

**ANAESTHESIOLOGY PRACTICE IN THE PREVENTION OF
PERIOPERATIVE TRANSMISSION OF INFECTION AT THE
KENYATTA NATIONAL HOSPITAL**

**A DISSERTATION SUBMITTED IN PART FULFILLMENT OF THE
REQUIREMENTS FOR THE AWARD OF MASTER OF MEDICINE DEGREE IN
ANAESTHESIA**

UNIVERSITY OF NAIROBI

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DECLARATION

This dissertation is my original work and to my knowledge has not been presented for any award in this university.

.....
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ABSTRACT

Background: Anaesthesiologists play a pivotal role in the prevention of nosocomial infections. In anaesthetic practice, physiologic barriers are routinely breached, leading to patient contamination with microorganisms and consequential development of infection. Hygiene practices of professionals, proper cleaning of equipment and adequate sterile execution of invasive procedures are among important aspects that reduce the risk of transmission of infections

Objective: The purpose of this study was to evaluate the degree to which anaesthesia providers utilize appropriate hygiene techniques and anaesthetic equipment disinfection procedures for the prevention of infection during the perioperative period at the Kenyatta National Hospital.

Design: This study was designed as a cross-sectional descriptive survey

Methodology: Data for the study was collected using a structured questionnaire distributed to anaesthesia providers practicing in the Kenyatta National Hospital operating theatres. All consenting anaesthesia providers were recruited into the study. Data was collected over a period of 6 weeks at the main and satellite operating theatres in the Kenyatta National Hospital. Analysis was done using the Statistical Package for Social Scientists (SPSS) software version 20.0. The results were presented in the form of charts, tables and graphs.

Results: A total of 85(83%) out of 102 anaesthesia providers participated in this study. Of the four different cadres of anaesthesia providers at the Kenyatta National Hospital; consultant anaesthesiologists were 29.4%, registered clinical officers in anaesthesia were 29.4%, registrars in anaesthesia were 15.3% while clinical officer students in anaesthesia were 25.9% of the participants. The distributed questionnaires were designed to assess the hygienic precautions taken to reduce the potential for transmission of infectious agents to and from the patients under their care. Face masks and gloves were always used by 65.9% and 23.5%, respectively, while only 28.2% washed their hands between cases. 13.1% of the respondents had never received a vaccination against hepatitis B. A higher proportion of anaesthetists continue to administer anaesthesia despite suffering from respiratory (87.1%) than gastrointestinal (37.6%) infections. Endotracheal tubes were maintained sterile by 36.5% whereas bacterial filters were used by 100% but changed after each case by 68.2%. On a scale of 0–10 (10 = significant) anaesthetists rated their potential for transmitting or contributing to patient infection at a mean of 5.14 (standard deviation 2.65).

Conclusion: The results of this study show that, although anaesthesia providers at the Kenyatta National Hospital are well aware of proper hygienic guidelines, their practice falls short of accepted recommendations.

List of Abbreviations and Acronyms

CDC – Centers for Disease Control

KNH – Kenyatta National Hospital

AIDS –Autoimmune deficiency syndrome

HIV – Human Immunodeficiency Virus

HBV - Hepatitis B Virus

Hep C – Hepatitis C

NHS – National Health Service

HME – Heat and Moisture Exchanger

AAGBI - Association of Anaesthetists of Great Britain and Ireland

SSD - Sterile Supplies Department

HCAI – Health Care Acquired Infection

HIS – Hospital Infection Society

TB - Tuberculosis

Definition of Operational Terms

1. Anaesthesia Provider

Health care giver involved in perioperative care, development of an anesthetic plan, and the administration of anesthetics this includes: consultant anaesthesiologists, registrars, registered clinical officers and student clinical officers in the department of anaesthesiology

2. Anaesthesiologist

A doctor (with a degree of Bachelor of Medicine and Bachelor of Surgery or its equivalent) who has specialized in the medical field of anaesthesiology. This could be a master of medicine in anaesthesia, a post graduate diploma in anaesthesia or their equivalents.

3. Anaesthesiology

The medical specialty concerned with the pharmacological, physiological, and clinical basis of anaesthesia, including resuscitation, intensive respiratory care and pain management.

4. Anaesthetic Circuitry/Anaesthetic breathing systems

An assembly of components which connects the patient's airway to the anaesthetic machine creating an artificial atmosphere, from and into which the patient breathes.

5. Antisepsis

Destruction of disease-causing microorganisms to prevent infection

6. Asepsis

The state of being free from living pathogenic organisms

7. Autoclave

A device used to sterilize equipment and supplies by subjecting them to high pressure saturated steam at 121 °C for around 15–20 minutes depending on the size of the load and the contents.

8. Clinical officer

A mid-level practitioner of medicine in East Africa and parts of Southern Africa (with a Higher National Diploma) who is qualified and licensed to perform general medical duties such as diagnosis and treatment of disease and injury, ordering and interpreting medical tests, performing routine medical and surgical procedures, and referring patients to other practitioners or licensed within a medical specialty such as anaesthesiology.

9. Hospital Acquired Infection/Nosocomial Infection

An infection that first appears three days after a patient is admitted to a hospital or other health care facility.

10. Registrar

A qualified medical doctor who, at the outset of her/his higher medical training is beginning to specialize in a particular medical specialty and by the end of it will be looking at obtaining a consultant post in that area.

11. Sterilize

To render sterile; to free from microorganisms.

Chapter 1: Introduction and Literature Review

The cornerstones of modern surgery are the principles of antisepsis and asepsis. These were introduced more than a century ago; however patients still continue to be plagued by postoperative wound infections. Although the mortality associated with postoperative sepsis has been notably reduced, the morbidity and surgical failure caused by wound infections and sepsis warrant further efforts to identify factors responsible and thereby reduce the rate of postoperative infections.

In the USA, approximately 70% of all acute illness can be attributed to infectious agents. Of these, nosocomial infections occur in approximately 5% of patients, increasing the average hospital stay by 4 days and causing approximately 60,000 deaths per year. ⁽¹⁾

The role of the anaesthesiologist has now expanded to that of the “total perioperative physician”. Therefore, there has been an increase in the number of invasive procedures performed by anaesthesiologists, resulting in an increase in the prevalence of emerging diseases. Hence stringent attention to infection control practices is of utmost importance.

The practice of anaesthesiology has the potential for transmitting a number of infectious agents to the patient, since it often requires breaching the body’s mechanical barriers. Placement of intravenous and intra-arterial catheters, airway instrumentation, and mechanical ventilation all provide potential vehicles for transmission of infection ⁽²⁾. The incidence of contact with blood among anaesthetic personnel has been estimated to range from 8% for intramuscular injection to 87% for central venous catheter insertion; 98% of these incidents of blood contact can be avoided by the use of gloves ⁽³⁾.

The potential for nosocomial transmission of infection in anaesthesiology practice is real, there is however very little data to support a cause and effect relationship. Certain anaesthetic practices have been implicated in the transmission of infections. The use of a common syringe for the administration of drugs to more than one patient, for example, is a risky practice, even if a new sterile needle is used for each individual patient use ⁽⁴⁾. Froggatt et al. ⁽⁵⁾ reported six patients who contracted acute HBV infections from a reused syringe that had come in contact with a contaminated stopcock from a hepatitis B carrier. A case of multiple patient-to patient

transmission of HIV in a private surgery clinic in Australia was described wherein the practice of reusing syringes from a potentially contaminated multidose local anesthetic vial was implicated^(6,7). Chant et al.⁽⁸⁾ also reported on an investigation of possible patient-to-patient transmission of hepatitis C. In this case, transmission from the source patient to four other cases implicated either a reused syringe or contaminated anesthetic circuitry.

In 2002, the Association of Anaesthetists of Great Britain and Ireland published guidelines to its members regarding the occupational hazards of HIV and hepatitis B virus (HBV) infection⁹. These guidelines include recommendations to wear gloves during induction of anaesthesia, inserting intravenous cannulae, setting up intravenous infusions and inserting and removing airways and tracheal tubes. Where substantial spillage of blood may occur, as, for example, in setting up an intra-arterial line, a plastic apron, mask and eye protection should be worn. Where possible, nondisposable contaminated equipment should be autoclaved. Where this is not possible the equipment should be thoroughly washed with detergent and left for a suitable period in 2% freshly prepared glutaraldehyde or any other agent recommended by local infection control policies⁹.

Surveys from the CDC have implicated extrinsic contamination of propofol with cases of postoperative infection⁽¹⁰⁾. It is recommended that infusion solutions should be used on a one-time, one patient basis. Studies show that contaminated infusions have resulted in bacterial and fungal infections when used on more than one patient⁽¹⁰⁾.

Although transmission of infection to a healthy patient is difficult, there are certain patient populations that are readily predisposed to infection; Diabetic patients, elderly, obese, or burns patients, or those with poor nutritional status (like alcoholics and drug abusers). Patients who smoke may also have an increased incidence of pulmonary infections⁽¹¹⁻¹³⁾

The anaesthesiologist today is faced with an increasing number of patients with immunosuppressive diseases which may be acquired or congenital or who are on immunosuppressive treatments for organ transplantation or malignancy. Infection is one of the leading causes of morbidity and mortality in these patients. Many commonly used anaesthetics are immunosuppressive and may compound the likelihood of pathogenic transmission⁽¹⁴⁻¹⁶⁾. Pneumonia, for example accounts for up to 40% of deaths among children and adults with cancer

^(17,18) and it has been estimated that 35% of renal transplant recipients develop pneumonia in the first year after transplantation ⁽¹⁹⁾

Multidose vials generally contain preservatives and, therefore, can be used on more than one patient. However, the rubber septum should be cleaned with alcohol prior to each use. Vials that are obviously contaminated should be discarded. Although transmission of infection by this route is uncommon, there have been reports of viral and bacterial infections linked to contaminated multidose vials ^(20, 21)

Adhering to simple hygienic practices could be the best approach in preventing perioperative infections. For example, hand washing or the use of disposable gloves can prevent transmission of a number of pathogens ⁽²²⁾. Gwaltney et al. ⁽²³⁾ showed that during experimental rhinovirus infections, transmission of the virus occurs in 73% of cases via the hands and only 8% via sneezing and coughing.

Wearing a face mask in surgical theatres is a controversial topic. Since its initial use by a German surgeon in 1897 ⁽²⁴⁾, the surgical mask has been repeatedly modified, scrutinized and criticized. Rogers ⁽²⁵⁾ recommended that surgeons, assisting nurses and anaesthetists should wear masks. This was supported by increased rates of infection after major abdominal surgery when surgeons and nurses did not wear masks ⁽²⁶⁾. Masks, however, may not be necessary for theatre staff who are not in close communication with the surgical field and the sterile instruments ^(27,28) especially in theatres with forced ventilation ⁽²⁹⁾ However, no member of the theatre staff can exclude themselves completely from either the surgical site or the sterile instruments trolley.

Tunevall ⁽³⁰⁾ concluded that masks provide no benefit to patients. It is however, generally recommended that masks should be used by people suffering from nasopharyngeal rhinoviral infection, but it is more sensible to exclude them from the surgical suite. In addition rhinoviral transmission has been shown to spread by hand-borne contamination, rather than by droplet transfer; this again raises the question about the necessity for the mask ⁽³¹⁾. Nevertheless when no mask was worn a significantly ($p < 0.002$) higher number of bacterial colonies were recoverable than when a full mask was worn; mask placement, however, above or below the nose made no significant difference to the mean colony counts ⁽³²⁾.

Heinsohn & Jewett⁽³³⁾ recommended the proper use of respiratory protection equipment instead of surgical masks because the latter do not offer adequate protection against aerosolized blood in the operating room. Face masks do however decrease the spread of contaminated droplets by filtration and alter the direction of dispersal from the upper respiratory tract during talking, coughing and breathing. It is also recommended that masks should be removed and discarded after use since they become wet and laden with micro-organisms. Standardized tests are therefore needed to evaluate the ability of face masks to protect the user from a variety of particle sizes and to quantify edge leakage⁽³⁴⁾.

Surveys were carried out in the late 90's among consultant anaesthetists in the United Kingdom and United States of America to assess the standards of hygiene and discipline and to highlight areas of practice which may be less than optimal⁽⁹⁾. The practice of reusing disposable plastic syringes for different patients is still prevalent in North American theatres despite warnings about the hazards⁽³⁵⁻³⁷⁾. The use of a syringe for more than one patient was never (80%) and rarely (13.1%) practiced, respectively, by the anaesthetists in United States of America. The multiple use was mainly for total intravenous anaesthesia for which only the infusion line was changed. The intravenous tubing, however, has been shown to have a significant contamination rate in routine use; the rate decreasing as the distance from the intravenous catheter increases⁽³⁸⁾. Tait & Tuttle⁽³⁹⁾ reported that 28% of anaesthetists in private practice frequently or always reuse syringes for more than one patient compared with 7% in university practice ($p < 0.01$).

The contamination of anaesthesia equipment and the potential for nosocomial transmission has long been a cause for concern. Indeed, as long ago as 1873, Skinner⁽⁴⁰⁾ decried the use of the same inhaler on successive patients without cleaning. The role of contaminated anaesthesia equipment in the development of postoperative infections is however controversial.

Although outbreaks of *Pseudomonas aeruginosa* infections have been described in patients ventilated using a contaminated anaesthesia machine, the use of disposable anaesthetic circuits with bacterial filters has not been shown to improve the incidence of postoperative pulmonary infections^(41, 42). In addition, the administration of anaesthesia to patients with documented Gram-negative infections does not result in significant colonization of the anaesthesia machine⁽⁴³⁾

Blood and body fluid contamination of stopcocks, anesthesia machine working surfaces, monitor cables, drawer handles, oximeter probes, and patient anesthesia records have all been described, although their role in transmission of infection has not been established ⁽⁴⁴⁻⁴⁶⁾. It has been shown that anaesthetic breathing systems can become contaminated with organisms from the respiratory tract, especially with coughing ⁽⁴⁷⁻⁵⁰⁾. It is recommended that either an appropriate filter should be placed between the patient and the breathing system, with a new filter being used for each patient, or that a new breathing system be used for each patient, especially in paediatric practice ⁽⁵¹⁾. A contaminated reusable part of the breathing system can possibly result in HCV infection ⁽⁵²⁾. However, the use of disposable anaesthetic circuits with bacterial filters has not been shown to reduce the incidence of postoperative pulmonary infection. ^(53,54)

HBV and HIV are the most important viruses to which the anaesthetist is exposed and have long been associated with anaesthetic practice. In the United Kingdom it was agreed that HIV- or HBV-infected anaesthetists who are clinically well could continue in clinical practice ⁽⁵¹⁾. This view was supported by the UK Health Departments' Advisory Panel on Health Care Workers Infected with Blood Viruses with the exception of those procedures which involved skin tunneling. Tait & Tuttle ⁽³⁹⁾ reported a substantial alteration in practice by 58% of anaesthetists in light of the AIDS epidemic, while practice was somewhat altered by 35.3%. Despite the recommendations of The Association of Anaesthetists of Great Britain ⁽⁹⁾ regarding infection control of HIV and HBV and other nosocomial infections, these recommendations were not strictly adhered to as shown in the survey done ⁽⁵⁵⁾

The practice of anaesthesiologists in the prevention of perioperative infection has been surveyed in various countries;

El Mikatti et al ⁽⁵⁵⁾ in 1997 did a survey among consultant anaesthetists in the North-West region of the UK. Regarding the frequency of use of face masks, gloves and hand washing between cases, there was no significant difference in the use of masks or frequency of hand washing between consultants with respect to their seniority. All respondents claimed to clean/disinfect the laryngoscope after each patient, with 59% using soap and water. 9.5% of respondents never used multidose vials. One third of the respondents (33.3%) changed the disposable breathing circuit at the end of the day or after an infected/high-risk patient, while 27% always changed it following a

known infected case. Only 1.3% of anaesthetists changed the breathing system after each case. Bacterial filters were used by 17% and changed between cases by 7.2%.

Most anaesthetists in UK admitted anaesthetising patients whilst harboring respiratory tract (94%), gastrointestinal (42.9%) and herpes simplex (32.6%) infections. Changing anaesthetic practice in consideration of AIDS as a dangerous infectious disease was reported by 74.8% of the respondents; 23.8% did not change their practice while 1.4% were not sure. Recognition of the possibility of hepatitis B and C virus (HB/CV) infection changed anaesthetic practice in 68.8% of the respondents; 28.8% did not change while 1.4% did not know. The anaesthetist's role in the transmission of infectious agents to the patients was scored on a scale of 0–10 (10 = significant); 46.4% of the respondents rated it higher than 5, 4.9% perceived it as 0, while it was reported as 10 by only 3.5%. The modal score was 2 (25% of respondents

Tait and Tuttle et al⁽³⁹⁾ carried out a cross sectional descriptive study in the United States among members of the American society of anaesthesiologists. 49% and 75.3% of respondents always used gloves and masks, respectively, in their everyday practice. Only 58% of respondents stated that they always washed their hands after every patient contact and 85% reported that they always used aseptic technique while placing indwelling catheters. 20% of the respondents reported frequently or always reusing syringes for more than one patient and 34.4% reported never or rarely disinfecting the septum of multidose vials prior to use. The practice of reusing syringes was significantly greater among private than university practitioners ($P < 0.01$). On a scale of 0-10 (10 = high) anesthesiologists rated their potential for transmitting or contributing to patient potential for transmitting or contributing to patient infection as 4.7

A study by Daniel Kishi et al⁽⁵⁶⁾ describing nosocomial infection prevention practices by anaesthesiologists in a University Hospital in Brazil showed that the routine use of eye protection was reported by 21.2% of anesthesiologists, while 95.2% always or frequently wear a surgical mask; 96.3% wear general procedure gloves, while 84.1% use them for venous cannulation; 98.8% wear sterile gloves for the neuraxial block, and 87% wear them for peripheral nerve blocks. Sterile technique including hand washing, mask, headwear, sterile gown, and sterile glove was reported by 91.3% of anaesthesiologist. Ninety-five per cent of anaesthesiologists wash their hands between cases, 89% wash their hands when removing the gloves, and 74.1% wash

their hands before a neuraxial block. The endotracheal tube is maintained sterile by 91.6% of anesthesiologists, and 95.1% change the filter of the ventilation system between patients. Prefilled propofol syringe was discarded at the end of each anesthesia by 98.8% of anesthesiologists; however, 52.4% refill the propofol syringe for the same patient. A three-way stopcock is used for intravenous infusion of drugs by 96.3%; however, only 30% reported cleaning vials of drugs with alcohol for use in the neuraxial blocks, while 19.8% clean vials before intravenous administration.

1.2 Justification

The appearance of infection following anesthesia and surgery is a major source of morbidity and mortality and therefore is an important indicator of the quality of health care in the perioperative period.

Nosocomial infections are known to increase the average hospital stay and health costs.

There is a need to develop protocols for the department of anaesthesiology at the Kenyatta National Hospital for the prevention of perioperative infections

There has been no similar study carried out in Kenya regarding practice of anaesthesia providers in the prevention of perioperative infections.

The assessment of the current practice of anaesthesia providers in the Kenyatta National Hospital in prevention of perioperative infection is paramount

1.2 Study Objectives

1.2.1 Broad Objective

Evaluate the degree to which anaesthesia providers in Kenyatta National Hospital utilize appropriate hygienic techniques for the prevention of infection in the perioperative period.

1.2.2 Specific Objectives

- 1) To evaluate compliance of anaesthesia providers with healthcare-related personal hygiene.
- 2) To assess the compliance of anaesthesia providers with anaesthetic equipment disinfection procedures at the Kenyatta National Hospital.
- 3) To assess compliance of anaesthesia providers with the universal guidelines for the prevention of occupational transmission of infectious diseases.

1.3 Research Question

Do anaesthesia providers at the Kenyatta National Hospital adhere to the recommended practices related to the prevention of perioperative infections? (Appendix III)

Chapter 3: Research Methodology

3.1 Study design

This is a cross - sectional study

Data for the study was collected by the principal investigator using a structured questionnaire (Appendix II) accompanied by a cover letter and consent form (Appendix I)

3.2 Study site

The survey was carried out at all the main and satellite operating theatres in the Kenyatta National Hospital.

3.2 Study population

The study population included the consultant anaesthetists, registrars, registered clinical officer anaesthetists and student clinical officers in the department of anaesthesiology, Kenyatta National Hospital.

Inclusion criteria

1. Consultant anaesthetists, part II registrars, registered clinical officer anaesthetists and part II student clinical officers in the department of anaesthesiology, Kenyatta National Hospital.
2. Those who gave informed consent to participate in the study.

Exclusion criteria

1. Those who declined consent to participate in the study.
2. Those not present in the period during which the study was conducted.
3. Part I registrars and part I student clinical officers in department of anaesthesia.

3.4 Sample size determination

The sample size was determined applying the following formula (Fisher et al, 1998).

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where:

n is the sample size.

z is the standard normal deviation at 95% confidence level.

p is the proportion in the targets population 50% (There is very little data to support a cause and effect relationship in nosocomial transmission of infection in anaesthesiology practice, hence the assumed incidence was 50%)

d is the target margin of error put at 0.05.

$$= \frac{1.96^2 * 0.5(1-0.5)}{0.05^2}$$

$$n=392$$

Since the population is below 10,000, the following adjustment was done in calculating sample size: N^0

Where N is the total number of anaesthesia providers at the Kenyatta National Hospital (102)

n

$$N^0 = \frac{n}{1 + \left[\frac{n-1}{N} \right]}$$

392

102

$$1 + \left[\frac{392 - 1}{102} \right]$$

$$= 81$$

3.5 Data collection

The survey was done after the approval of Kenyatta National Hospital/University of Nairobi-Ethics and Research committee over a period of 6 weeks. Details on the study were explained to the anaesthesia providers by the principle researcher before handing the pretested questionnaires to those that consented to the study. They were filled out and returned at the same sitting and the filled out questionnaires checked for completeness.

The consent explanation form contained contacts of the principal investigator, his supervisor and that of KNH/UON-ERC. It was made clear that the respondent was at liberty to contact any of

the contacts above and ask questions or seek any clarifications. This could be during the study period or even thereafter.

3.6 Data processing and analysis

The completed questionnaires were checked to ensure each question had been filled out correctly and that there were no gaps. The questionnaires were then numbered and coded for ease of handling.

Data from structured questionnaires were entered, checked, cleaned and analyzed using Statistical Package for Social Scientists (SPSS) version 20.0

Univariate analysis was performed in order to obtain descriptive statistics. Proportions, means and standard deviations were determined during the analysis. The results are presented in form of tables and charts. The T-test was used to calculate statistical values for continuous variables whereas chi-square test was used for categorical variables in case of any relationship. Measures of association were considered statistically significant when p value will be equal to or less than 0.05.

3.7 Ethical considerations

1. The study was undertaken after approval from the Kenyatta National Hospital – University of Nairobi, Ethics and Research Committee.
2. Participants were assured that no harm will come to them as a result of participating in this study. Additionally no direct benefits for participation.
3. All participants were informed of the purpose of the study and what it involved of them through the Informed Consent Form that was affixed to the questionnaire.
4. The questions were answered voluntarily and anonymously. Confidentiality was maintained throughout the study.
5. There were no cost implications to the participants of this study.

Chapter 4: Results

The following is a summary of the results.

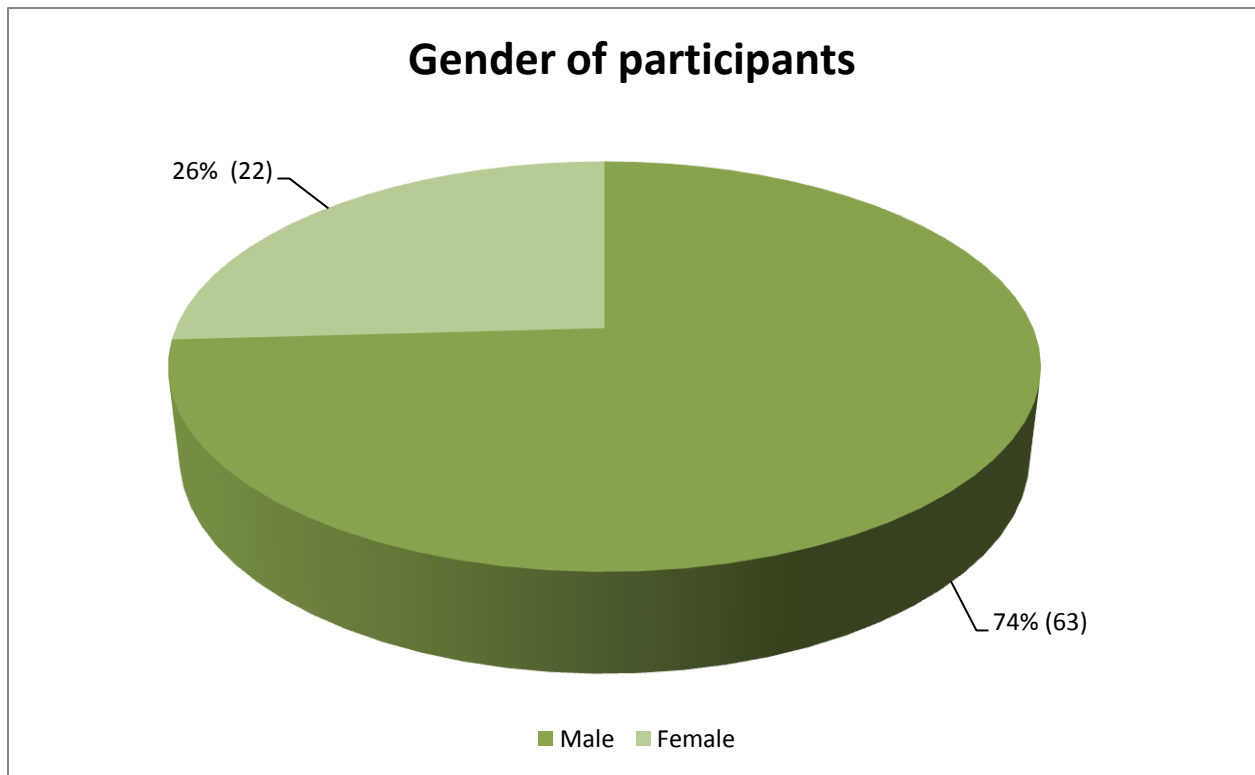


Figure 1: Gender distribution of participants

Male participants were 74% and female participants were 26% of respondents.

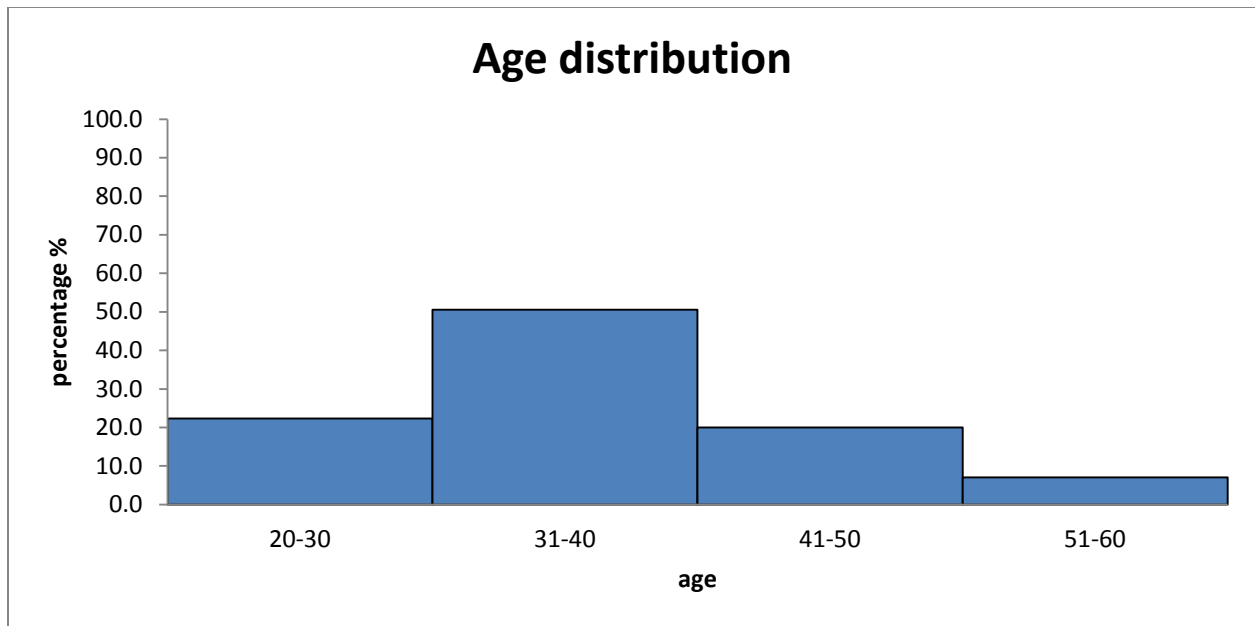


Figure 2: Participant age distribution

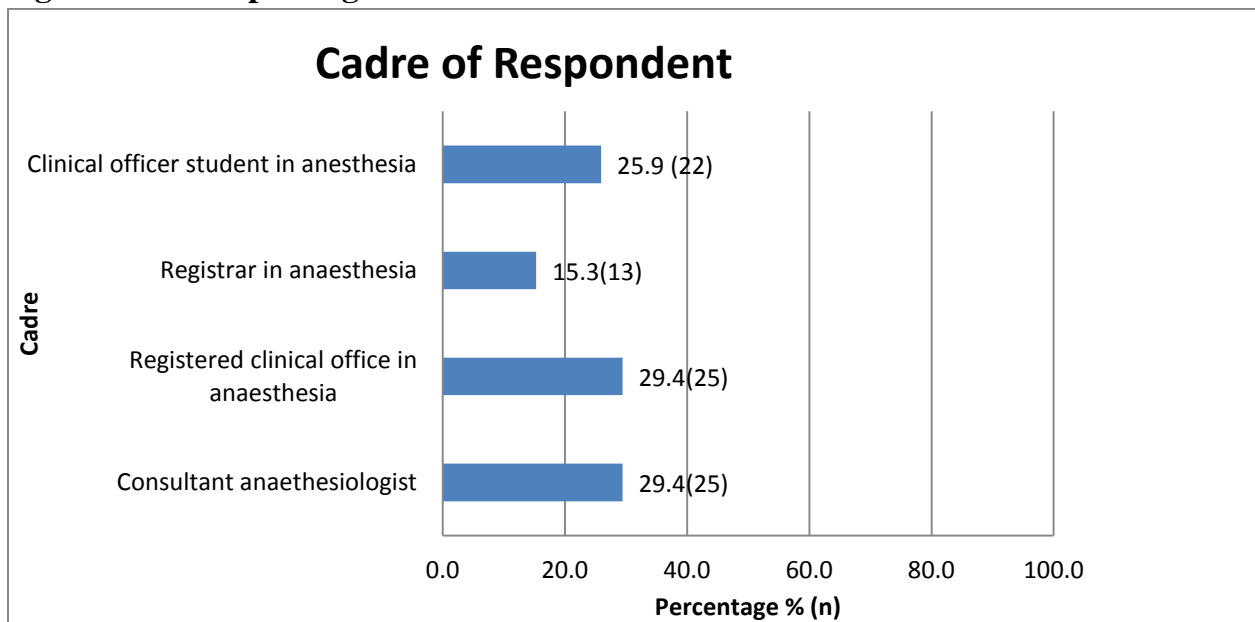


Figure 3: Cadre of anaesthesia provider

Four cadres of anaesthesia providers were surveyed; Consultants anaesthesiologists were 29.4% of the respondents, registered clinical officers in anaesthesia were also 29.4%. Registrars in anaesthesia were 15.3% and clinical officer students in anaesthesia formed 25.9% of the respondents.

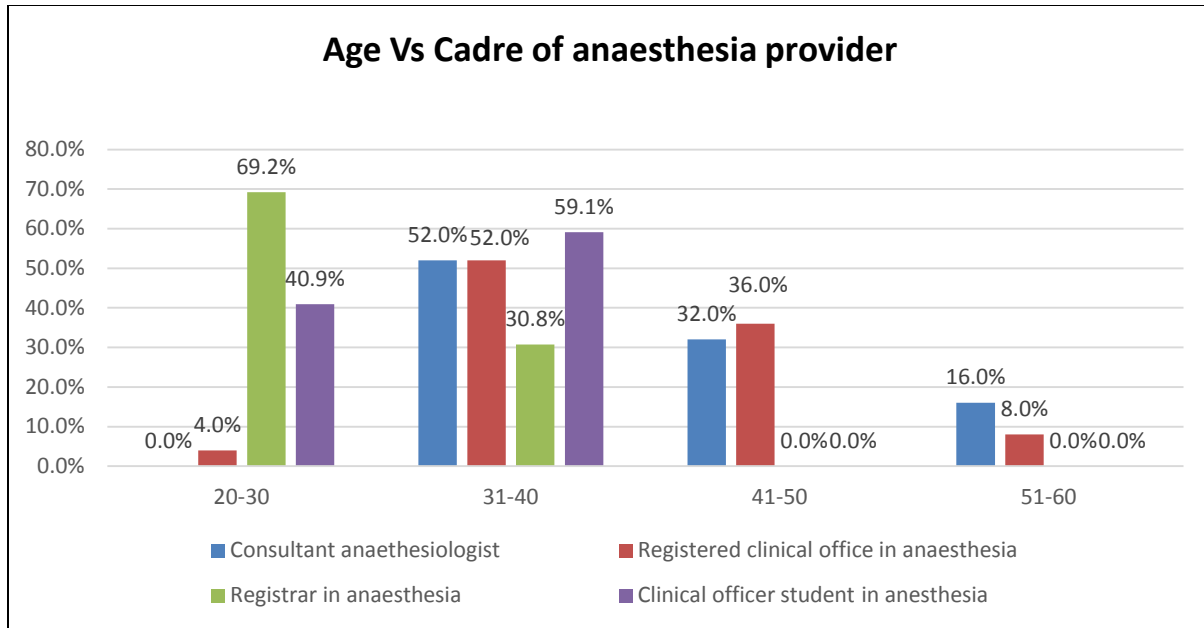


Figure 4: Comparison of age versus cadre of anaesthesia provider

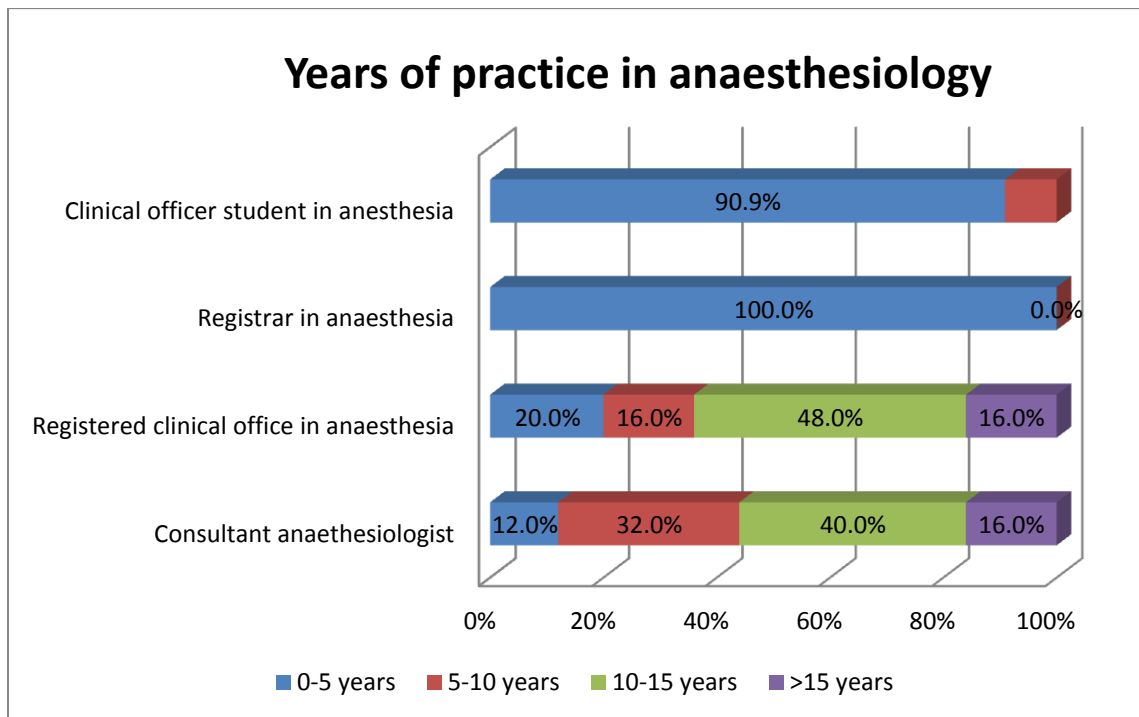


Figure 5: Years of practice in the field of Anaesthesiology

The clinical officer students and registrars in anaesthesiology had mainly practiced for less than five years, while the years of practice for the consultant anaesthesiologists and registered clinical officers in anaesthesia varied widely.

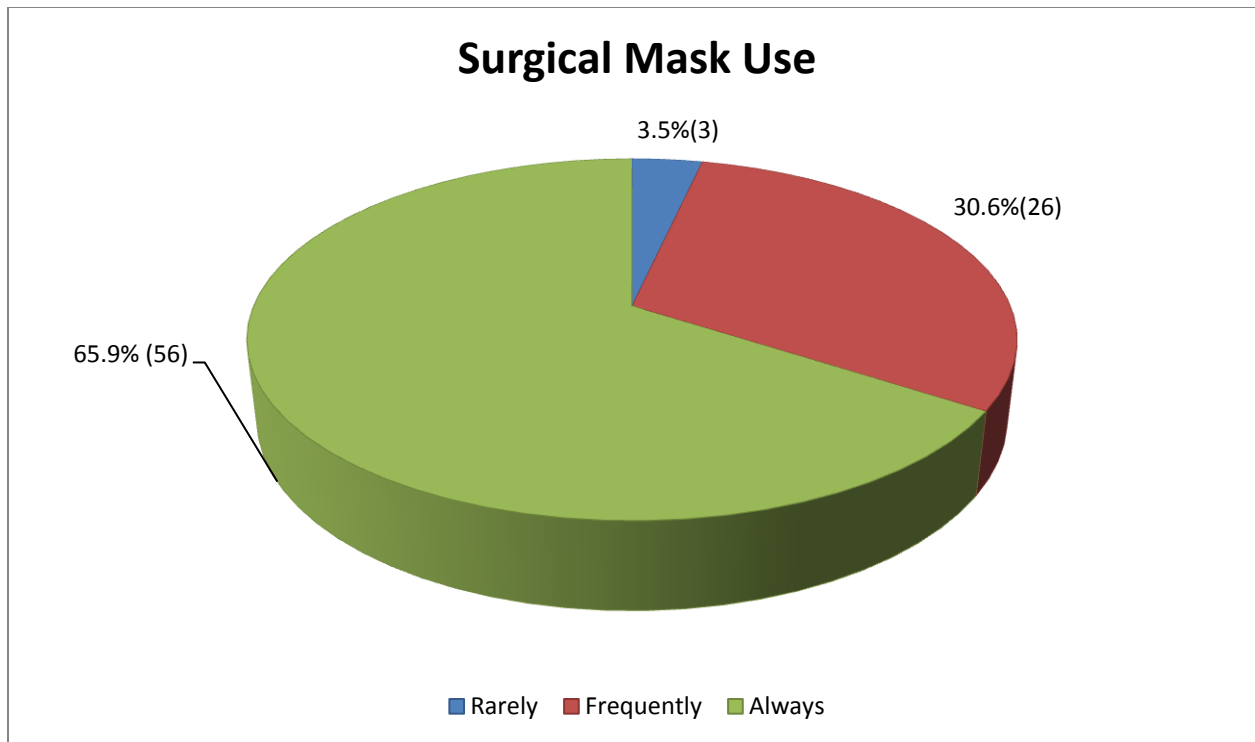


Figure 6: Frequency of Surgical Mask Use

Surgical masks were always used by 65% of the participants, whereas 30.6% and 3.5% frequently and rarely wore them.

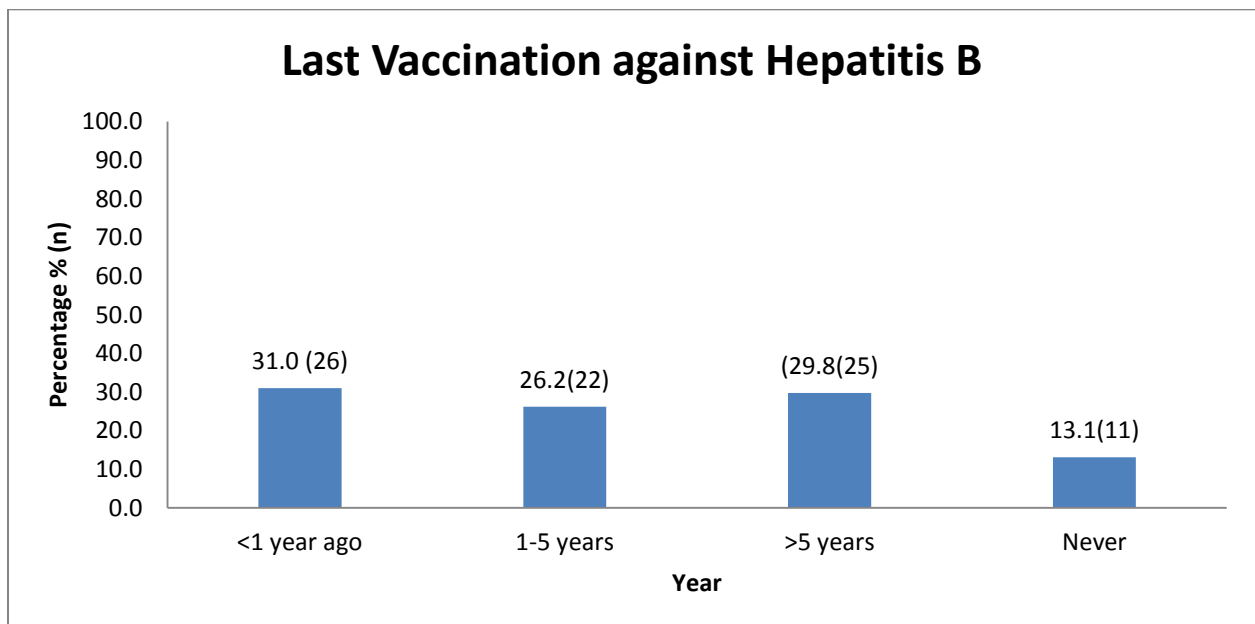


Figure 7: Last Vaccination against Hepatitis B

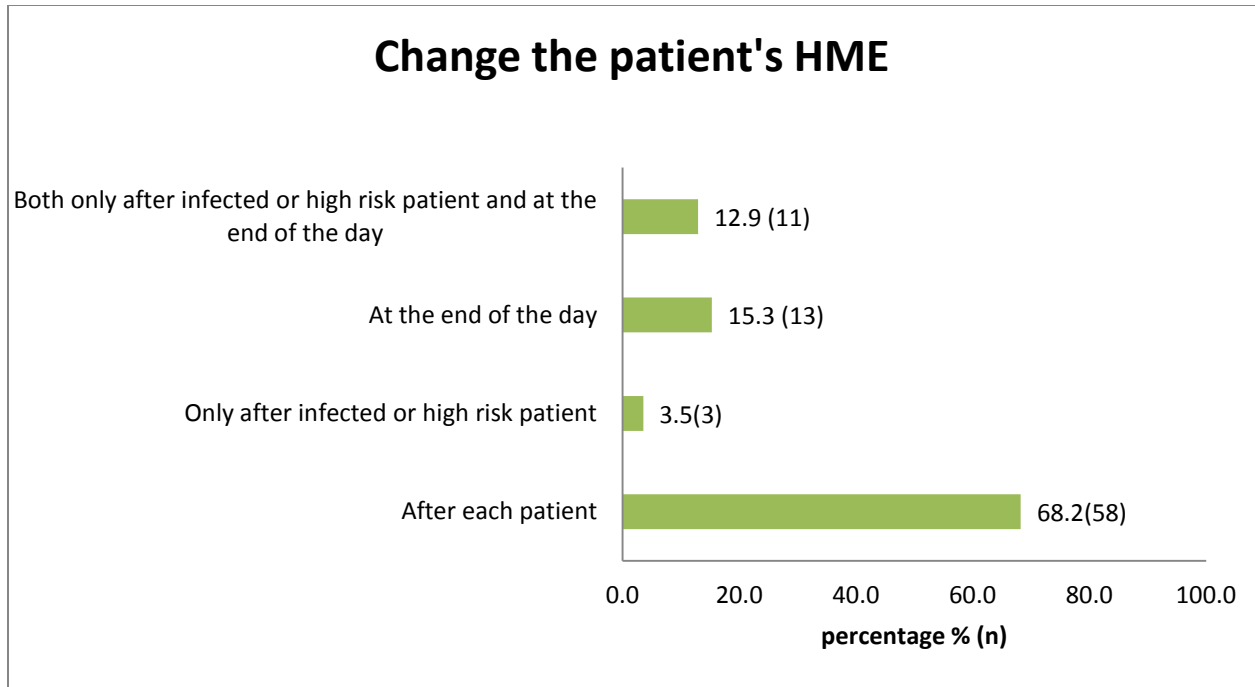


Figure 8: Frequency of HME Change

Most (68.2%) of the anaesthesia providers change the HME after each patient, 15.3% at the end of the day and 12.9% both only after infected or high risk patient and at the end of the day.

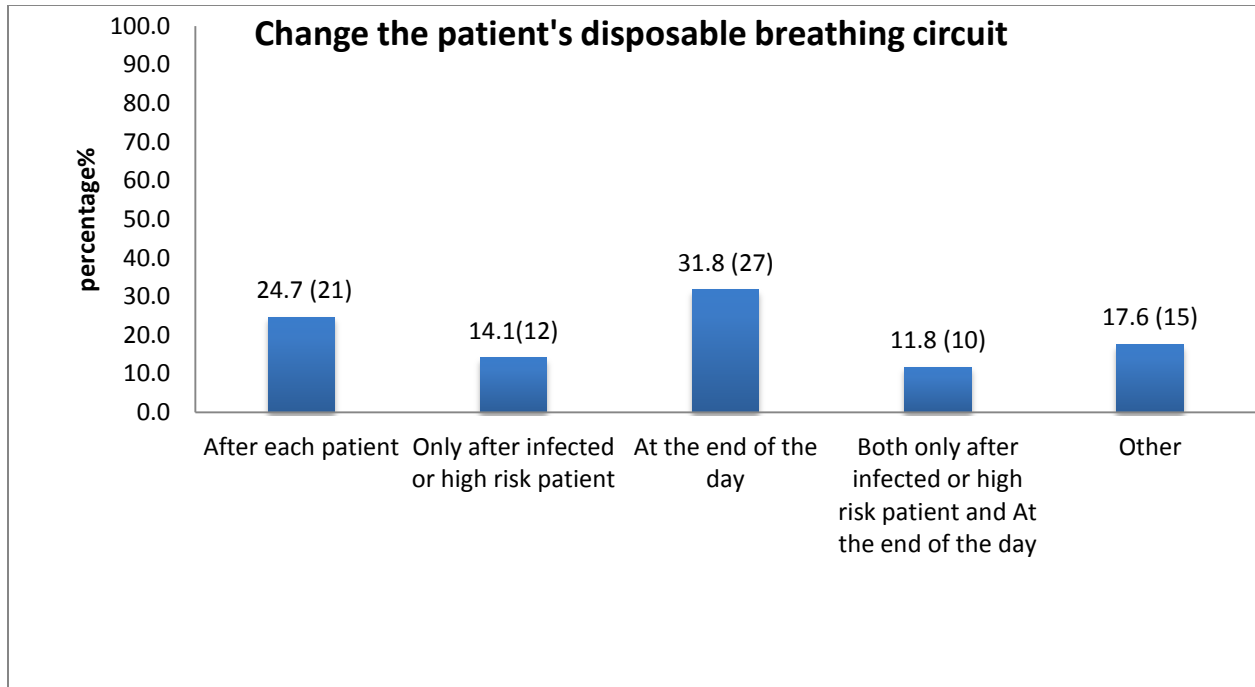


Figure 9: Frequency of Changing the Patient’s Disposable Breathing circuit

The breathing circuit was changed by 31.8% of the respondents at the end of the day, 24.7% changed after each patient, 14.1% changed the breathing circuit only after an infected or high risk patient, 11.8% changed the breathing circuit both after an infected or high risk patient and at the end of the day. 17.6% of the respondents cited other reasons for change of the breathing circuit.

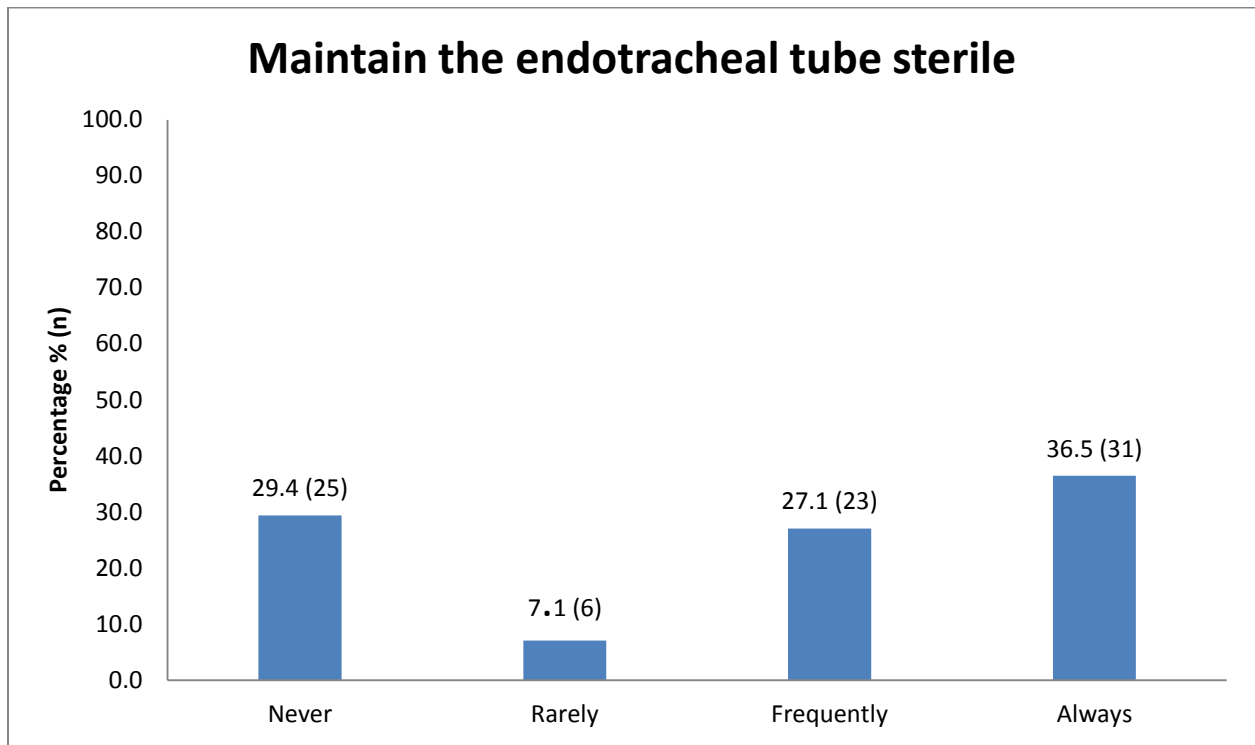


Figure 10: Frequency of Maintaining the Endotracheal Tube Sterile

While intubating, the endotracheal tube was always maintained sterile by 36.5% of the respondents, 29.4%, 27.1%, 7.1% respectively never, frequently and rarely maintained the endotracheal tube sterile.

Table 1: Adherence to various hygienic and aseptic practices

	Never % (n)	Rarely% (n)	Frequently% (n)	Always% (n)
Wear gloves	0	10.6 (9)	52.9 (45)	23.5 (20)
Scrub before giving spinal or epidural	28.2 (24)	40.0(34)	10.6 (9)	21.2 (18)
Use aseptic technique when placing indwelling catheter	15.3 (13)	21.2 (18)	23.5 (20)	40.0 (34)
Wipe the rubber septum of a multidose vial with alcohol prior to use	8.3 (7)	28.6 (24)	29.8 (25)	33.3 (28)
Share syringe between multiple patients	49.4 (42)	24.7 (21)	22.4 (19)	3.5 (3)

Table 2: Conduct of anaesthesia with regard to infectious diseases

	Yes % (n)	No % (n)
Knowingly administered anaesthesia while infected with a respiratory infection	87.1(74)	12.9(11)
Knowingly administered anaesthesia while infected with a gastrointestinal infection	37.6 (32)	61.2(53)
Change of conduct if patient is HIV positive	24.7(21)	72.9(64)
Change of conduct if patient has Hepatitis B or C	81.9(70)	18.1(15)

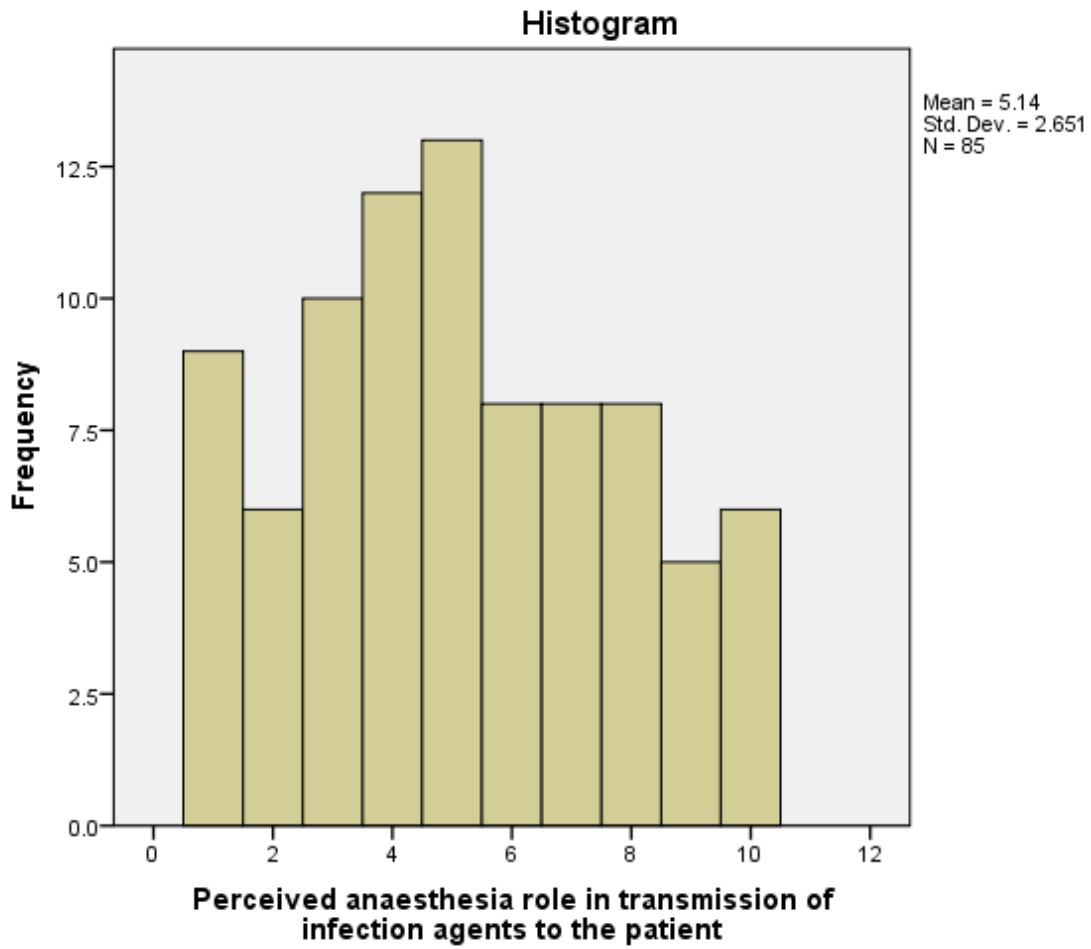


Figure 11: Perceived anaesthesia role in transmission of infectious agents to the patient

Chapter 5: Discussion

Given the impact of perioperative infection on both the society and economy, it is essential that anaesthesiologists and other operating room personnel use appropriate precautions to reduce the potential for transmission of infectious agents to the patients under their care. This study was carried out to evaluate the degree to which anaesthesia providers in Kenyatta National Hospital utilize appropriate hygienic techniques for the prevention of infection in the perioperative period. It sought to assess their compliance with the universal guidelines for the prevention of occupational transmission of infectious diseases and to highlight the areas of practice which may be less than optimal.

5.1 Participants and procedures

A total of 85(83%) anaesthesia providers participated in this study. Compared to other studies; such as that of Tait et al.⁽³⁹⁾ in the United States, with 44% of participation, El Mikatti et al.⁽⁵⁴⁾ in the United Kingdom, with 68%, and Daniel Kishi et al.⁽⁵⁵⁾ in Brazil, with 75%, the participation of anaesthesia providers in the present study can be considered favorable.

There are four different cadres of anaesthesia providers at the Kenyatta National Hospital. All were included in this study as they are actively involved in the provision of anaesthesia in the Kenyan hospital setting. Consultants anaesthesiologists were 29.4% of the respondents, registered clinical officers in anaesthesia were also 29.4%. Registrars in anaesthesia were 15.3% while clinical officer students in anaesthesia formed 25.9% of the respondents. Male participants were 74% and female participants were 26% of respondents which represents a male to female ratio of 3:1 which is reflective of the general distribution of anaesthesia providers at the Kenyatta National Hospital.

The seniority of the anaesthesia providers was recorded; 16% each of the consultants and registered clinical officers in anaesthesia had been practicing anaesthesiology for more than 15 years. 40% of consultants had been in the field between 10-15 years, 48% of the registered clinical officers in anaesthesia had been practicing for 10-15 years. 32% of the consultants compared to 16% of the registered clinical officers in anaesthesia had been in the post for 5-10

years while all the registrars as well as the clinical officer students in anaesthesia had been practicing for less than 5 years.

5.2 Adherence to healthcare-related hygiene and aseptic practices

Washing hands between cases, a simple procedure that can prevent transmission of microorganisms with the best cost/benefit relationship, was reported by 71.7% of anaesthesiologists in the present study, compared to 95.1% in Brazil (Daniel Kishi et al.⁵⁵) and 83.9%, in the United Kingdom (El Mikatti et al.⁵⁴).

Regarding the neuraxial block, 63.5% report using aseptic technique prior to administering the block. Higher proportions were reported in Brazil 98.8 % (Daniel Kishi et al.⁵⁵) and New Zealand 99.3 % (Ryan et al.⁵⁶) indicating suboptimal practice at the Kenyatta national hospital in comparison to the fore mentioned countries. Adherence to the practice of handwashing is lower before neuraxial blocks (31.8%) compared to 74.1% in Brazil.(Daniel Kishi et al.⁵⁵) According to a recent recommendation of the ASA (American Society of Anaesthesiologists), before a neuraxial block, one should wash his/her hands, wear sterile gloves, cap, and mask covering the mouth and nose, besides using individual packages in skin preparation, and remove all jewelry.⁽⁵⁷⁾

In this study there was significant difference in the use of aseptic technique prior to placing indwelling catheters among the different cadres ($p < 0.025$) 46.2% registrars compared to 16% consultant anaesthesiologists, 16% registered clinical officers and 27.3% clinical officer students frequently used the aseptic technique. The difference was also significant among the different age groups ($p < 0.005$). 47.1% of the age group between 41-50 years never used aseptic technique in comparison with 0% 20-30 years, 9.3% 31-40 years and 16.7% 51-60 years

Surgical masks were used by 96.5% of the respondents, this is similar to the American study of Tait et al.⁽³⁹⁾ (94.9%) and the Brazilian study of Daniel Kishi et al.⁽⁵⁵⁾ 95.2% but higher than that of the United Kingdom 68.3% (El Mikatti et al.⁵⁴). The high level of compliance with wearing of surgical masks in the Kenyatta National Hospital may probably be attributed to the use of disposable surgical masks which are affordable and always readily available at the main entrance to all operating theatres.

The practice of reusing disposable plastic syringes for different patients is still prevalent in Kenyatta national hospital operating theatres despite warnings about the hazards. Reusing syringes between patients is an unacceptable practice⁽³⁸⁾, even if needles are changed. Microorganisms can be introduced into the syringe during a plunger shaft pull⁽⁵⁸⁾ or by otherwise passing through the syringe barrel⁽⁵⁹⁾. In this study, sharing of syringes between multiple patients was practiced by 25.9% of the anaesthesia providers, whereas 49.4% and 24.7% respectively never and rarely shared a syringe. There was no significant difference in the sharing of syringes between patients with regard to the cadre ($p>0.1$) or the age group ($p>0$). In the study by El Mikatti et al.⁽⁵⁴⁾ (UK) 80% of the respondents never reused syringes whereas in a study carried out in Taiwan by Richard C.H et al less than 6% of anaesthesiologists and nurse anaesthetists reported frequently or always reusing syringes⁽⁶⁰⁾.

In the present study 76.4% wore gloves, compared to 96.3% in the study of Daniel Kishi et al.⁽⁵⁵⁾ (Brazil) and 84.2% in the study of Ryan et al.⁽⁵⁶⁾ (New Zealand). Gloves being perforated or torn during procedures is a common occurrence. It has been shown that most nosocomial infections in intensive care units and post-anaesthesia care units are caused by cross contamination from microorganisms carried on the hands of health care workers^(61,62) with the improvements in hand hygiene practices having a noticeably positive effect on nosocomial infection rates^(63,64).

The results of this study suggest ineffective care with airways contamination, since only 63.6% of anaesthesiologists try to maintain the endotracheal tube sterile, and 68.2% change the filter of the ventilation system between patients. This care was considerably lower in the study of El Mikatti et al.⁽⁵⁴⁾ (UK - 7.2%). However an improvement of practice in the last decade was reflected in the study of Daniel Kishi et al.⁽⁵⁵⁾ (Brazil - 91.6%) and Ryan et al.⁽⁵⁶⁾ (New Zealand - 97.1%)

Hemingway et al.⁽⁶⁵⁾ has shown that cleaning the exterior of vials with alcohol can reduce contamination of the contents however, most anaesthesiologists do not clean vials before using them, which increases the risks of drug contamination. 33.3% of the respondents always wiped the rubber septum of a multidose vial with alcohol prior to use. There was significant difference among the different cadres ($p<0.035$), 54.5% clinical officer students always wiped the rubber

septum with alcohol prior to use, compared to 20% consultant anaesthesiologists, 33.3% registered clinical officers and 23.1% registrars. There was no significance ($p < 0.5$) with regard to the different age groups.

5.3 Conduct of Anaesthesia With Regard to Infectious Diseases

The observation that 87.1% of anaesthesia providers administer anaesthesia while harboring an infection of the respiratory tract is perhaps not surprising this however does not imply that the practice results in transmission of the infection to the patient.

Among the participants, a significant 13.1% had never received any vaccination against HBV. This is despite the knowledge that in terms of risk, HBV is the most important virus to which the anaesthetist is exposed to, and it has long been associated with anaesthetic practice⁽⁵¹⁾. The recommended hepatitis B vaccine dosage for all healthcare workers at the Kenyatta National Hospital is administered as a three-dose series on a 0, 1 and 6 month schedule. However, there was a change in conduct when administering anaesthesia to a patient who is HIV positive or has HB/CV (24.7% and 81.9%, respectively). The study by El Mikatti et al⁽⁵⁴⁾ showed that most anaesthetists have changed their practice in recognition of the risks from HIV and HB/CV (74% and 68.8%, respectively). Tait & Tuttle⁽³⁹⁾ reported a substantial alteration in practice by 58% of anaesthetists in light of the AIDS epidemic, while practice was somewhat altered by 35.3%.

5.4 Cleaning and Disinfecting Anaesthetic Equipment

With respect to changing the patient's disposable breathing circuit, Tait & Tuttle⁽³⁹⁾ reported that 88.4% of their respondents, compared with 24.7% in the present study, always changed it after each patient use. The breathing circuit was changed at the end of the day by 31.8% of the anaesthetists reporting in the present study compared with 3.2% in the North American study. Most (68.2%) of the anaesthesia providers change the HME after each patient, 15.3% at the end of the day. The filter was changed between cases by 7.2% of the respondents in the study by El Mikatti et al.⁽⁵⁴⁾ (UK), but it is likely that, in the years since the study was done, the use of bacterial filters has increased.

Cleaning and sterilizing anaesthetic equipment is another issue of importance when it comes to infection control. Guidelines for infection Control in Anaesthesia were published by the Association of Anaesthetists of Great Britain and Ireland (Appendix III). The CDC has also published guidelines on procedures for disinfecting anaesthetic equipment. Both publications put emphasis on items used in the respiratory tract, such as the anaesthesia breathing circuit, face mask, laryngoscope blade, endotracheal tube, and oral airway, which should be disposed of after use or else undergo high-level disinfection between patients.

CONCLUSION

- 1) The compliance of anaesthesia providers with healthcare – related personal hygiene in most aspects is well below that which is recommended.
- 2) There is low compliance with regard to disinfection reusable anaesthetic equipment
- 3) Most anaesthetists are aware of the occupational hazards; however they do not strictly follow the recommended universal guidelines for the prevention of occupational transmission of infectious diseases

RECOMMENDATIONS

Anaesthetic department should have a written protocol for hygienic standards and discipline in the operating theatres.

Appropriate training and education of all anaesthetic personnel should be done routinely.

Precautions against the transmission of infection between patient and anaesthetist or between patients should be a routine part of anaesthetic practice. In particular, anaesthetists must ensure that hand hygiene becomes an indispensable part of their clinical culture.

Anaesthetic equipment is a potential vector for transmission of disease. Policies should be documented to ensure that recommended decontamination practices are followed and audited for all reusable anaesthetic equipment.

STUDY LIMITATIONS

The study was carried out in only one hospital in Kenya; thus the results are not generalized to the overall anaesthesiology practice in Kenyan hospitals.

There was potential for self report bias, this is because the study was based on self reporting therefore dependent on the respondents' honesty.

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APPENDICES

APPENDIX I: INFORMED CONSENT

ANAESTHESIOLOGY PRACTICE IN THE PREVENTION OF PERIOPERATIVE TRANSMISSION OF INFECTION AT THE KENYATTA NATIONAL HOSPITAL

Introduction

I am Dr. Sheilla Nzioka, a third year resident in the Master of Medicine in Anaesthesia program at The University of Nairobi. I am conducting a survey on anaesthesiology practice in the prevention of perioperative transmission of infection at the Kenyatta National Hospital as part of my post-graduate program requirements. I will strive to answer any queries that may arise before and during the course of the intended study.

Purpose of the research

The objective of this survey is to determine the practice of anaesthesia providers in the prevention of perioperative transmission of infection among anaesthesia providers at the Kenyatta National Hospital

Research Intervention

This research will not involve any interventions

Participant selection

Consultant anaesthetists, registrars, registered clinical officers student clinical officers in the department of anaesthesiology, Kenyatta National Hospital

Voluntary Participation

Your participation in this research is entirely voluntary. No monetary payment will be given or asked for participating in this survey. You are free to withdraw from the study at any point during the study without any adverse consequences to you.

Duration

The research is intended to take place over a period of six weeks. During that time questionnaires will be administered to all consenting participants.

Risks

By participating in this research you will not be exposed to any risk.

Benefits

There are no known benefits from the study to the participants however knowledge gathered will be helpful in understanding practice in the prevention of perioperative transmission of infection at the Kenyatta National Hospital. The study findings will be presented to the KNH/UON ethics and research committee and the department of anaesthesia and used to make recommendations on prevention of perioperative infections.

Confidentiality

The information that I collect from this research project will be kept confidential. Any information about you will have your initials to which a serial number will be assigned instead of your name.

Whom to Contact

If you have any questions you may ask them now, during the period of the study or even after the study is over. If you wish to ask questions later, please use the contacts below:

Dr. Sheilla Nzioka (Researcher) –0713737431 tsheilla@yahoo.co.uk

Dr. Thomas Chokwe (Supervisor) –0722528237 tmchokwe@gmail.com

Dr. Charles Kabetu (Supervisor) – 0722512205 ckabetu@gmail.com

KNH/UON-ERC uonknh_erc@uonbi.ac.ke , www.uonbi.ac.ke/activities/KNHUoN

INFORMED CONSENT FORM

I have read the foregoing information. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I hereby consent to participate in this research.

Serial no. of Participant:.....

Date:

Statement by the researcher

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Name of Researcher.....

Signature: Date:

APPENDIX II:

QUESTIONNAIRE

Date.....

ANAESTHESIOLOGY PRACTICE IN THE PREVENTION OF PERIOPERATIVE TRANSMISSION OF INFECTION AT THE KENYATTA NATIONAL HOSPITAL

These Questions Relate to the Anesthesiologist's Role in Limiting the Transmission of Any Type of Infectious Agent to the Patient

1. Bio data

- a) Gender (please underline) i)male ii)female
- b) Age (years)
- c) Cadre:
 - i) Consultant anaesthesiologist
 - ii) Registered clinical officer in anaesthesia
 - iii) Registrar in anaesthesia
 - iv) Clinical officer student in anaesthesia

2. How long have you been practicing in the field of anaesthesiology?

- a) 0–5 years
- b) 5–10 years
- c) 10–15 years
- d) > 15 years.

3. Do you always wear surgical masks?

- a) Yes
- b) No
- c) On surgeon's request.

4. Do you always wear gloves?

- a) Yes
- b) No

c) Change them between cases: Yes/No.

5. Do you wash your hands between cases?

- a) Yes
- b) No

6. Do you scrub before giving spinal or epidural (vs. wearing sterile gloves)?

- a) No
- b) Yes

7. Do you use aseptic technique when placing an indwelling cannula?

- a) Never
- b) Rarely
- c) Frequently
- d) Always.

8. Do you wipe the rubber septum of a multidose vial with alcohol prior to use?

- a) Yes
- b) No

9. Do you share syringes between multiple patients when administering drugs

- a) Yes
- b) No

10. Have you ever knowingly administered anaesthesia while infected with:

a) A respiratory infection (cold, influenza, etc.)

- 1. Yes
- 2. No

b) A gastrointestinal infection

11. Do you change your conduct if you know a patient is HIV positive?

a) Yes

b) No

Comments.....

12. Do you change your conduct if you know a patient has hepatitis B or C?

a) Yes

b) No

Comments.....

13. When did you last get vaccinated against Hepatitis B?

a) <1 year ago

b) 1-5 years ago

c) > 5yrs ago

d) Never

14. Do you change the patient's disposable breathing circuit?

a) After each patient

b) Only after infected or high-risk patient

c) At the end of the day

d) Both (b) and (c)

e) Other (please explain)

15. Do you change the patient's HME?

a) After each patient

b) Only after infected or high-risk patient

c) At the end of the day

d) Both (b) and (c)

e) Other (please explain).

16. Do you try to maintain the tracheal intubation tube sterile?

- a) Never
- b) Rarely
- c) Frequently
- d) Always

17. Are laryngoscope blades cleaned/ disinfected?

- a) After each patient
- b) Only after an infected or high-risk patient
- c) At the end of the day
- d) Other (please explain).

18. How are laryngoscope blades usually cleaned/ disinfected?

- a) Wiped with a clean cloth
- b) Rinsed under running water
- c) Washed with a soap and water
- d) Wiped with an alcohol swab
- e) Cleaned with disinfectant/germicidal agent

19. After administering anaesthesia, is the anaesthesia machine ever wiped

- a) Never
- b) Rarely
- c) Frequently
- d) Always.

20. On a scale of 0 (none) to 10 (significant), how do you perceive the anaesthetist's role in transmission of infectious agents to the patient (please circle)?

None

Significant

0 1 2 3 4 5 6 7 8 9 10

APPENDIX III: GUIDELINES

Infection Control in Anaesthesia

Association of Anaesthetists of Great Britain and Ireland

This is a consensus document produced by expert members of a Working Party established by the Association of Anaesthetists of Great Britain and Ireland (AAGBI)

Summary

- (1) A named consultant in each department of anaesthesia should liaise with Trust Infection Control Teams and Occupational Health Departments to ensure that relevant specialist standards are established and monitored in all areas of anaesthetic practice.
- (2) Precautions against the transmission of infection between patient and anaesthetist or between patients should be a routine part of anaesthetic practice. In particular, anaesthetists must ensure that hand hygiene becomes an indispensable part of their clinical culture.
- (3) Anaesthetists must comply with local theatre infection control policies including the safe use and disposal of sharps.
- (4) Anaesthetic equipment is a potential vector for transmission of disease. Policies should be documented to ensure that nationally recommended decontamination practices are followed and audited for all reusable anaesthetic equipment.
- (5) Single use equipment should be utilized where appropriate but a sterile supplies department (SSD) should process reusable items.
- (6) An effective, new bacterial/viral breathing circuit filter should be used for every patient and a local policy developed for the re-use of breathing circuits in line with manufacturer's instructions. The AAGBI recommends that anaesthetic departments should consider changing anaesthetic circuits on a daily basis in line with daily cleaning protocols.
- (7) Appropriate infection control precautions should be established for each anaesthetic procedure, to include maximal barrier precautions for the insertion of central venous catheters, spinal and epidural procedures and any invasive procedures in high risk patients.

Standard precautions

Precautions are recommended for all patients regardless of their diagnosis or presumed infectious status and must be implemented when there is a possibility of contact with:

- 1 Blood.
- 2 All other body fluids.
- 3 Non-intact skin.
- 4 Mucous membranes.

Preventative measures should be based on the likelihood of an infectious agent being present, the nature of the agent and the possibility of dispersion, e.g. splashing. A standard set of precautions should be established for every invasive procedure (see below) with additional risk assessment of each patient to determine extra and specific precautions that may be appropriate.

Hand hygiene

Anaesthetists must ensure that good hand hygiene becomes an indispensable part of their clinical culture. Hand-mediated transmission is the major contributing factor to infection associated with healthcare. Effective hand decontamination immediately before every episode of direct patient contact will result in a significant reduction in the transfer of potential pathogens and a decrease in the incidence of preventable HCAI. At the start of every session, and when visibly soiled or potentially contaminated, hands must be washed with liquid soap and water. When there is no soiling, the Hand Hygiene Liaison Group advocates that staff should use an antimicrobial hand rub between patients or activities as this is effective and quicker. Antimicrobial hand rub is not effective in preventing cross infection with *Clostridium difficile*.

Gloves

Sterile gloves must be worn for invasive procedures and contact with sterile sites. Non-sterile examination gloves must be worn for contact with mucous membranes, non-intact skin and all activities that carry a risk of exposure to blood, body fluids, secretions and excretions. All blood and body fluids, substances, secretions and excretions may be considered to be potentially infective regardless of the perceived risk of the source. They should be put on immediately before an episode of patient contact and removed as soon as the activity is completed, and before contact with fomites, including curtains, pens, clinical notes, keyboards and telephones. Gloves should be changed between patients and between different procedures on the same patient.

Facemasks

The use of facemasks to decrease the incidence of postoperative wound infection has been questioned. However, masks with a face shield should be worn when there is a risk of blood, body fluids, secretions and excretions splashing into the face and eyes. Masks must also be worn by anaesthetists when carrying out a sterile procedure under full aseptic conditions. Correctly fitting facemasks may also give some protection to the anaesthetist against inhaling infected droplets from the respiratory tracts of patients with infectious respiratory diseases.

Theatre caps

Theatre personnel in most UK operating theatres wear disposable headgear although there is little evidence for the effectiveness of this practice except for scrub staff in close proximity to the operating field. However, theatre caps should be worn in laminar flow theatres during prosthetic implant operations.

Theatre suits and gowns

The skin of staff working in the operating theatre is a major source of bacteria that have the potential for being dispersed into the air. Clean theatre suits should be available for all staff in theatre. Full body, fluid-repellent gowns should be worn where there is a risk of extensive splashing of blood, body fluids, secretions and excretions.

Sterile gowns should be worn when invasive procedures are undertaken. Disposable plastic aprons are often worn on wards in situations where there is a risk of physical soiling of clothing in order to prevent transmission of infection between patients

Shoes and overshoes

Special footwear should be worn in the operating department and cleaned if contaminated or after every use. Trusts should ensure that a system for cleaning theatre footwear is in place in each theatre suite. Plastic overshoes may increase bacterial contamination of floors and, in addition, hands become contaminated when overshoes are put on or removed. Their use is not recommended.

Movement within the theatre complex

To reduce airborne contamination, general traffic in and out of the operating theatre itself should be kept to a minimum. Doors should be kept closed to ensure the efficiency of the ventilation system. Moving patients on their beds into the operating theatre may increase the bacterial count

on floors. The use of separate trolleys from ward to transfer area and transfer area to table has not been shown to have benefit although this practice continues in many operating areas.

Order of patients

There should be a written hospital policy requiring accurate printed theatre lists to be available prior to the scheduled date. ‘Dirty cases’, i.e. patients likely to disperse microbes of particular risk to other patients, should be identified before surgery and theatre staff should be notified. These patients should be scheduled last on an operating list to minimize risk. Where this is not possible, the Hospital Infection Society (HIS) advises that a

Plenum-ventilated operating theatre should require a minimum of 15 min before proceeding to the next case after a ‘dirty’ operation. Appropriate cleaning of the operating theatres between all patients should be undertaken. Whenever there is visible contamination with blood or other body materials, the area must be disinfected with sodium hypochlorite (according to local protocols) and then cleaned with detergent and water. Floors of the operating room should be disinfected at the end of each session.

Safe use and disposal of sharps

- Sharps must not be transferred between personnel and handling should be kept to a minimum.
- Needles must not be bent or broken prior to use or disposal.
- Needles and syringes must not be disassembled by hand prior to disposal.
- Needles should not be recapped or resheathed.
- Used sharps must be discarded into an approved sharps container at the point of use.
- The sharps container should be sealed and disposed of safely by incineration when about two-thirds full or in use for more than four weeks, whichever is sooner
- Blunt aspirating needles should be used for drawing up drugs.

Preventing contamination of drugs

Syringes and needles are sterile, single-use items and, after entry or connection to a patient’s vascular system or attachment to infusions, a syringe and needle should be considered contaminated and used only for that patient. A syringe must not be used for multiple patients even if the needle is changed. Before use, prepared syringes and needles should be stored in a clean container and syringes capped to avoid contamination.

After use or at the end of the anaesthetic, all used syringes with needles should be discarded into an approved sharps container. Care must be taken when drawing up drugs. Single use ampoules

should be discarded after the required amount of drug is drawn up and not re-used for subsequent patients. Ampoules can be kept for identification purposes and discarded at the end of the list. Multiple-use ampoules are not recommended.

All infusions, administration sets or items in contact with the vascular system or other sterile body compartments are for single-patient use. An aseptic technique should be used when preparing infusions and breaks/taps in lines should be kept to a minimum. Injection ports should be maintained with a sterile technique, kept free of blood and covered with a cap when not in use.

Connections and injection ports in intravenous lines should be kept to a minimum. Three-way taps should be avoided if practicable..

Anaesthetic equipment and infection control

Items of anaesthetic equipment may become contaminated either by direct contact with patients, indirectly via splashing, by secretions or from handling by staff.

Contamination is not always visible and all used pieces of equipment must be assumed to be contaminated and disposed of or, if reusable, undergo a process of decontamination. There is a need to designate a person who is responsible for ensuring equipment cleanliness

Single-use equipment

Where appropriate, single-use disposable equipment will remove the difficulties of re-use and decontamination procedures. The use of such equipment is to be encouraged. However, there are problems of cost, storage and disposal of single-patient use devices and for some equipment there is no feasible disposable alternative.

Packaging should not be removed until the point of use for infection control, identification, traceability in the case of a manufacturer's recall, and safety.

Decontamination

Decontamination is a combination of processes including cleaning, disinfection and / or sterilisation used to make a re-usable item safe to be handled by staff and safe for further use on patients. Effective decontamination of re-usable devices is essential in reducing the risk of infection. It is recommended that each department identifies a designated consultant who, in conjunction with the appropriate bodies in their Trust, will develop specific guidelines for anaesthetic practice which satisfy national recommendations and that these practices are audited on a regular basis.

Decontamination processes

Cleaning – removal of foreign material from an item. This usually involves washing with a detergent to remove contamination followed by rinsing and drying. All organic debris, e.g. blood, tissue or body fluids, must be removed before disinfection or sterilisation, as its presence will inhibit disinfectant or sterilant from contacting microbial cells

Low Level Disinfection – kills most vegetative bacteria (except TB and endospores), some fungi and some viruses using disinfectants such as sodium hypochlorite, 70% alcohol and chlorhexidine.

High Level Disinfection – kills vegetative bacteria (not all endospores), fungi and viruses. With sufficient contact time (often several hours), these high level disinfectants may produce sterilisation, e.g. the use of aldehydes, peracetic acid and chlorine dioxide.

Sterilisation – A process used to render an object free from viable micro-organisms, including all bacteria, spores, fungi and viruses, with techniques such as autoclaving.

Risk assessment

The choice of equipment and/or the level of cleanliness/disinfection/sterility required of reusable items may be assessed against the risk posed to patients of transmission of infection during any procedure in which the equipment is employed. It has been proposed by the MHRA Microbiology Advisory Committee that three levels should be considered:

1 High Risk – the device will penetrate skin or mucous membranes enter the vascular system or a sterile space – these devices require sterilisation.

2 Intermediate Risk – the device will be in contact with intact mucous membranes or may become contaminated with readily transmissible organisms – these devices require high level disinfection or sterilisation.

3 Low Risk – the device contacts intact skin or does not contact patient directly – these devices require low level disinfection or cleaning.

Infection control policy

Anaesthetic face masks

These items are frequently contaminated by secretions from patients and have been implicated in causing cross infection .These items should be single-use.

Airways and tubes

Oral airways, nasal airways and tracheal tubes should be of single-use type since they readily become contaminated with transmissible organisms and blood . Ideally, supraglottic airways should be of the single patient use type but the re-usable design is in common use and many anaesthetists perceive it as being less traumatic. Therefore, a supraglottic airway designed for repeated use should be sterilised no more often than the manufacturer recommends. A supraglottic airway used for tonsillectomy or adenoidectomy should not be used again. The AAGBI recommends single-use supraglottic airways.

Catheter mounts – angle pieces

It is recommended that these items are single-patient use type.

Anaesthetic breathing systems

The AAGBI has previously recommended that ‘an appropriate filter should be placed between the patient and the breathing circuit (a new filter for each patient)’

Anaesthetic machines

Routine daily sterilisation or disinfection of internal components of the anaesthetic machine is not necessary if a bacterial / viral filter is used between patient and circuit. However, manufacturers’ cleaning and maintenance policies should be followed, and bellows, unidirectional valves and carbon dioxide absorbers should be cleaned and disinfected periodically. All the surfaces of anaesthetic machines and monitors should be cleaned on a daily basis with an appropriate disinfectant or immediately if visibly contaminated.

Laryngoscopes

Blades are regularly contaminated with blood, indicating penetration of mucous membranes, which places these items into a high-risk category. Proper cleaning of laryngoscope blades is of great importance before decontamination / sterilisation, particularly of residue around light sources or articulated sections. Although repeated autoclaving may affect the function of laryngoscopes, the Working Party recommends that re-usable laryngoscope blades should be sterilised by an audited SSD between patients, following the manufacturers' instructions.

There are an increasing number of inexpensive, single use laryngoscope blades and handles of improving design available, and their use is to be encouraged.

Traditional blades should be available at all times in case difficulty is encountered.

Laryngoscope handles also become contaminated with micro-organisms and blood during use, and they should be washed / disinfected and, if suitable, sterilised by SSDs after every use.

Anaesthetists should wear gloves during intubation and place used instruments in a designated receptacle to prevent contamination of surfaces, pillows and drapes.

Bougies

Re-use of these items has been associated with cross infection. Manufacturers recommend that a gum elastic bougie may be disinfected up to five times between patients and stored in a sealed packet. It is preferable that alternative single-use intubation aids are employed when possible.

Surfaces

The surfaces of anaesthetic machines and monitoring equipment, especially those areas which are likely to have been touched by the gloved hand that has been in contact with blood or secretions, should be regarded as contaminated and should be cleaned at the earliest opportunity, probably between patients. Local policies should be in place to ensure that all equipment that touches intact skin, or does not ordinarily touch the patient at all, is cleaned with a detergent at the end of the day or whenever visibly contaminated. This includes non-invasive blood pressure cuffs and tubing, pulse oximeter probes and cables, stethoscopes, electrocardiographic cables, blood warmers etc., and the exterior of anaesthetic machines and monitors. Items such as temperature probes should be for single patient use.

Oxygen masks and tubing

Single-patient use products should be used.

Resuscitation equipment

Single-patient use equipment should be kept in a sealed package or should be resterilised between patients according to the manufacturer's instructions. All training equipment should be handled similarly.

Infection control precautions for anaesthetic procedures

Carrying out procedures in an operating theatre does not pose a lower risk of infection than other hospital locations and the risk of infection depends on the procedure and on the level of barrier protection rather than the surrounding environment

Maximal barrier precautions

Maximal barrier precautions involve full hand washing, the wearing of sterile gloves and gown, a cap, mask and the use of a large sterile drape. The skin entry site should be cleaned with an alcoholic chlorhexidine gluconate solution or alcoholic povidone-iodine solution. The antiseptic should be allowed to dry before proceeding.

Certain invasive anaesthetic procedures require this optimum aseptic technique:

- Insertion of central venous catheters.
- Spinal, epidural and caudal procedures.

Other barrier precautions

Certain invasive procedures do not require full barrier precautions as above but nevertheless demand appropriate aseptic techniques. Such precautions involve the wearing of sterile gloves and use of small drapes, although similar attention is required to hand washing and skin preparation.

These procedures include:

- Peripheral regional blocks.
- Arterial line insertion.

Peripheral venepuncture or intramuscular injection in low-risk patients will involve hand washing, non-sterile gloves and skin preparation with propyl alcohol. Peripheral intravenous catheters are a significant source of nosocomial bacteraemias and care is required.

High-risk patients

Certain patients may be especially vulnerable to infection, e.g. the immunocompromised, or offer particularly high risk of transmitting infection, e.g. tuberculosis and HIV. For the immunocompromised, maximal barrier precautions are required for all invasive procedures and similarly, where there is a high infection risk, staff should concentrate not only on preventing cross-infection between patients but in protecting themselves by ensuring compliance with all precautions.

APPENDIX IV: ETHICAL APPROVAL FROM KNH/UON ERC



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
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Link: www.uonbi.ac.ke/activities/KNHUoN



KENYATTA NATIONAL HOSPITAL
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30th July, 2013

Dear Dr. Nzioka

RESEARCH PROPOSAL: ANAESTHESIOLOGY PRACTICE IN THE PREVENTION OF PERIOPERATIVE TRANSMISSION OF INFECTION AT THE KENYATTA NATIONAL HOSPITAL (P114/03/2013)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 30th July, 2013 to 29th July, 2014.

This approval is subject to compliance with the following requirements:

- a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
- d) Any changes, anticipated or otherwise that may increase the risks or affect 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.
- e) 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*).
- f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.

- g) Submission of an *executive summary* report within 90 days upon completion of the study
This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website www.uonbi.ac.ke/activities/KNHUoN.

Yours sincerely



PROF. M. L. CHINDIA
SECRETARY, KNH/UON-ERC

- c.c. Prof. A.N. Guantai, Chairperson, KNH/UoN-ERC
The Deputy Director CS, KNH
AD, Health Information, KNH
The Principal, College of Health Sciences, UoN
The Dean, School of Medicine, UoN
The Chairman, Dept. of Anaesthesia, UoN
Supervisors: Dr. Kabetu C. E., Dr. Chokwe T. M.

APPENDIX V: DECLARATION OF ORIGINALITY FORM



UNIVERSITY OF NAIROBI Declaration of Originality Form

Name of Student _____
Registration Number _____
College _____
Faculty/School/Institute _____
Department _____
Course Name _____
Title of work _____

DECLARATION

1. I understand what Plagiarism is and I am aware of the University's policy in this regard
2. I declare that this _____ (Thesis, project, essay, assignment, paper, report, etc) is my original work and has not been submitted elsewhere for examination, award of a degree or publication. Where other people's work or my own work has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.
3. I have not sought or used the services of any professional agencies to produce this work.
4. I have not allowed, and shall not allow anyone to copy my work with the intention of passing it off as his/her own work.
5. I understand that any false claim in respect of this work shall result in disciplinary action, in accordance with University Plagiarism Policy.

Signature of student _____
Date _____

Signature of supervisor(s) _____
Date _____