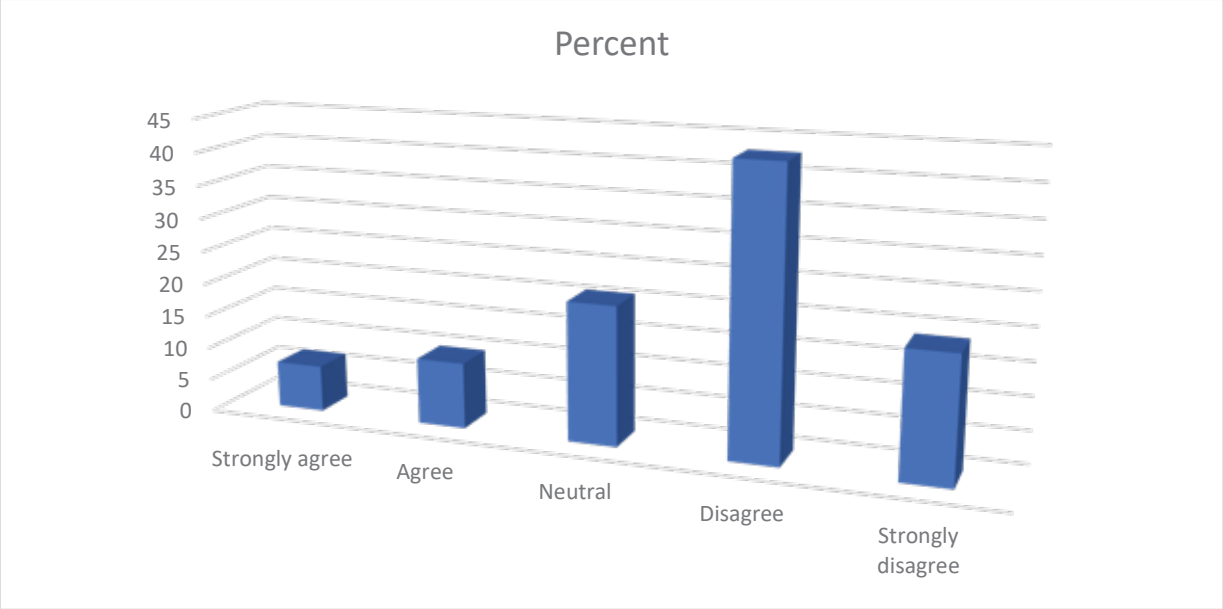

Figure 5: Units are well equipped to handle emergencies during sedation out of theatre

Table 16:Satisfaction on availability of items in the provision of sedation out of theatre

	Very satisfied	Satisfied	Neutral	Dissatisfied	Very dissatisfied
Drugs	2 (2.1)	**34 (36.2)**	24 (25.5)	31 (33.0)	3 (3.2)
Equipment	2 (2.1)	22 (23.4)	20 (21.3)	**47 (50.0)**	3 (3.2)
Team preparedness (emer.)	1 (1.1)	17 (18.1)	19 (20.2)	**46 (48.9)**	11 (11.7)
Help/Assistance (emer.)	10 (10.6)	25 (26.6)	18 (19.1)	**31 (33.0)**	10 (10.6)

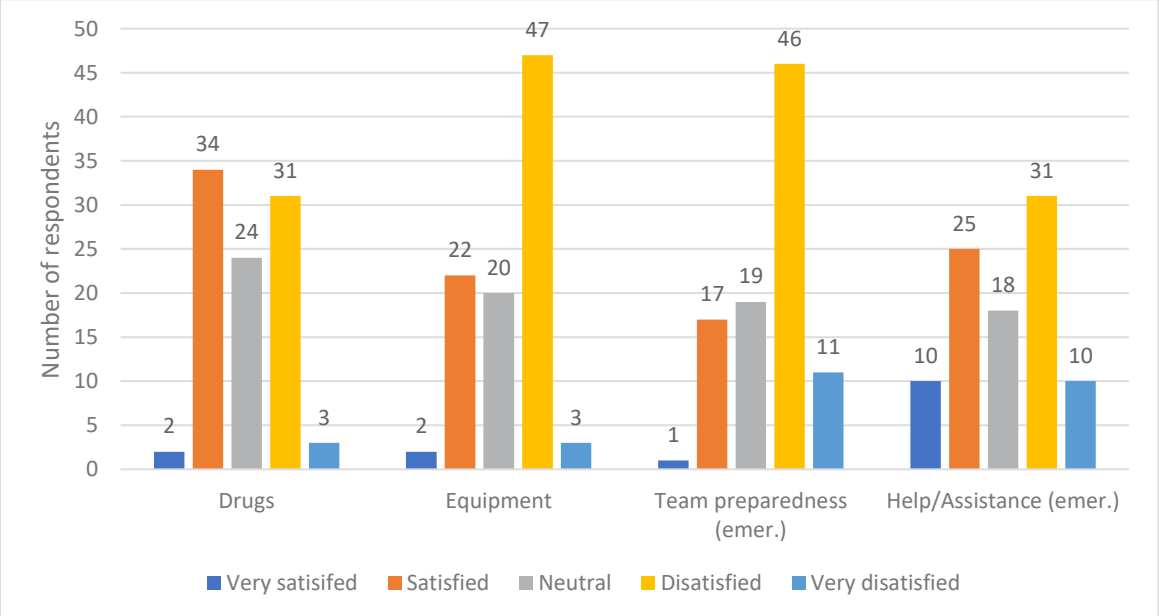

Figure 6:Satisfaction on availability of items in the provision of sedation out of theatre

4.5 To Survey the Practice of Sedation Out of Theatre by Anaesthesia Providers

The respondents were asked to state the units they have provided sedation, and their responses are as shown on Table 17. Majority of the anaesthesia providers had carried out sedation procedures in MRI/CT scan (81.9%), Endoscopy Unit (71.3%) and clinic 66(68.1%). A lower proportion of anaesthesia providers had carried out sedation procedures in the wards (22.3%), Cath lab (29.8%) and Casualty (30.9%).

Table 17 :Provision of sedation to patients in these units

	Frequency	**Percent of respondents,** *(n=94)*
MRI/CT scan	77	81.9%
Endoscopy Unit	67	71.3%
Clinic 66	64	68.1%
Ophthalmology/Eye Clinic Theatre	55	58.5%
Radiotherapy	50	53.2%
Casualty	29	30.9%
Cath lab	28	29.8%
Wards	21	22.3%

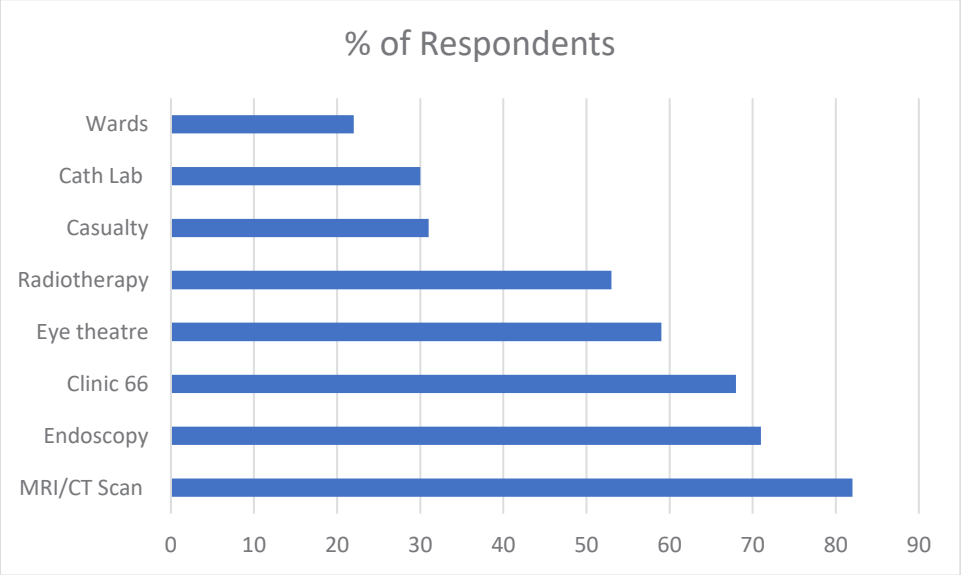

Figure 7:Provision of sedation to patients in these units

The respondents were asked to state what determines the choice of drugs used in sedation, and their responses are as shown on Table 12. All the options listed were potential determining factors on choice of drugs used when carrying out sedation out of theatre. Majority of the anaesthesia providers chose drugs based on availability (94.7%) and procedure being done (90.4%) and least based on route of administration (66%) and side effects (68.1%).

Table 18:Determining factors on choice of drugs used in sedation

		Percent of respondents, *(n=94)*
Availability	89	94.7%
Procedure being done	85	90.4%
Patient's age	74	78.7%
Onset of action	68	72.3%
Side effects	64	68.1%
Route of administration	62	66.0%

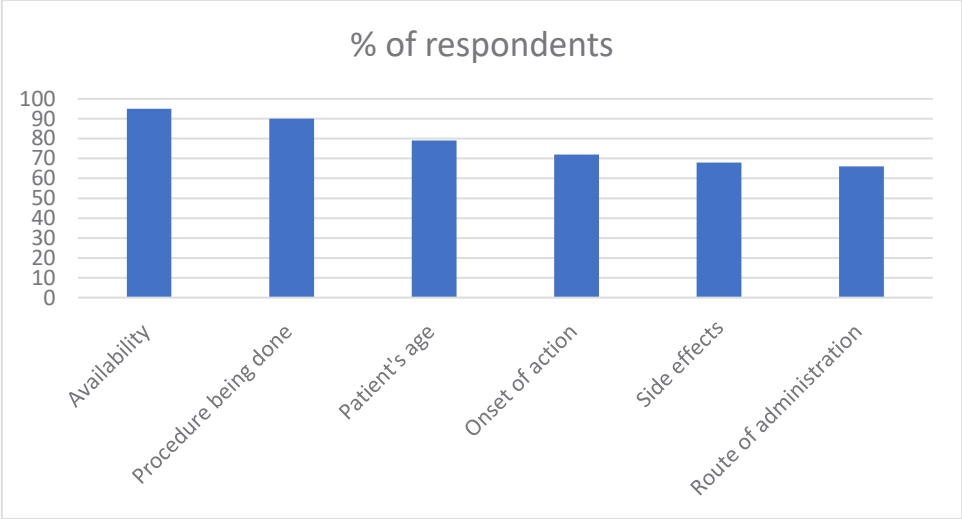

Figure 8:Determining factors on choice of drugs used in sedation

The respondents were asked to state the drugs that were available when carrying out sedation out of theatre, and their responses are as shown on Table 19. On the availability of emergency drugs and antidotes when carrying out sedation out of theatre; atropine (98.9%) and adrenaline (95.7%) had been availed to the anaesthesia providers. The least available were flumazenil (4.3%) and chlorpheniramine (10.6%)

Table 19:Drugs available when carrying out sedation out of theatre

	Frequency	Percent of respondents, *(n=94)*
Atropine	93	98.9%
Adrenaline	90	95.7%
Glycopyrrolate	58	61.7%
Hydrocortisone	19	20.2%
Naloxone	17	18.1%
Chlorpheniramine	10	10.6%
Flumazenil	4	4.3%

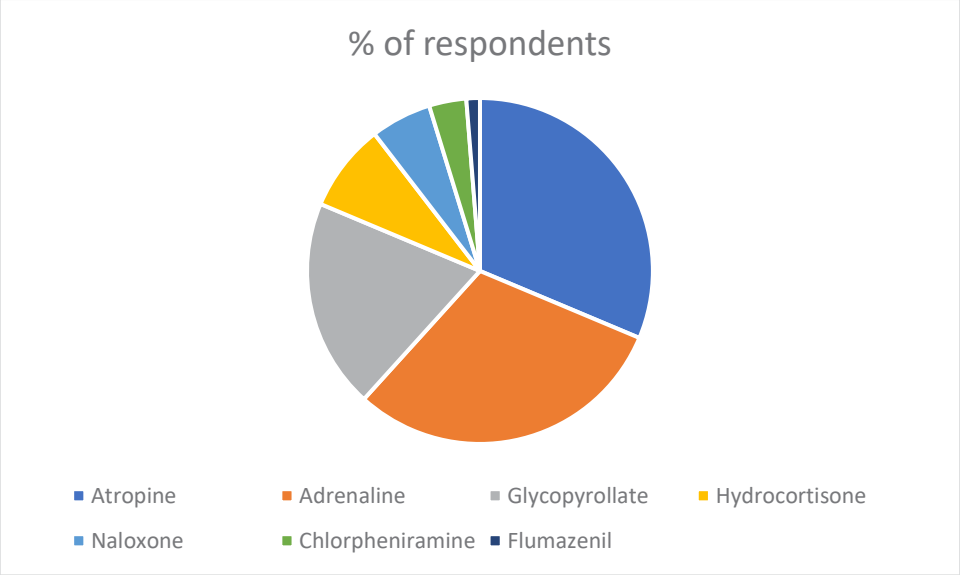

Figure 9:Drugs available when carrying out sedation out of theatre

The respondents were asked to state which patients are not to be given sedation out of theatre, and their responses are as shown on Table 20. Sedation out of theatre can be carried out successfully in both categories of patients by a skilled anaesthesia provider who has the appropriate drugs and equipment. 35% of the respondents gave the correct response. Majority (45.7%) chose that ASA III and IV patients should not be provided for sedation out of theatre.

Table 20:Patients not to be provided sedation out of theatre

	Frequency	**Percent of respondents,** *(n=94)*
ASA III and IV	43	45.7
Geriatric patients	2	2.1
All of the above	16	17.0
None of the above	33	35.1

4.6 To Determine the Challenges Experienced by Anaesthesia Providers When Providing Sedation Services Out of Theatre.

The respondents were asked to state the challenges experienced when providing sedation out of theatre, and their responses are as shown on Table 21. The most common challenge experienced was unfamiliar rooms and environment and not knowing where the drugs and equipment are kept (83%). 6.4% of respondents added to the list lack of functional monitoring equipment.

Table 21:Challenges experienced when providing sedation out of theatre

		Percent of respondents, *(n=94)*
Exposure to radiation	57	60.6%
Poor accessibility to the patient	50	53.2%
Inadequate or inexperienced staff	66	70.2%
Lack of sedation protocols	68	72.3%
Unfamiliar rooms and environment and not knowing where the drugs and equipment are kept	78	83.0%
Lack of a trained assistant	65	69.1%
Lack of functional monitoring equipment	6	6.4%

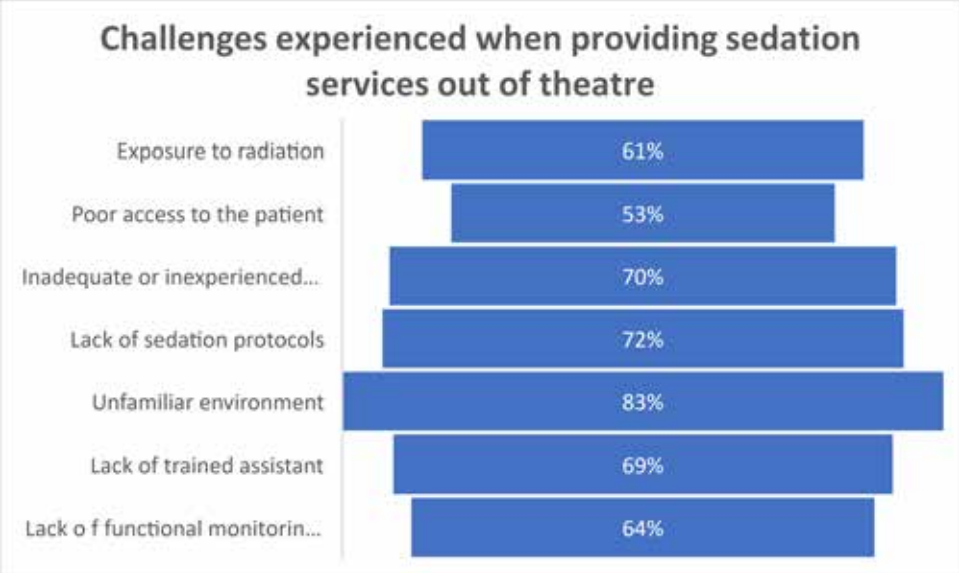

Figure 10:Challenges experienced when providing sedation out of theatre

5.0 CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

The aim of this study was to assess the knowledge, attitude and practice of sedation out of theatre by anaesthesia providers. The study involved anaesthesia providers practicing in KNH. For this study Anaesthesia Providers included Anaesthesia Residents, Registered Clinical Officer Anaesthesia and Consultant Anaesthesiologists. The response rate was 100% compared to 90% response rate seen by Mwangi et al in a similar study on sedation and analgesia use at KNH ICU (55).

IN relation to knowledge, majority correctly noted that KNH does not have guidelines/protocols to guide the practice of sedation out of theatre. However, sedation practice is part of the curriculum and practical undertaking of the anaesthesia providers and the Main CCU has outlined protocols that can be extrapolated and easily adapted for the remote section use. Wood Thompson et al in a study to determine current sedation practices, indications and obstacles in selected emergency centres in Southern Gauteng, South Africa found that 70% of the institutions had written protocols. However, they concluded that there was a need to enhance practitioner training and promote awareness of current trends and protocols (29).

All the sedation related equipment required according to the ASA Statement on Non Operating Room Anaesthetizing Locations (4) were enquired on in relevance. The equipment chosen as most important were oxygen, pulse oximeter, suction machine, supraglottic airway and endotracheal tube in descending order. The least chosen equipment was infusion pump and capnograph. Safety standards apply hence all the equipment are necessary.

The anaesthesia providers were also asked to choose drugs required when carrying out sedation out of theatre from a list. All the drugs on the list may be used for sedation. Volatile anaesthetics have a role together with other sedatives and analgesic drugs. Most of the respondents chose ketamine, midazolam and propofol as preferred drugs to use. This is similar to the findings of a study conducted to determine current sedation practices and obstacles in select emergency centres in Southern Gauteng South Africa. Most drugs used for sedation were midazolam, ketamine and propofol (29). A study assessing the safety parameters of complicated endoscopic procedures under deep sedation or general anaesthesia performed in children in the endoscopy suite rather than the operating theatres was found to be safe. The drugs of choice were propofol 63% followed by a combination of propofol and midazolam 16% (46). A survey of sedation practice in six acute hospitals in the southwest England was done whereby all procedural

sedations over 48 hours were recorded. The most used sedative agent was found to be midazolam (47). Only 12% chose dexketoprofen which is a non-steroidal anti-inflammatory drug. This may be considered a slight confusion to dexmedetomidine an emergent sedo-analgesic agent but, in reality it is also considered that adequate analgesia is a contributing factor to the success of some procedures.

The gold standard for monitoring ventilation was correctly identified by a majority of the respondents as capnography. Capnography is useful in improving the safety profile of procedures carried out in these settings, while pulse oximetry has a delayed response . It is more accurate than clinical observation and oximetry in detecting respiratory depression (48). Capnography also allows the anaesthesia provider to use oxygen without the concern of blunting the response of the pulse oximeter (49). This is in keeping with a study done by Conway et al on issues and challenges associated with nurse administered procedural sedation and analgesia in the cardiac catheterization lab. Capnography was found to be a vital monitoring tool especially where there were limitations of oxygen saturation monitoring (50).

Fasting guidelines apply as correctly identified by 88% of the anaesthesia providers. Sedation per se may gradually progress in depth to the point of loss of protective airway reflexes and a possibility of pulmonary aspiration of gastric contents. In certain situations, during procedural sedation , airway manipulation and direct instrumentation maybe required. It is imperative that the conditions for safety must be reassures d and fasting as appropriate is required. Endoscopic evaluation of the upper gastrointestinal tract as a minimum prerequisite will also require a fasted state.

The attitude of anesthesia providers was evaluated using Likert Scale questions. 96% of the anaesthesia providers strongly agreed and 4% agreed that the introduction of protocols would improve the practice of sedation out of theatre. The respondents also thought that trainings, seminars and CMEs were very important (92%) and important (8%) in the practice of sedation out of theatre. The Academy of Medical Royal Colleges in an update on safe sedation practice for healthcare procedures recommends that: practitioners who are providing sedation services should undergo training in the knowledge, skills and competencies necessary for safe sedation. They should also be able to recognize complications and handle them accordingly. The African Surgical Outcomes Study did a prospective observational study on the postoperative outcomes associated with procedural sedation conducted by physician and non physician anaesthesia providers. They hypothesized that the level of training of the sedation provider may be associated with the incidence of severe postoperative complications and death. The incidence of severe postoperative complications and death was 10.2 % in the non physician group and

2.1% in the physician group. This further proves that training and indeed level of training has an impact on the sedation outcomes (51).

Lapere et al in a prospective observational study on paediatric out of theatre sedation at a tertiary children's hospital (Red Cross War Memorial Children's Hospital) concluded that protocols, guidelines and trainings are essential in out of theatre procedural sedation (20). Similarly attitude evaluation by Mwangi et al in ICU sedation profiles showed similar profiles to our study ten years later in the same institution (55).

The study also sought to find out how well equipped the units are to handle emergencies during sedation procedures out of theatre. 43% of the respondents disagreed that the units were well equipped, 19% strongly disagreed and 21% were neutral. Relatedly this shows quite a high proportion of the workers are in situation they felt are inadequately set up for providing a safe service. It begs then , what would be needed to ensure optimal conditions are met if the providers keep giving this service. A recent review from the African Surgical Outcome Studies (ASOS 2022) highlighted the appropriate needs and support for sedation practice (51). However, the non-availability of a dedicated equipment and devices in some centers has been considered concerning, rendering these facilities unsafe for the practice of procedural sedation (29).

The anaesthesia providers were evaluated on the satisfaction on availability of items in the provision of sedation out of theatre. The range was from very satisfied, satisfied, neutral, dissatisfied to very dissatisfied. 36% of the respondents were satisfied with the availability of drugs, 50% were dissatisfied with the availability of equipment, 49% were dissatisfied with team preparedness during emergencies and 33% were dissatisfied with availability of help/ assistance during emergencies. Tembo in a study of knowledge, attitude and practice of sedation out of the operating theatres at Muhimbili National Hospital, Tanzania found that most of the areas of sedation out of theatre did not have adequate resuscitation equipment. There was an assistant available 69% to assist in checking drugs, monitoring the patient and for resuscitation if required. (27).

The study also sought to survey the practice of sedation out of theatre. There was good penetration of anaesthesia services in many parts of the hospital. Majority of the anaesthesia providers had provided sedation services in the MRI/CT scan, endoscopy, clinic 66 and eye theatre. The units least frequented by the respondents were the wards, Cardiac Catheterization Lab and Casualty. Similarly, a survey of sedation practice in 6 acute hospitals in the southwest of England was done whereby all procedural sedation over a 48-hour period was recorded. Most sedation was done in endoscopy 56% operating theatres 30% and cardiology 7% (47).

On factors that were used to determine choice of drugs used during sedation, all the factors listed are potential determining factors. Most anaesthesia providers chose drugs to use for sedation outside theatre 95% chose according to what was available and 90% according to the type of procedure being done. The least chosen determining factors were route of administration 66% and side effects 68%. These findings are comparable to a study done by Wood Thompson et al to determine current sedation practices, indications and obstacles in selected emergency centers in Southern Gauteng, South Africa. The choice of sedation agent was mostly influenced by clinician using the drug 47%, clinical scenario 29%, safety profile 17% and cost 11% (29).

The anaesthesia providers were also questioned on the categories of patients who should not be provided with sedation out of a theatre setting. Depending on the circumstances, ASA III and IV and geriatric patients can still undergo sedation procedures out of theatre. The geriatric population have unique challenges which should be considered when planning for sedation. They tend to have numerous comorbidities; they may be on some medications and have declining organ function. There may be altered pharmacokinetics and pharmacodynamics, hence need to reduce drug doses and titrate to effect (48) . This should only happen in the presence of a skilled anaesthesia provider who is well equipped with the necessary equipment and drugs. Hence the correct answer would be 'none of the above'. This question was not answered correctly. Majority 46% chose that ASA III and IV patients should not have sedation out of theatre. Miner et al did a prospective study on procedural sedation of critically ill patients in the emergency department between August 2002 and December 2003. Sedation using propofol and etomidate was deemed to be safe in ASA III and ASA IV patients. The rates of respiratory depression, hypotension and need to employ airway interventions was similar to the non-critical patients (52). In a study assessing the safety parameters of complicated endoscopic procedures under deep sedation or general anaesthesia performed in children in the endoscopy suite rather than the operating theatre, it was concluded that complicated paediatric patients can be managed successfully out of theatre provided that safety criteria for sedation are met (46).

Challenges experienced by the anaesthesia providers when carrying out sedation out of theatre. 83% of the respondents identified unfamiliar rooms and environment hence not knowing where drugs and equipment are kept as a challenge. Lack of sedation protocols (72%) and inexperienced/ inadequate staff (70%) as other challenges. Lack of a trained assistant (69%) was another major challenge experienced by anaesthesia providers. Carstens in his study on the management of a safe and cost effective conscious sedation unit found that shortages in

personnel, drugs, equipment and training factors to be major challenges influencing service delivery (53). Khoza did a study on current sedation practices in paediatric audiology clinics in Gauteng, South Africa. The challenges encountered included lack of resources: lack of monitoring equipment more so size appropriate for paediatric patients. Other challenges identified include lack of uniformity and standard sedation practices/protocols (54). This is also comparable to the finding of Conway et al in a study on issues and challenges associated with nurse administered procedural sedation and analgesia in the cardiac catheterization lab. Environmental barriers to patient assessment with included heavy surgical draping and medical imaging equipment (50).

5.2 Study Limitations

Some anaesthesia providers are not actively involved in sedation out of theatre. The study did not include non anaesthesia providers who routinely carry out sedation out of theatre for some procedures: for example, in endoscopy unit. The study was carried out online, hence it was not possible to offer explanations or clarifications in case any of the respondents did not understand the questions.

5.3 Conclusion

The knowledge of the anaesthesia providers on various items on sedation out of theatre was good. Majority of the anaesthesia providers felt that the units where sedation is carried out are not well equipped to handle emergencies. The anaesthesia providers were dissatisfied with the availability of equipment, team preparedness during emergencies and availability of help/ assistance during emergencies. Drugs for use during sedation were chosen according to what was available and the procedure being done. Emergency drugs were readily available but the antagonist drugs were not readily available. The major challenges experienced when carrying out sedation out of theatre were unfamiliar rooms, lack of sedation protocols and inadequate/ inexperienced staff.

5.4 Recommendations

Formulation of institutional protocols that guide the anaesthesia providers on sedation out of theatre thus standardizing patient management. Ensure availability of trained assistants to help the anaesthesia providers when carrying out sedation in the various units. Have a fully stocked emergency trolley with the appropriate emergency and resuscitation drugs and equipment. Provide appropriate monitoring equipment in all areas where sedation is carried out including various options for the paediatric patients. Have training courses and CMEs on practice of sedation out of theatre. This will help improve the standards of care.

REFERENCES

1. Hinkelbein J, Lamperti M, Akeson J, Santos J, Costa J, De Robertis E, et al. European Society of Anaesthesiology and European Board of Anaesthesiology guidelines for procedural sedation and analgesia in adults. European Journal of Anaesthesiology | EJA. 2018 Jan;35(1):6–24.
2. Blayney MR. Procedural sedation for adult patients: an overview. Continuing Education in Anaesthesia Critical Care & Pain. 2012 Aug;12(4):176–80.
3. Chang B, Urman RD. Non-operating Room Anesthesia. Anesthesiology Clinics. 2016 Mar;34(1):223–40.
4. Titus SJ. Statement on Non-Operating Room Anesthetizing Locations. :2.
5. Turnbull DD, Gannon DJ. Chapter 7 Guidelines for the Provision of Anaesthesia Services in the Non-theatre Environment 202. 2021;29.
6. Roelofse J, Rensburg MJ van, Gray R, Lapere C. SASA paediatric guidelines for the safe use of procedural sedation and analgesia for diagnostic and therapeutic procedures in children: 2021–2026. Southern African Journal of Anaesthesia and Analgesia. 2021 Aug 13;27(4):S1–84.
7. Continuum of Depth of Sedation: Definition of General Anesthesia and Levels of Sedation/Analgesia [Internet]. [cited 2021 Oct 7]. Available from: https://www.asahq.org/standards-and-guidelines/continuum-of-depth-of-sedation-definition-of-general-anesthesia-and-levels-of-sedationanalgesia
8. Titus SJ. Position on Monitored Anesthesia Care. :2.
9. Practice Guidelines for Moderate Procedural Sedation and Analgesia 2018. Anesthesiology. 2018 Mar 1;128(3):437–79.
10. Ae A, Ml L, Ee H. ASA Physical Status Classification System. :4.
11. Coté CJ, Wilson S, AMERICAN ACADEMY OF PEDIATRICS, AMERICAN ACADEMY OF PEDIATRIC DENTISTRY. Guidelines for Monitoring and Management of Pediatric Patients Before, During, and After Sedation for Diagnostic and Therapeutic Procedures: Update 2016. Pediatrics. 2016 Jul 1;138(1):e20161212.
12. Gozal D, Gozal Y. Pediatric sedation/anesthesia outside the operating room. Current Opinion in Anaesthesiology. 2008 Aug;21(4):494–8.

13. Watts J. Safe Sedation for All Practitioners : A Practical Guide. :190.

14. Campbell K, Torres L, Stayer S. Anesthesia and Sedation Outside the Operating Room. Anesthesiology Clinics. 2014 Mar;32(1):25–43.

15. Urman RD, Kaye AD. Moderate and Deep Sedation in Clinical Practice. :344.

16. Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration: Application to Healthy Patients Undergoing Elective ProceduresAn Updated Report by the American Society of Anesthesiologists Task Force on Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration*. :18.

17. Hinkelbein J, Schmitz J, Lamperti M, Fuchs-Buder T. Procedural sedation outside the operating room. Current Opinion in Anaesthesiology. 2020 Aug;33(4):533–8.

18. Jo YY, Kwak HJ. Sedation Strategies for Procedures Outside the Operating Room. Yonsei Med J. 2019;60(6):491.

19. Lightdale JR, Goldmann DA, Feldman HA, Newburg AR, DiNardo JA, Fox VL. Microstream Capnography Improves Patient Monitoring During Moderate Sedation: A Randomized, Controlled Trial. Pediatrics. 2006 Jun 1;117(6):e1170–8.

20. Lapere C, Gray R, Wilson G. Paediatric out-of-theatre procedural sedation at a tertiary children's hospital: A prospective observational study. S Afr J CH. 2021 Apr 30;15(1):33.

21. Metzner J, Domino KB. Risks of anesthesia or sedation outside the operating room: the role of the anesthesia care provider. Current Opinion in Anaesthesiology. 2010 Aug;23(4):523–31.

22. Coté CJ, Wilson S, AMERICAN ACADEMY OF PEDIATRICS, AMERICAN ACADEMY OF PEDIATRIC DENTISTRY. Guidelines for Monitoring and Management of Pediatric Patients Before, During, and After Sedation for Diagnostic and Therapeutic Procedures. Pediatrics. 2019 Jun 1;143(6):e20191000.

23. Coté CJ, Wilson S, AMERICAN ACADEMY OF PEDIATRICS, AMERICAN ACADEMY OF PEDIATRIC DENTISTRY. Guidelines for Monitoring and Management of Pediatric Patients Before, During, and After Sedation for Diagnostic and Therapeutic Procedures. Pediatrics. 2019 Jun 1;143(6):e20191000.

24. Ruskin KJ, Bliss JP. Alarm Fatigue and Patient Safety. 2019;28.

25. Malviya S Naughton, Norah N, Tremper KK. Sedation and analgesia for diagnostic and therapeutic procedures. Totowa, N.J.: Humana; 2003.

26. Anwar A, Heller KO, Esper SA, Ferreira RG. Nonoperating room anesthesia: strategies to improve performance. International Anesthesiology Clinics. 2021;59(4):27–36.

27. Tembo F. ASSESSMENT OF KNOWLEDGE AND PRACTICE ON SEDATION OUTSIDE THE OPERATING THEATERS AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM, TANZANIA, 2016. :60.

28. Omisore A, Adenekan A, Ayoola O, Owojuyigbe A, Afolabi B. Sedation practice among Nigerian radiology residents. Southern African Journal of Anaesthesia and Analgesia. 2016 Oct 3;22(5):145–50.

29. Wood-Thompson DK, Enyuma COA, Laher AE. Procedural sedation and analgesia practices in the emergency centre. African Journal of Emergency Medicine. 2019 Mar;9(1):8–13.

30. Goudra BG, Singh PM, editors. Out of Operating Room Anesthesia: A Comprehensive Review [Internet]. Cham: Springer International Publishing; 2017 [cited 2021 Nov 2]. Available from: http://link.springer.com/10.1007/978-3-319-39150-2

31. Mason, MD KP, editor. Pediatric Sedation Outside of the Operating Room: A Multispecialty International Collaboration [Internet]. Cham: Springer International Publishing; 2021 [cited 2022 Jan 7]. Available from: https://link.springer.com/10.1007/978-3-030-58406-1

32. Urman RD, Gross WL, Philip BK, editors. Anesthesia outside of the operating room. Oxford ; New York: Oxford University Press; 2011. 360 p.

33. Jayaraman L, Sethi N, Sood J. Anaesthesia Outside the Operating Theatre. :5.

34. Weiss MS, Fleisher LA. Non-operating room anesthesia [Internet]. Philadelphia, PA: Elsevier Saunders; 2015 [cited 2022 Jan 7]. Available from: https://www.clinicalkey.com/dura/browse/bookChapter/3-s2.0-C20120021734

35. Hoffman GM, Nowakowski R, Troshynski TJ, Berens RJ, Weisman SJ. Risk Reduction in Pediatric Procedural Sedation by Application of an American Academy of Pediatrics/American Society of Anesthesiologists Process Model. PEDIATRICS. 2002 Feb 1;109(2):236–43.

36. Youn AM, Ko YK, Kim YH. Anesthesia and sedation outside of the operating room. Korean J Anesthesiol. 2015;68(4):323.

37. Karamnov S, Sarkisian N, Grammer R, Gross WL, Urman RD. Analysis of Adverse Events Associated With Adult Moderate Procedural Sedation Outside the Operating Room. J Patient Saf. 2017 Sep;13(3):111–21.

38. Sedation, analgesia and anaesthesia in the radiology department, second edition. :34.

39. Hlongwane-Gukuta T. Out of theatre sedation – how I do it safely. S Afr Fam Pract. 2016 May 23;58(7):S28–31.

40. Melloni C. Anesthesia and sedation outside the operating room: how to prevent risk and maintain good quality. Current Opinion in Anaesthesiology. 2007 Dec;20(6):513–9.

41. Jirativanont T, Manomayangkul K, Udomphorn Y, Yokubol B, Saguansab A, Kraiprasit K, et al. Incidence and risk factors for adverse events during anesthesiologist-led sedation or anesthesia for diagnostic imaging in children: a prospective, observational cohort study. Asian Biomedicine. 2017 Jan 31;9(5):649–58.

42. Soyalp C, Yüzkat N. Attitudes of Anesthesiology and Reanimation Specialists Towards Pediatric Anesthesia Outside of the Operating Room Practices: A survey analysis. Eastern J Med. 2019;24(3):340–9.

43. Souter KJ, Van Cleve W. Training anesthesiologists in out-of-operating room anesthesia. Current Opinion in Anaesthesiology. 2017 Aug;30(4):480–9.

44. Manga P. Levels of awareness of procedural sedation and analgesia among non-anaesthesiologists at an academic hospital in Johannesburg, South Africa. :9.

45. Roelofse J, Jansen van Rensburg M. Guidelines for the safe use of procedural sedation and analgesia for diagnostic and therapeutic procedures in adults: 2020–2025. South Afr J Anaesth Analg. 2020 Apr 24;S1–75.

46. Wengrower D, Gozal D, Gozal Y, Meiri Ch, Golan I, Granot E, et al. Complicated endoscopic pediatric procedures using deep sedation and general anesthesia are safe in the endoscopy suite. Scandinavian Journal of Gastroenterology. 2004 Jan;39(3):283–6.

47. South West Anaesthetic Research Matrix (SWARM). Sedation practice in six acute hospitals - a snapshot survey. Anaesthesia. 2015 Apr;70(4):407–15.

48. Beeton A. Sedation: Is it getting easier? Southern African Journal of Anaesthesia and Analgesia. 2006 Jul;12(3):87–93.

49. Krauss B, Green SM. Procedural sedation and analgesia in children. 2006;367:15.

50. Conway A, Rolley J, Page K, Fulbrook P. Issues and challenges associated with nurse-administered procedural sedation and analgesia in the cardiac catheterisation laboratory: a qualitative study. J Clin Nurs. 2014 Feb;23(3–4):374–84.

51. van der Merwe F, Vickery NJ, Kluyts HL, Yang D, Han Y, Munlemvo DM, et al. Postoperative Outcomes Associated With Procedural Sedation Conducted by Physician and Nonphysician Anesthesia Providers: Findings From the Prospective, Observational African Surgical Outcomes Study. Anesthesia & Analgesia. 2022 Aug;135(2):250–63.

52. Miner JR. Procedural Sedation of Critically Ill Patients in the Emergency Department. Academic Emergency Medicine. 2005 Feb 1;12(2):124–8.

53. Carstens HA. The Management of a Safe and Cost Effective Conscious Sedation Unit.

54. Khoza-Shangase K. Current sedation practices in paediatric audiology clinics in gauteng, South Africa. International Journal of Pediatric Otorhinolaryngology. 2019 Jul;122:93–8.

55. Mwangi CM. A Survey of Knowledge, Attitude and Practice of Sedation and Analgesia among nurses working in Kenyatta National Hospital Intensive Care Unit.

APPENDICES

Appendix I: Questionnaire

DEMOGRAPHIC DATA

1. Age _
2. Sex Male ( ) Female ( )
3. Cadre Anaesthesia Resident ( ) Registered Clinical Officer ( ) Consultant Anaesthesiologist
4. Institution KNH ( ) UoN ( )
5. Years of Practice Post Qualification _

PART 1

6. Are there KNH guidelines on the practice of sedation out of theatre Yes ( ) No ( )
7. The following equipment are required when carrying out sedation out of theatre. Tick all that apply.

Oxygen port (piped or cylinder)	Infusion pump
Suction machine	Defibrillator
Pulse oximeter	Supraglottic airway
Capnograph	Endotracheal tube

8. The following drugs are used for sedation out of theatre. Tick all that apply.

Isoflurane	Midazolam	Dexketoprofen
Nitrous Oxide	Dexmedetomidine	Ketamine
Propofol	Fentanyl	
Sevoflurane	Paracetamol	

9. The gold standard for monitoring ventilation is

Pulse oximetry ( )

Capnography ( )

10. The same fasting guidelines apply for patients undergoing sedation out of theatre as those undergoing surgery in the operating theatres.

Yes ( ) No ( )

PART 2

11. Introduction of protocols will improve how we practice sedation out of theatre?

Strongly agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly disagree ( )

12. Trainings, seminars and CME's (continuous medical education) are useful in our practice of sedation out of theatre.

Very important ( ) Important ( ) Neutral ( ) Of little importance ( ) Unimportant ( )

13. Units are well equipped to handle emergencies that arise during sedation out of theatre

Strongly agree ( ) Agree ( ) Neutral ( ) Disagree ( ) strongly disagree ( )

14. How satisfied are you when providing sedation out of Theatre in KNH?

a. Availability of drugs Very satisfied ( ) Satisfied ( ) Neutral ( ) Dissatisfied ( ) Very Dissatisfied ( )
b. Availability of equipment Very satisfied ( ) Satisfied ( ) Neutral ( ) Dissatisfied ( ) Very Dissatisfied ( )
c. Team preparedness during emergencies Very satisfied ( ) Satisfied ( ) Neutral ( ) Dissatisfied ( ) Very Dissatisfied ( )
d. Availability of help when calling for assistance during an emergency Very satisfied ( ) Satisfied ( ) Neutral ( ) Dissatisfied ( ) Very Dissatisfied ( )

PART 3

15. I have provided sedation to a patient in these units. Tick all that apply.

Clinic 66 ( )	MRI/ CT scan ( )	Wards ( )
Cath Lab ( )	Radiotherapy ( )	Ophthalmology/eye unit ( )
Endoscopy Unit ( )	Casualty ( )	

16. What determines the choice of drugs used in sedation

Availability ( )	Side effects ( )
Route of administration ( )	Patients age ( )
Onset of action ( )	Procedure being done ( )

17. The following have been made available to me when carrying out sedation out of theatre.

Naloxone ( )	Hydrocortisone ( )	Atropine ( )
Intralipid ( )	Chlorpheniramine ( )	Glycopyrrolate ( )
Flumazenil ( )	Adrenaline ( )	

18. The following patients should not be given sedation out of theatre.

ASA III and IV ( ) Geriatric Patients ( ) None of the above ( )

Paediatric patients ( ) All of the above ( )

PART 4

19. The challenges I have experienced when providing sedation out of theatre include:

Poor accessibility to the patient ( )

Exposure to radiation ( )

Inadequate or inexperienced staff ( )

Lack of a trained assistant ( )

Unfamiliar rooms and environment and not knowing where the drugs and equipment are kept ( )

Lack of sedation protocols ( )

Other ……

Appendix II: Consent Explanation

Study Title: Knowledge, Attitude and Practice of Sedation out of theatre by Anaesthesia Providers in Kenyatta National Hospital
Name of Principal Investigator: Dr. Joy Nyatichi Nyabuti

I am a 4th year postgraduate student in the Department of Anaesthesia, University of Nairobi. this research is being conducted as part of my coursework towards completion of the degree of Master of Medicine in Anaesthesia and Critical Care.

Sponsor: self

Objective

The role of this study is to elucidate our knowledge, attitude and practice of sedation out of theatre as anaesthesia providers. I would also like to identify the challenges faced when carrying out sedation out of theatre. This will help in the improvement and safety profile of services we offer to our patients in Kenyatta National Hospital.

Study Procedure

To achieve this, I will obtain information through a questionnaire that will be administered online to the participants. The information garnered from the questionnaire will be handled confidentially and there will be no personal identifying markers on the forms. The data obtained from the questionnaire will be analyzed and the results will enable me to come up with some recommendations.

Terms and Conditions

Your participation in this study is voluntary. There are no attendant risks in participating in this study. You may withdraw from the study at any point. There is no cost attached to participating in this study. There is no compensation either monetary or in kind when participating in this study.

If you have any questions about the study, feel free to contact:

1. Dr Joy Nyatichi Nyabuti

   tichijoy@gmail.com

   0725132501

2. Dr. Thomas Chokwe

   Consultant Anaesthesiologist and Senior Lecturer, University of Nairobi.

3. KNH /UoN – ERC

   Uonknh_erc@uonbi.ac.ke

   Telephone number 2726300 ext. 44102

Appendix III: Informed Consent

I have read the consent form and understood the information therein. I agree to participate voluntarily and without any compensation. I can withdraw my consent at any point of the study without any consequences.

Name: …….

Date: …….

Appendix IV: NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 433431

Date of Issue: 14/February/2023

RESEARCH LICENSE

This is to Certify that Dr.. Joy Nyatichi Nyabuti of University of Nairobi, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: KNOWLEDGE, ATTITUDE AND PRACTICE OF OUT OF THEATRE SEDATION BY ANAESTHESIA PROVIDERS AT THE KENYATTA NATIONAL HOSPITAL for the period ending : 14/February/2024.

License No: NACOSTI/P/23/23361

433431

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix V: KNH/UoN-ERC Letter of Approval

UNIVERSITY OF NAIROBI
FACULTY OF HEALTH SCIENCES
P O BOX 19676 Code 00202
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Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
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Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/410

19th October, 2022

Dr. Joy Nyatichi Nyabuti
Reg No. H58/87679/2016
Dept of Anaesthesia
Faculty of Health Sciences
University of Nairobi

19 OCT 2022

Dear Dr. Nyabuti,

RESEARCH PROPOSAL: KNOWLEDGE, ATTITUDE AND PRACTICE OF OUT OF THEATRE SEDATION BY ANAESTHESIA PROVIDERS AT THE KENYATTA NATIONAL HOSPITAL (P498/06/2022)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P498/06/2022.** The approval period is 19th October 2022 – 18th October 2023.

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC.

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

Yours sincerely,

DR. BEATRICE K.M. AMUGUNE
SECRETARY, KNH-UoN ERC

c.c. The Dean, Faculty of Health Sciences, UoN
The Senior Director, CS, KNH
The Assistant Director, Health Information Dept., KNH
The Chairperson, KNH- UoN ERC
The Chair, Dept, of Anaesthesia, UoN
Supervisors: Dr. Thomas M Chokwe, Dept. of Anaesthesia, UoN