THE DEVELOPMENT OF A COMPREHENSIVE INFECTION PREVENTION QUALITY AUDIT TOOL FOR OPERATING ROOM THEATRES IN A PRIVATE HEALTH CARE ENVIRONMENT

Linette Engelbrecht

A Dissertation submitted to the Faculty of Health Science, University of the Witwatersrand, in fulfilment of the requirements of the degree of Master of Science in Nursing Education

Johannesburg, June 2017

DECLARATION

I, Linette Engelbrecht, declare that this Dissertation is my own, unaided work. It is being submitted for the Degree of Master of Science in Nursing Education at the University of the Witwatersrand, Johannesburg. It has not been submitted for any degree or examination at any other University.

4th day of June 2017 in Johannesburg.

Johannesburg, 2017

ABSTRACT

Multi-resistant organisms, the involvement of numerous stakeholders in the OR as well as the complex procedural and technical advancements, especially in the private healthcare environment, justifies an evidence based infection prevention quality audit tool for an OR that is comprehensive. The purpose of the study was to develop a comprehensive infection prevention quality audit tool for operating room within a private healthcare environment. A three phased, multi-method study was conducted whereby phase one included the identification of statements in existing audit tools, policies and published articles. This was used to compile concourse statements that were used during phase 2 in the Q-sort data collection method, which allowed stakeholders (scrub- and anaesthetic nurses, CSD Managers, IPC- and OHS Coordinators and surgeons) to indicate what they want to be included in the IPC Audit Tool for operating room. A statement verification was conducted to expand the concepts that enabled the researcher to compile an audit tool. Subject experts and the researcher tested the degree of validity of the audit tool in phase three of the study. A descriptive analysis revealed that the results of the Q-sort event was inconclusive. The subject experts were unable to determine the degree of validity of the audit tool, which forced the researcher to test the audit tool in an OR. A Comprehensive IPC Control Quality Audit Tool was developed. The utilisation of the audit tool in an OR should be a well-planned event. Specific education and training of the multidisciplinary team regarding IPC in the OR should be considered.

ACKNOWLEDGEMENT

I would like to acknowledge the following people for their guidance and assistance:

Doctor S J Armstrong (University of the Witwatersrand, Johannesburg) as the supervisor of this study.

Dedré Engelbrecht as language and style advisor of the study.

Johannesburg, 2017

TABLE OF CONTENT

CONTENTS PAGE

CHAPTER THREE - RESEARCH METHODOLOGY

CHAPTER EIGHT - CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

LIST OF NOMENCLATURE

BMRC: British Medical Research Council

CDC: Communicable Disease Centre

CMS: South African Council for Medical Schemes

CRE: Carbapenem-Resistant Enterobactriceae

CSA: Clinical Standards Audit

CSD: Central Sterilizing Department

CVI: Content Validity Index

CVR: Content Validity Ratio

EN: Enrolled Nurse

ENA: Enrolled Nurse Assistant

ESBL: Extended Spectrum beta-lactamase

FIDSSA: Federation of the Infectious Disease Societies of South Africa

HAI: Hospital Acquired Infection

HCW: Health Care Worker

HCP: Health Care Professional

HFE: Human Factors Ergonomics

HPCSA: The Health Professions Council of South Africa

ICN: Infection Control Nurse

IPC: Infection Prevention and Control

IPCNS: Infection Prevention Clinical Nurse Specialist

MRSA: Methecillin Resistant S. aureus

NCS: National Core Standards

NHI: National Health Insurance Scheme

NICD: National Institute for Communicable Diseases

OHSC: The Office of Health Standards Compliance

OR: Operating Room/ Operating Room Theatre / Operating Theatre

OHS: Occupational Health and Safety

RN: Registered Nurse

SANC: The South African Nursing Council

SAPC: The South African Pharmacy Council

SEIPS: Systems Engineering Initiative for Patient Safety

SSI: Surgical Site Infection

SQ: Service Quality

TQM: Total Quality Management

VRE: Vancomycin Resistant Enterococci

WHO: World Health Organisation

UVC: Ultra Violet C-wave

LIST OF FIGURES

CHAPTER 3

CHAPTER 5

LIST OF TABLES

CHAPTER ONE **PAGE**

CHAPTER THREE

CHAPTER FOUR

CHAPTER FIVE

CHAPTER SEVEN

LIST OF APPENDICES

TITLE **PAGE**

CHAPTER 1

1. GENERAL INTRODUCTION

1.1 Rationale and Significance

Although the World Health Organisation (WHO) identifies surgical site infections (SSIs) as the leading type of infection in the general patient population in countries with "limited resources" (World Health Organisation, 2013), the recent shut-down of units in a private hospital, caused by a Carbapenem-Resistant Enterobactriceae (CRE) outbreak, deprived the specific health care group of a considerable income. Furthermore, it has also focused the attention of the public and healthcare on how infection prevention control programmes, are managed. These programmes include audits of the Operating Room Theatres and the performance of the multi-disciplinary team with regard to infection prevention. With the private healthcare system being under constant pressure to produce a world class service, the shortage of specialist staff and the fast turn-over of patients, especially in operating room theatres, concerns has been raised about the management of infection control programmes and it would appear that concerns regarding quality audits and quality auditing processes are not unfounded (Nembhard *et al*, 2009).

Hospital Acquired Infections (HAI's) contribute to additional suffering, extended hospitalisation, increased resistance to antimicrobials, possible loss of income and unnecessary deaths of the patients. Anderson *et al* (2014) state that surgical site infections are responsible for 160 000 to 300 000 incidents in the United States per year. Surgical site infections are the most expensive HAI to date (Anderson *et al*, 2014). The Communicable Disease Centre (CDC) estimated that out of the 16 million surgical procedures that were performed in the US in 2010, 31% of HAI's were surgical site infections. It is estimated that 60% of surgical site infections could be prevented if evidence based guidelines were to be instituted (Anderson *et al,* 2014). In 2012 the incident rate of surgical site infections was 1.98 per 100 patient procedures in the United States (Bates *et al*, 2013).

The National Institute for Communicable Diseases (NICD) confirmed that only 131 CRE infections were reported between 2011 and 2013. They also admitted that South African data is unreliable at this stage as reporting is voluntary, and surveillance programs are diverse (Emery, 2014).

Declaro and Gebremariam (2013) state that any healthcare provider should have a well organised, highly functional infection prevention control team that is effective in proactive and reactive strategies regarding infection control and they should have the authority to influence systems. This includes audit tools relevant to infection prevention and control.

Although the private healthcare group has incorporated the National Core Standards and group specific CSA (Clinical Standards Audit) into quality audit tools, sections relevant to the Operating Room are in-bedded within the General Wards' and other Specialist Units', Occupational Health and Safety's (OHS), Central Sterilizing Department's (CSD) and Infection Prevention Control (IPC) audit tools. The compliance rating of the multi-disciplinary team, as well as of the Operating Room as a unit, to infection prevention standards in an operating room, is unreliable due these multiple fragmented quality audit tools.

1.2 Statement of the Problem

Within the specific private health care environment, numerous attempts have been made to design an infection prevention control program for an operating theatre based on evidence-based practices which has resulted in fragmentation, and duplication of individual roles and responsibilities. Existing audit documentation consists of general statements and allows for numerous interpretations of requirements in the specialised area, as well as confusion between individual stakeholders and role players regarding their responsibilities. This results in poor quality auditing, misleading results and impacts on the reliability of the existing audit tool.

1.3 Research Questions

The following research questions are relevant:

1.3.1 Phase one

What is currently included in infection prevention quality audit tools, policies and procedures for operating room theatres in a health care environment?

1.3.2 Phase two

What do internal and external stakeholders regard as important elements in an audit tool?

1.3.3 Phase three

What elements should be included in an infection prevention control quality audit tool in order to identify risks leading to hospital acquired infection in an operating room in a private health care environment?

1.4 Purpose of the Study

The purpose of this study is to develop and test a comprehensive infection prevention control quality audit tool for operating room theatres in a private health care environment.

1.5 Objectives of the Study

This purpose is supported by the following objectives:

1.5.1 Phase one

To identify the content of the infection prevention quality audit tools and policies currently used in the operating room theatres in a private health care environment.

1.5.2 Phase two

- To determine what internal stakeholders (nurses, Infection Control and OHS Coordinators) and external stakeholders (surgeons) regard as important elements in the infection prevention quality audit tool of operating theatres in a private health care environment.
- To review the literature to determine evidence based practices that provide validation for, and the expansion of the concourse statements identified.

1.5.3 Phase three

- To incorporate the elements as determined by stakeholders in an infection prevention quality audit tool for an operating room theatre in a private health care environment.
- To test the audit tool in one operating room theatre in a private health care environment to determine the validity of the tool.

1.6 Conceptual Definitions Relevant to this Study

For the purpose of this study, the following concepts are defined by using references as indicated or the researcher's understanding of the concepts.

An audit is a multi-dimensional process that determines if best practices are adhered to in clinical practice. It contains standards, criteria and details the data to be collected (indicators).

An audit tool is the documented verification of evidence of compliance to criteria and indicators as determined by standards by an auditor.

Carbapenem Resistant Enterobacteria (CRE) is defined as bacteria that is resistant to one or more carbapenem antibiotic e.g. Doripenem, Ertapenem, Imipenem and Meropenem.

Category is defined as a group of concepts with similarities.

Central Sterilising Department (CSD) is the area where all contaminated surgical items are decontaminated and sterilised, sterile sets are prepared and stored in a sterile store room.

Concourse is a collection of data relevant to the study, specifically to q-sort as data collection method.

Condition of instruction is a statement that gives direction to the participant on how to relate the Q-set to the Q-sort deck.

Evidence-based practice guideline is defined as "rigorous, explicit clinical guidelines that are based on the best research evidence available in that area" (Burns, Gray, Grove, 2013).

Hospital Acquired Infection (HAI) is defined as "… a localised or systematic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxins(s) that was not present on admission to the acute care facility" (CDC, 2014).

Infection Prevention Programme is the deliberate attempt to prevent hospital acquired infections by setting standards, encouraging audit compliance, and ensuring implementation of evidence based practices, analysing of data and events and education and training of the stakeholders.

Intra-operative Area refers to the specific location in the Operating Theatre where invasive procedures are performed.

Multi-disciplinary Team is a group of specialists that performs a specific task in the operating room, which contributes to the quality of patient care rendered. E.g.

nursing staff, doctors, cleaners, porters, nurse managers and CSD workers, OHS Coordinators, IPC Coordinators, Technical Managers as well as kitchen staff.

Operating Room/ Operating Room Theatre/ Operating Theatre is a restricted area purposefully designed to perform invasive and surgical interventions as well as the management of anaesthesia within a controlled environment.

Peri-Operative Area refers to all the areas within the Operating Room e.g. pre-operative area, intra-operative area, recovery room, CSD, change rooms and storerooms and Operating Room kitchen.

Private Health Care is the provision of any care by an institution that is not owned by the state or an organ of the state (Government Gazette. National Health Act. (2004). No. 26595. No 61 of 2003. 23 July 2004. Cape Town. South Africa).

Q-set/cards/deck are statements identified as concourse statements that are transcribed onto individual cards to be used during the Q-sort process.

Q-sort refers to a phase in Q-methodology where participants rate statements according to a condition of instruction.

Quality of care refers to the extent to which the health care provider adheres to evidence based practices in an isolated environment (Operating Room Theatre).

Standards are referred to as pre-determined qualities that has to be met. Structure standards include the physical building, policies and procedures, human resources as well as medical resources (medication, equipment, and linen), education and training of staff and financial resources. Process standards include the use of the resources to deliver a certain level of care e.g. compliance to treating pathways. Outcomes standard include end-results of what should be achieved e.g. surgical site infection rate and patient satisfaction (Armstrong *et al*, 2014).

Stakeholders: External stakeholders are members of the multi-disciplinary team that are not employed by the specific private health group e.g. surgeons. Internal stakeholders are members of the multi-disciplinary team that are employed by the private health care group e.g. nursing staff, CSD staff, cleaners, OHS Manager and IPC Manager.

Surgical Site Infection (SSI) is an infection of the operative site within 30 days after the initial procedure and is defined as either superficial, deep or organ depending on the anatomical structures involved. An infection of the operative site where prosthesis

was implanted within one year post operatively is regarded as a surgical site infection. Grolman and Richards (2005) clarifies that a surgical site infection is confirmed when tissue is introduced to 100 000 or more organisms per gram of tissue, and claims that life-threatening organisms may only need 100 organisms per gram of tissue to cause an infection.

1.7. Structure of the Dissertation

The structure of the dissertation is summarised in Table 1.1

Table 1.1 The structure of the dissertation

Chapter	Description
Chapter 1	Introduction to the study Rationale and Significance of the study
Chapter 2	Literature Review
Chapter 3	Research Methodology
Chapter 4	Phase One: Development of a Concourse
Chapter 5	Phase Two: Q-sort –Methods. Findings and Discussions
Chapter 6	Literature Verification
Chapter 7	Phase Three: Development of the Audit Tool
Chapter 8	Conclusion, Limitations and Recommendations

1.8 Conclusion

Due to the large number and variety of stakeholders involved in infection control and prevention of infection in private theatre settings, implementation of an IPC programme in operating theatres is challenging. Not only does this study include a comprehensive evidence based infection prevention quality audit for the operating room but the researcher has included the opinions of the various stakeholders regarding the content of the audit tool by using Q-sort as methodology to try to prevent social desirable bias during the data collection phase in this multi-method study.

CHAPTER 2

2. LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to review literature related to the concept of quality and quality measurement, a historical overview of quality, the management of quality and how the concept of quality relates to, and is applied to, quality in the operating theatre. The specialised physical environment of the operating room challenges the application of ethical principles and is discussed in this chapter. Legislative frameworks relevant to the South-African healthcare environment, and the operating room environment are also included. Literature related specifically to the indicators selected during this study will be reviewed in chapter 6.

2.2 The Concept of Quality

ISO 9000 defined quality as "the totality of characteristics of an entity that bear upon its ability to satisfy stated and implied needs" (Radziwill, 2013) as well as "… the degree to which a set of inherent characteristics fulfils requirement" (Van Nederpelt, 2013).

The quality of a healthcare service is measured by standards as first advocated by Donabedian in 1960. Donabedian (1987) described quality in the healthcare environment as "The application of medical science and technology in a way that maximizes its benefits to health without correspondingly increasing its risks. The degree of quality is, therefore, the extent to which the care provided is expected to achieve the most favourable balance of risks and benefits" (Donabedian, 1987).

According to the Donabedian Model for Quality Improvement the focus of quality should include structure (resources and the environment) processes (providing care) and outcomes (results) of the healthcare provided (Jovic *et al*, 2012).

While various concepts are related to quality, in this study the terms Total Quality Management, Service Quality, Systems Engineering Initiative for Patient Safety (SEIPS) as well as The Operation Profile will be discussed in the last part of this chapter as they apply to the operating theatre environment in order to provide the context of the study.

2.3 Infection Prevention Quality Control

The art of infection prevention and the management thereof is, and has, for a long time, been one of the biggest challenges with in the health care environment. As far back as 1858, Florence Nightingale confirmed this statement with her well known statement that “The first requirement of a hospital is that it should do the sick no harm” (Forder, 2007).

The *Bacteriological Era* in the 19th century was infused with the discoveries of Pasteur, Koch and Lister. The earliest connection between sepsis and surgery was identified by Ignatius Semmelweiss in 1847. With the opening of hospitals for infectious diseases in the 20th century it became clear that human understanding of infectious diseases and microbiology was limited. In 1941 the British Medical Research Council (BMRC) recommended *full time special officers* to manage infections in hospitals. The BMRC also recognised the value in a multi-disciplinary team approach to the problem and advised every hospital in 1944 to have a committee that consists of administrators, doctors and nurses. The first Infection Control Nurse (ICN) was appointed in 1959 in the UK to assist the infection control officer, a medical doctor, with his duties (Forder, 2007). The first operating room nurse speciality training commenced in 1876 in Massachusetts General Hospital in the USA.

In 1946 the Communicable Disease Centre (CDC) was established by the United States government to protect public health. The CDC has been instrumental in standardising surveillance strategies regarding hospital acquired and surgical site infections worldwide. The World Health Organisation (WHO) was established in 1948. The WHO states on their website (Accessed 10 March 2015) that the Infection Prevention and Control in Health Care Initiative’s goal is to assist countries to minimise hospital acquired infections and to advise countries on managing an outbreak.

Fifty-seven years later, in 2005, Dr Brink’s articles on hospital acquired infections were published with the launch of the Federation of the Infectious Diseases Societies of South Africa (FIDSSA) (Brink, 2005). Antimicrobial pathogens that were already identified in South African laboratories in 2005 include extended spectrum beta-lactamase (ESBL) in *Klebsiella* and *Enterobacter* , carbapenem resistance and multi-drug resistance in *P. aeruginosa* and *Acinetobacter baumannii.* Multi-drug resistant

E.coli and *S. aureus* (MRSA) and vancomycin-resistant enterococci (VRE) were also listed by Brink (2005).

2.4 Policy Background to Quality

South African legislation regarding health and quality assurance of patient care is extensive and much of it is specifically related to operating room practice as discussed below.

The Constitution of the Republic of South Africa (South Africa, 1996a) guarantees each citizen's right to access to healthcare and healthcare services as stated in The Patient's Rights Charter (South Africa, 1996a). This runs parallel with Section 10 of The Bill of Rights, recognising each patient's humanity in respecting and upholding their human dignity, as well as recognising each patient's right to equality (Section 9). Improvement of healthcare, setting of rights and responsibilities of both the patient and the service provider, the empowerment and participation of patients as well as the improvement of the provider- patient relationship is regarded as outcomes of the charter. This is supported by the transformation priorities of the Batho Pele Principles of 1997 which includes consultation, service standards, access, courtesy, information, openness, transparency, redress and value for money. The Consumer Protection Act (No. 68 of 2008) has introduced a no-fault liability clause as well as eight consumer rights. The right to market equity and protection against discrimination allows the patient to query the quality of items utilised, as well as to complain about the quality of care. The patient is entitled to quality service and goods as stated in the right to fair value, good quality and safety right. The right to choose also gives the patient the right to disclosure of information regarding previous audit scores and the healthcare provider's compliance to evidence based practices, which will allow the patient to make an informed decision regarding his preferred provider of choice. The operating room is a mecca of medical and surgical products, equipment and devices that has to be managed according to specific guidelines, to ensure the integrity and sterility of the product as it has a direct impact on infection prevention control practices in the operating room.

The National Health Act (No. 61 of 2003) allows the Minister to set standards of health care after consultation with the National Health Council and all establishments (public and private) have to comply with these quality standards. These standards include accommodation, treatment, the physical environment, hygiene, equipment, technology and human resources (Government Gazette No 61 of 2003: National

Health Act, 2004. 23 July 2004. Cape Town. Republic of South Africa.). These standards are addressed in quality audit tools relevant to the operating room.

The Office of Health Standards Compliance (OHSC) is the regulator of quality health care in South Africa (Department of Health, 2011). All health care providers that wish to be part of the newly proposed National Health Insurance Scheme (NHI) have to comply with these quality standards (Armstrong *et al*, 2014). Although the implementation of the NHI is still under review, the inclusion of the private healthcare provider based on quality care within its hospitals is important.

The National Core Standards (NCS) for Health Establishments is a set of standards and norms developed by a task group and published in 2011 (National Department of Health, 2011). The NCS were welcomed by the private healthcare group and the first internal NCS audits were initiated in 2012. The standards are broad and the application thereof in an operating room environment is challenging.

The Health Professions Council of South Africa (HPCSA), The South African Pharmacy Council (SAPC) and The South African Nursing Council (SANC) are professional councils that regulate education, continuous professional development as well as quality of care and conduct of its members. As numerous stakeholders are involved in rendering of quality healthcare especially in the operating room theatre the understanding of the professional role of each member is important.

The South African Council for Medical Schemes (CMS) monitors private health financing through medical schemes, as well as the impact of the Medical Schemes Act 131 of 1998. The CMS protects medical aid members and investigate any complaints from the members regarding payment for healthcare services (Department of Health, 1998). This also complies with payment of the costs for HAI's and specifically SSI's in the private healthcare environment and is therefore relevant to this study.

The Occupational Health and Safety (OHS) Act (No.85 of 1993) provides the framework for health and environmental safety for all employees (Botha *et al,* 2009). This is relevant to quality infection prevention control in the operating room as the disease profiles and environments that have to be managed within an operating room is challenging. The protection of the holistic workforce in the operating room environment is important.

The rendering of quality care in the operating room is dependent on the multi-disciplinary team's approach to quality care and adherence to legislative frameworks.

2.5 Factors Influencing the Understanding of, and Compliance to, Quality

Our perceptions of quality systems and compliance to theories are influenced by world events e.g. world wars and the outbreak of diseases, like the Zika and Ebola virus. This does not only impact on revised patient treatment regimens and costs but also the survival of mankind.

Andersson (2013) explains that surgical infection is a social construct due to the fact that humans relate to events differently depending on time and culture (Andersson, 2013). Before the discovery of antibiotics in the 1940's SSI's were perceived as a natural complication of surgery and associated with death and mutilation. With the turn of the century SSI's were mainly associated with anti-biotic resistance and with death as a potential outcome. Human behaviour and perspectives influence the management of potential devastating events e.g. SSI's.

The multi-disciplinary team's perspective of, and compliance to, policies and procedures is diverse. When people work in an isolated environment and engage in habit-forming tasks, a distinctive unit or institutional culture develops. Edgar Schein (1990) defines culture as patterns and thought processes of behaviour executed by a specific group of people that has been developed in an attempt to cope with challenges within an environment. This behaviour is perceived as valid if it is repeated over time without consequences, and taught to new members of the group as the correct approach to the mentioned challenge. According to Rowley and Warning (2012) nurses have developed a methodology to appropriate policies. This has resulted as the nursing methods (work and thought processes of self-worth) have never been questioned (Rowley *et al*, 2012). Circumstances in operating room theatres are related to this concept. Phrases like "*OR staff are a breed of their own"* and "*In this unit we do the procedure like this"* are common amongst nurses and managers. The operating room is physically isolated from the rest of the hospital, teams are formed for specific procedures and the dress code is very distinctive. Compared to the ward situation, OR staff's work standards are not scrutinised by visitors or awake patients. Tasks are repetitive and nursing activities routine.

Al-Ali (2014) states that doctors have different views on quality and Total Quality Management in the private healthcare environment as they are not employed by the

provider and do not have a direct interest in the provider. Responsibility, leadership as well as autonomy is perceived by physicians as exclusive individual roles controlled by themselves. Planning is rigid and results from complaints are used as feedback. In Total Quality Management (TQM), planning is flexible, benchmarking is used for feedback, appraisals are continuous and authority is shared. It is therefore important to have physician involvement from as early as the planning phase of quality processes in the operating room theatre. The interactive roles of the physicians often set the standard of care within the private healthcare environment.

Einspruch (2010) defines healthcare innovation as "… the introduction of a new concept, idea, service, process or product aimed at improving treatment, diagnosis, education, outreach, prevention and research, and with the long term goals of improving quality, safety, outcomes, efficiency and costs". Examples of technical advance innovations in the OR are video-scopes, robotic surgery, cyber knife stereotactic radiosurgery and ablation therapy (Einspruch, 2010). Due to the competitiveness of the private healthcare environment, the pace of new innovations, techniques or products demands policies, standards and work processes to be adjusted to stay current and relevant. This ever-changing landscape has its own challenges of which people's reaction to change have a direct impact on quality.

2.6 Total Quality Management

Although the operating room theatre is regarded as one department, the sub-departments (pre-operative, anaesthetics, CSD, recovery room) within contribute to its dynamic environment and demand a high level of teamwork and inter-disciplinary understanding of roles. Total Quality Management (TQM) addresses these characteristics and demands as well as the challenges of a private healthcare environment where clinical and business objectives have to meet.

Al-Ali (2014) defines Total Quality Management as "… a system that makes quality the responsibility of all clinicians and administrators throughout the health care organisation". Ovretveit (2000) defines Total Quality Management as "…a comprehensive strategy of organizational and attitude change for enabling personnel to learn and use quality methods, in order to reduce costs and meet requirements of patients and other customers" (Ovretveit, 2000). Johnson & Williams (2013) referred to Total Quality Management as a managerial method consisting of a management philosophy and management method by supporting competent managers that are

equipped to assess and improve processes, provide evidence based data, support a multi-disciplinary team approach. Patient as well as provider satisfaction is regarded as important indicators for quality care (Johnson *et al*, 2013). Total Quality Management is viewed as a deliberate focus on processes, statistical and psychological analysis of quality aspects influencing individual and group performance and activities in the organization (Al-Ali, 2014).

Strategic goals for the achievement of TQM in an healthcare environment are listed as a commitment for change by management and staff, setting of a quality orientated culture, a supporting infrastructure to support the quality culture, education and training regarding quality and change, the establishment of quality teams as well as a contingency leadership style, knowledge about internal and external customer needs, conducting surveys and standardisation of policies and procedures (Al-Ali, 2014). These can be related to Edwards Deming's 14 points of management that focus on competitiveness in the business, management responsibilities and leadership (Mons, 2012). The focus is on quality processes and not only outcomes. Training and retraining of management and workers, inter-departmental agreements and communication of quality messages. Deming also focused on the generation and interpretation of statistical information in an attempt to guide planning as well as the understanding of variance in outcomes, identification of the cause of the variance as well as its impact on quality (Mons, 2012). Statistical analysis of infection prevention audit scores determines the success rate of infection prevention programmes and identifies areas of concern.

2.7 Service Quality

Satyanarayana and Yogesh (2012) discuss Service Quality (SQ) as a process of evaluation when the consumer (patient), compares the outcome of the service he received with what he expected before the services were rendered. This implies that the patient needs information regarding the service relevant to infection prevention control programmes and statistical information regarding the operating room performance before the use of the service, to be able to do the comparison (Satyanarayana *et al*, 2012).

Although the patient's interpretation and understanding of processes inside an operating room may be distorted due to anaesthesia the contribution of the patient is valuable. Areas that are stipulated in the Hospital Service Quality Instrument are the

environment, quality of staff, image and trustworthiness, support, clinical care processes, communication, personal attention, and administrative systems. These aspects are based on patient's indicators of what quality care should consist of (Satyanarayana *et al*, 2012).

Talib (2015) describes Service Quality (SQ) as a system that audits services from the view of the patient and states further that both quality care and quality service is important to patients. Service product, environment and delivery of services are the main dimensions (Talib, 2015).

2.8 Systems Engineering Initiative for Patient Safety (SEIPS)

Utilising the Donabedian quality model of structure, process and outcome, SEIPS expanded the framework by assessing the integration of systems within the healthcare provider and its impact on the patient, employee and the organization. The SEIPS model is based on Human Factors Ergonomics (HFE) (Carayon *et al*, 2014). Human ergonomics are defined as a study of understanding the interaction between humans and other elements within a system. The SEIPS system approach focuses on components in healthcare and their interactions with processes and does not only focus on the individual within the healthcare system (Alvarado *et al*, 2005). The goal of all quality audits is the ability to determine a health system's resilience to anticipate, adapt to errors as a pro-active contingency characteristic to ensure quality patient care irrespective of the changing circumstances (Alvarado *et al*, 2005). When the structure in which the work is performed is assessed the physical environment, organizational culture and climate, incident reporting and analysis as well as work design must be included in audit tools (Alvarado *et al,* 2005).

2.9 The Operation Profile

Chang *et al* (2004) proposed a systems design whereby outcomes are assessed in the operating room. *The operation profile* allows assessment of all the factors that impact on surgery. These risks include patient risk factors, surgical and technical skill of the team, the OR environment, teamwork, communication, decision making, operative events and the procedure performed (Chang *et al,* 2004). These factors should therefore be included in quality audit tools.

2.10 Applied Ethics in Healthcare Quality

Justice in the healthcare environment refers to the allocation of resources to all. This includes physical buildings, equipment, human (staff) and affordability of services. Pera & van Tonder (2013) listed the following issues in surgery as examples of compliance to justice: resource allocation, reporting of malpractices and incidents (whistle blowing), respect for human rights and legal matters (Pera *et al*, 2013).

Armstrong *et al* (2013) adapted Gordon's interpretation of the role of a patient advocate as someone that represents, accompanies, empowers the patient, mediates for the patient, models practice, negotiates for the patient and networks with other members of the multi-disciplinary team. This is relevant to the operating room as each team member have specific roles that have to be coordinated during every surgical procedure (Armstrong *et al,* 2013).

The International Dual Loyalty Working Group (2002) states that ignoring and/or acceptance of harmful practices, omitting to report harmful practices and withholding of information is a violation of human rights (Armstrong *et al,* 2013). The healthcare workers' exposure to dual loyalties challenges patient advocacy (Armstrong *et al* 2013). Current economic challenges, cost containment strategies in the private healthcare sector and ignorance of some stakeholders result in dual loyalty conflicts and frustration in the operating room.

In no other area is the level of patient advocacy, compliance to ethical principles and maintenance of quality care as obvious as in an operating room department. The intensity of high risk procedures (anaesthetic and surgical), the fact that the patient is unconscious and neither he nor his family can observe the quality of intra-operative care, demands of stakeholders, medical scheme restrictions and private healthcare management structures, place pressure on the operating room teams to perform with efficiency and speed.

Bryan and Elliot (2007) also included the doctrine of precautionary principle as a challenge and defines the precautionary principles as "…in its simplest form, justifies anticipatory preventative action despite incomplete scientific evidence". The engagement with and compliance to evidence based practices in the OR are an example (Bryan *et al*, 2007).

2.11 Conclusion

The vast variety of official and explicit legislative frameworks and ethical concepts as well as numerous quality perspectives creates the foundation for safe patient care in the operating room.

CHAPTER 3

3. RESEARCH METHODOLOGY

3.1 Introduction

This chapter will provide an overview of the research methods used for the entire study. Details of data collection and analysis, as well as findings, will be provided in the chapters relevant to each of the three phases of research. In phase two where Q-sort was used, a detailed explanation of the data collection methods will be provided as its use is not common in health care research but was considered appropriate for this study.

A multi- method research design was used to ensure triangulation of the data used in this study.

3.2 A Multi-Method Research Design

Morse (2003 in Tashakkori and Teddlie, 2003) describes multiple methods as "…a research programme when a series of projects are interrelated within a broad topic and designed to solve an overall research problem". This study consists of three phases which, in Morse's terms would be considered to be *individual projects*. As stated in chapter one, the objectives of each phase were as follows:

Phase one: To identify the content of the infection prevention quality audit tools and policies used in operating room theatres.

The content analysis process is described in detail in chapter 4 and is referred to as the first component of the triangulation in this study.

Phase two: To determine what internal stakeholders (nurses, Infection Control and OHS Coordinators) and external stakeholders (surgeons) regard as important elements in the infection prevention quality audit tool of operating room theatres in a private health care environment.

Q-sort as data collection method was used, and is described in chapter 5. A literature review was conducted to expand and confirm the statements in chapter 6, and is the second component of the triangulation.

Phase three: To incorporate the elements as determined by stakeholders in an infection prevention quality audit tool for an operating theatre in a private health care

environment. To test the audit tool in one operating theatre in a private healthcare environment to determine the validity of the audit tool.

The data collected from both phase one and two is used to develop a comprehensive infection prevention quality audit tool for operating room theatres within a private health care environment. Experts were unable to provide adequate information to determine the degree of validity. The researcher tested the audit tool in one operating room, and adjusted the audit tool as described in chapter 7. This is the third component of triangulation in this study.

The research methods used are illustrated in figure 3.1 indicating how the methods were triangulated.

Figure 3.1 Triangulation of data in the study

Each phase required different research methods which were used for the purpose of triangulation to facilitate validation by combining the findings to be included in the audit tool. Tashakkori and Teddlie (1998) contend that triangulation results in the identification of factors, and stimulate further research as well as providing a contextual multi-view of the research topic. Triangulation provides a possible 360° view of the topic which allows the researcher to discover previously unknown contributors to the research problem.

3.3 Research Setting

The Operating Room is a restricted area purposefully designed to perform invasive and surgical interventions as well as the management of anaesthesia within a controlled environment. Other specialised areas where invasive studies are performed are referred to as catheterisation laboratories due to the complexity of the procedures and specialised equipment used. These areas are equally maintained as operating theatres. Basic sterile principles are adhered to and operating procedures are performed. They are therefore included in this study.

The healthcare provider in this study owns 343 operating room theatres, 26 catheterisation and electrophysiology laboratories in 54 hospitals in South Africa and 188 operating room theatres, 8 catheterisation and electrophysiology laboratories in 57 hospitals in the United Kingdom. A quality audit tool will assist in the reduction of infection in 531 operating theatres and 34 catheterisation laboratories and will make a substantial improvement to the care of thousands of patients.

The National Infection Prevention Control Practitioner is responsible for both Infection Prevention Control and Occupational Health and Safety. At hospital level the Infection Prevention Control Committee consists of the IPC Coordinator, Hospital Manager, Nursing Services Manager, Microbiologist, Surgeon, Physician, Unit Representatives, Pharmacy Representative, Technical Services Representative, Catering and Kitchen Representative, Clinical Facilitators and Domestic Representatives.

Each unit in the hospital has an appointed Link Nurse who is responsible for attending IPC meetings chaired by the IPC Coordinator. Infection Prevention Control policies are available on the healthcare group's internal intranet portal, and each unit has a printed copy available. Policies relevant to the operating room environment and practices are embedded in hospital policies.

3.4 Population

The population included all members of the multi-disciplinary team working in or assisting with the measurement and improvement of quality in the operating theatres included in this study. N =73. Of these, 48 were employed by the health care provider and 25 (surgeons) were not.

The role and responsibilities of the abovementioned participants, relevant to infection prevention in the operating room are defined.

The scrub nurses included in this study are registered with the South African Nursing Council (SANC), and hold an additional qualification in Operating Room Science as regulated by SANC, Regulation 212 (Department of Health, 1993). Functions of a scrub nurse include the planning, implementation, coordination and evaluation of all IPC practices in the OR, specific to the list to which she is assigned (specific patients and procedures). The registered scrub nurse is the team leader of the peri-operative environment with an understanding of applied ethical principles and patient advocacy. The registered scrub nurse is a skilled clinical practitioner with insight into the planning, implementation and evaluation of surgical procedures. The registered nurse is technologically skilled in the management of medical equipment as well as the implementation and application of basic sterile principles throughout the procedure.

The OHS coordinators included in this study were registered nurses, with no other additional qualification, except experience in the OHS environment. She is required to plan, implement and evaluate strategies to protect all the employees, patients and stakeholders from injury on the premises of the hospital. She assists the IPC coordinator with the maintenance of IPC standards, buildings and work processes to prevent all from injury. The OHS Coordinator facilitates learning programmes relevant to OHS in the hospital. Only one OHS Coordinator is appointed per hospital.

The IPC coordinators included in this study were registered nurses, with an additional qualification (certificate or diploma) in infection prevention control. The IPC coordinator is required to plan, implement and evaluate strategies to protect all employees, patients and stakeholders from infection with micro-organisms that can cause harm. The IPC coordinator facilitates learning programmes relevant to IPC in the hospital. Only one IPC nurse is appointed per hospital. The IPC coordinator is responsible for the external cleaning service in the hospital.

The CSD manager is a registered nurse, with or without an additional qualification in Operating Room Science. The CSD manager is skilled in decontamination and sterilisation techniques of surgical instrumentation as well as other items required for surgical procedures. The CSD manager is technically advanced in the management of sterilising equipment e.g. autoclaves. The CSD manager is required to plan,

implement and evaluate strategies to ensure decontamination and sterilisation practices, to manage the sterile store room, to transport contaminated and sterile instrumentation and packs and to appoint CSD assistants. The CSD manager facilitates learning programmes relevant to sterile services.

The Anaesthetic nurse is a registered nurse, skilled in the planning and preparation for anaesthetic techniques and practices when performed by the anaesthetist. The Anaesthetic nurse is technically advanced in the managing of anaesthetic delivery units as well as medication management. The Anaesthetic nurse assist the anaesthetist during surgical procedures, and is responsible to ensure the decontamination/ sterilisation of all anaesthetic equipment before use. The Anaesthetic nurse is responsible for monitoring the patient during the intra-operative stage, as well as the maintenance of the patient's hemodynamic status as instructed by the anaesthetist. The anaesthetic nurses included in this study had to be skilled in the management of general anaesthetic techniques, including the preparation and maintenance of invasive devices e.g. central venous and arterial intra-venous lines. The inclusion of the anaesthetic nurses in this study were based on recommendations from the unit manager.

The Surgeon is a medical practitioner, licenced with The Health Professions Council of South Africa (HPCSA) with an additional qualification in the specific field of speciality (e.g. orthopaedic or general surgery). The surgeon performs the surgical procedure after the patient has given him informed consent. The surgeons referred to in this study are not employed by the private health care provider. The surgeon appoints the anaesthetist and surgical assistant of his choice to assist him with the surgical procedure. The surgeon should ensure that he approves of the operating room conditions, including the sterile field created by the scrub nurse, as well as the conditions of the equipment in the OR before commencing with the procedure. The surgeon is the first member of the OR multi-disciplinary team who consults with the patient and is therefore responsible for communicating all relevant patient information to the OR when the patient is booked for the procedure.

3.5 The Sampling Process

3.5.1 Hospitals Included in the Study

The study was conducted in four hospitals that belong to the same private healthcare provider in Gauteng. The stakeholders in three of the hospitals were

included in the data collection phase and a fourth was used to determine the validity of the audit tool.

All four hospitals had nurse practitioners employed as Operating Room Unit Managers, Central Sterilising Department Managers, Infection Prevention Control Coordinators and Occupation Health & Safety Coordinators. All four Operating Room Departments manage between 700 and 1200 procedures every month, including joint replacement surgery, open abdominal surgery with general anaesthesia. The scrub nurses employed in the hospitals had to be registered nurses. This excluded some hospitals from the study.

Table 3.1 Staff distribution in the Operating Room Theatres

	Hospital A	**Hospital B**	**Hospital C**	**Hospital D**
Scrub Nurse	RN - 5 Surgical Tech- 2	RN – 9 ENA – 2 Surgical Tech - 3	RN – 13 Surgical Tech - 1	RN – 8 ENA - 2
Anaesthetic Nurse	RN - 2 EN – 2 ENA - 1	RN – 1 EN- 3 ENA - 7	RN – 6 EN - 4	RN – 4 EN - 1
Floor Nurse	ENA - 6	ENA - 9	ENA - 9	ENA – 5 EN – 3 HCW - 2
CSD Assistant	6 RN - 1	11 EN - 1	12 RN - 1	8 RN - 1
Cleaner	6	5	6	4
IPC Coordinator	1	1	1	1
OHS Coordinator	1	1	1	1
CSD Manager	1	1	1	1

Internal Stakeholders included in the study were scrub nurses, anaesthetic nurses, IPC Coordinators, OHS Coordinators and CSD managers. External Stakeholders included surgeons.

A non-probability purposive sampling method was used. Burns *et al* (2013) define sampling as the selection of individuals to be included in a study. Non-probability purposive sampling ensures that some elements in the population are included from the research on purpose. Data was collected involving internal and external stakeholders in three hospitals. The internal stakeholders included scrub nurses,

anaesthetic nurses, IPC Coordinators, OHS Coordinators and CSD Managers. Surgeons as external stakeholders were also included. None of the selected stakeholders refused to partake in this study.

Table 3.2 Participant distribution per hospital

	Hospital A	Hospital B	Hospital C	Total per category
Scrub nurse	2	2	2	6
OHS coordinator	1	1	1	3
IPC coordinator	1	1	1	3
CSD manager	1	1	1	3
Surgeon	1	1	1	3
Anaesthetic nurse	1	1	1	3
Total Participants	7	7	7	21

The inclusion criteria for this research study in each of the three selected hospitals were as follows:

All participants had to be practicing in the operating room in one of the selected private hospitals. All the participants, except the surgeons, were permanently employed by the specific private health care provider during the data collection phase. The researcher included selection criteria for the nursing staff, based on qualifications, in an attempt to ensure that nurses with similar qualifications and experience partake in the study. The internal stakeholders were selected on recommendation of the Operating Room Unit Manager. The external stakeholders (surgeons) were selected on recommendation of the Hospital Nursing Service Manager and Operating Room Unit Manager based on their area of speciality.

- One registered scrub nurse per hospital practicing in the orthopaedic theatre where prosthesis is implanted.
- One registered scrub nurse per hospital practicing in the general theatre where colon-rectal procedures are performed.
- One senior registered nurse per hospital practicing as an anaesthetic nurse where general anaesthesia is performed.
- All three nurses mentioned above must have the longest service in her specific field as confirmed by the NSM (Nursing Service Manager).
- One CSD (Central Sterilising Department) Manager per hospital.

- One IPC (Infection Prevention Control) Coordinator per hospital.
- One OHS (Occupational Health and Safety) Coordinator per hospital.
- One surgeon per hospital. One orthopaedic surgeon specialised in hip replacement surgery and was the chairperson of the Hospital Infection Committee. One orthopaedic surgeon specialised in knee replacement surgery. One general surgeon specialised in laparoscopic and abdominal surgery involving intestinal procedures which is regarded as *contaminated* surgery.

3.6 Data Collection

In phase one of this research study the researcher attempted to identify existing quality tools and policies and other relevant data used in operating room theatres to include it in the concourse of an infection prevention control quality audit tool in an operating room in a private health care environment. A revised qualitative content analysis guide (Gläser *et al*, 2011) was used to determine the statements to be included. Forty three statements were identified after consolidation of statements, identification and merging of patterns as well as exploration of statements not allocated. This phase is discussed in detail in chapter 4.

In phase two of this study the participants sorted the statements (q-set) prepared in phase one using the score sheet according to specific instructions (Q-Sort). Forced sorting was used according to a specific deck design. A literature review was conducted to confirm the relevance and validity of every statement, and to expand the concepts and align them to an operating room environment. This phase is discussed in detail in chapter 5 and 6.

In phase three the data collected in both the previous phases was used to compile a comprehensive infection prevention quality audit tool. This phase is documented as chapter 7 of this study. The audit tool was reviewed by a micro-biologist, IPC Coordinator and OHS Coordinator, OR unit manager, OR clinical specialists as well as the Quality Coordinator, IPC of the private healthcare group to ensure relevance and validity. This phase is discussed in detail in chapter 7.

Q-sort, as a data collection method, is a fairly new convention – it is not a main stream data collection method in healthcare and is therefore discussed in order to provide background for the whole study.

3.6.1 Q-sort Methodology

Sigmund Freud believed that our subjective viewpoints are involuntary mirrored by our actions and decisions (Freud, 1900). This statement is supported by William Stephenson, the *father* of Q-methodology, stating that "subjectivity is operant behaviour" (Watts, 2012).

Watts, (2012) also stated that a participant's subjective view is captured by a methodology (Q-sort) according to its influence on the immediate surroundings, as Q-methodology is operant itself (Watts, 2012). In 1980, Brown supported this viewpoint by stating that "A viewpoint does not exist within a person, but only in their current *outlook* or *positioning* relative to some aspect of their immediate environment (a circumstance perhaps, an event, or some other object of enquiry). A viewpoint exists and takes a defined form only in the moment of *relationship* between a subject and its object, between knower and know, observer and observed" (Watts, 2012).

Good (in Watts, 2010) therefore stated that "Q-methodology then provides a rigorous set of procedures for identifying that point of view and relating it to the points of view of others" (Watts, 2012).

Apart from the above arguments, the following characteristics of Q-sort allow the research objectives to be met: similarities and differences are displayed and classified, interpretation of data per specific groups can be classified, a small number of participants can be used and researcher influence on responses are minimised (de Graaf and van Exel, 2005). In this study similarities and differences of specific hospitals and stakeholders are compared in the data analysis phase, only 21 participants were included in this study and the researcher's role during the data collection phase is clearly described.

Meloche and Qi *(*2009) argued that play still exists in an adult world and can stimulate creative thinking and approaches to problems and "the features of play imply it will encourage people to use positive interpersonal behaviour, promote empathy, conflict resolution and social and communication skills" (Meloche *et al*, 2009) and further states that "Q-methodology is employed as a discovery tool for this research to open up and dig into the objectives of the participants" (Meloche *et al*, 2009). The following steps are followed in a Q-sort event: definition of a concourse, development of a q-sample - phase one of this study - selection of a p-set, q-sorting and data analysis - phase two of this study - (de Graaf *et al*, 2005).

Chris Fluckinger (2014) believes that Q-sort minimises the social desirability bias of responding to questionnaires – a problem often experienced when Likert -scales and questionnaires are used. This is supported by his quote “moderately ipsative measures such as Q-sorts may represent a useful middle ground by providing a modest check on socially desirable responding while still providing enough user control to sort each item relative to all the items in the set” (Fluckinger, 2014).

Avoiding the social desirability bias problem, cognitive dissonance regarding the specific topic is initiated which results in choice justification processes. Festinger (1957), believed that when an individual has to make a choice between two statements he likes equally cognitive conflict or dissonance can only be reduced by reinterpreting the meaning of the statements and his options as choice justification (Chua *et al,* 2013). The participants in this study are therefore forced to compare the statements with each other during the sorting process.

3.7 Rigor, Validity and Reliability

Phase one and three of this study were assessed for trustworthiness according to Guba and Lincoln’s criteria of confirmability, dependability and transferability (Shenton, 2004).

Confirmability is addressed to ensure that work reflects the data collected from participants and not the preferences of the researcher. A detailed description of the methodology were included to allow for an audit trail to be conducted. A content analysis is included in chapter six reflecting the relevant resources used in phase one. Statements were included based on the qualitative content analysis of Gläser & Laudel (2011).

Credibility refers to the establishing that the results of the study are believable. The true credibility of the results can only be established by the participants, but in this study triangulation has been used to enhance credibility.

Dependability refers to the reliability of the data collected, and is addressed by inclusion of a detailed description of the planning and implementation of the methodology, detail description of the data collection phase and a reflective appraisal of the process as is evident in the dissertation.

Transferability refers to the applicability of the findings to other similar situations. This cannot be assured though as the study has only, to date included one private

hospital group. A background study, detailed description of the topic and defined concepts are included that does allow for comparisons to be made. Recommendations are included in the dissertation.

Validity reflects the measure of accuracy and truth of the finding of a research study (Burns *et al*, 2013). Internal validity is addressed under credibility. External validity is supported by the inclusion of a detailed description of the study, as well as the methodology to allow repetition of the same study in another context. Construct validity is addressed by pre-testing the q-sort concourse statements with professional nurses outside the research site prior to inclusion in this study. Content validity was determined by experts that tested the audit tool in the clinical environment.

Reliability of an instrument (concourse statements and forced deck design) mirrors the consistency of score results if the study is to be repeated (Burns *et al*, 2013). The participant had the q-sort ranking visible to him and had an opportunity to change the score. Recognition and flexibility gave participants a sense of control of their contribution. The same instruction statement *Rank the following concepts in order of importance for inclusion in an Infection Prevention Control Quality Audit Tool* was presented to all participants including the same set of statement cards (q-set) and sorting deck. An audit trail to check for consistencies during the data collection process was included.

The data collected in phase two was transcribed, photographed and included in chapter five.

3.8 Ethical Considerations

The research problem has been shown to be significant in the light of recent events in the private health care environment. Permission was obtained from the management of the private hospitals, the participants and the private group's research committee. Ethical approval was obtained from the University Of Witwatersrand Human Research Ethics Committee (See Appendix K and L).

The researcher was able to engage with all the relevant stakeholders due to her knowledge and 25 years' experience in the operating room environment.

The following ethical principles are evident in this study (Burns *et al*, 2013).

3.8.1 Right to self-determination

All participants were informed of the study and a participant information letter was provided to all participants (see annexure 1). The participants had the right to withdraw from the research study at any time without any consequence to the participant. Written consent was obtained from all the participants.

3.8.2 Right to privacy

The data collection process was conducted in a separate room away from the direct working environment with only the participant and the researcher present.

3.8.3 Right to autonomy and confidentiality

The participants have the right to anonymity. A participant number was allocated to each participant. This number appeared on the consent document, post-scoring interview document, the transcribed document and the photographed sorted deck. Only the researcher has access to this information. The data collected is utilised for the research purposes only.

3.8.4 Right to fair treatment

The criteria for selecting the individual participants was directly related to the study. All participants were treated with respect and the researcher was present throughout the data collection process to clarify statements and questions the participants had. The participant group was diverse in age, gender, race and nationality. The data collection schedule was designed according to the availability of the participants.

3.8.5 Right to protection from discomfort and harm

The participants did not show any signs of physical or emotional harm during the data collection process. Signs of frustration were however evident by all participants and this was related to the demands of forced-sorting deck design utilised in this q-sort methodology. This information was included in the field notes of the researcher during every data collection process as a significant observation itself. This frustration was temporary and subsided as soon as the sorting process was completed. The participants were allowed to discuss their experience of the process with the researcher. No specific time limit was required per data collection phase.

3.9 Conclusion

The multi-method strategy allows for exploration and discovery of aspects relevant to the research questions. Q-sort as the data collection method allows participants the freedom of choice within a structured framework that potentially forced a true reflection of their viewpoints. The ethical aspects are clearly described. Every phase is discussed in detail in the following chapters.

CHAPTER 4

4. PHASE ONE: THE DEVELOPMENT OF A CONCOURSE

4.1 Introduction

During the first phase of this study the researcher attempted to identify all the aspects included in infection prevention audit tools in operating room theatres, and therefore presumably considered important. A content analysis was conducted and concourse statements were created for use in phase two of this study.

4.2 Research Question

What is currently included in infection prevention quality audit tools, policies and procedures for operating room theatres in a health care environment?

4.3 Objective

To identify the content of the infection prevention quality audit tools and policies currently used in the operating room theatres in a private health care environment.

4.4 Data Collection

Reviews of existing audit tools, policies and relevant data used by other healthcare groups were used to compile a concourse for the Q-sort exercise that followed in phase 2 of this research study. Statements were selected based on a content analysis of the documents using Gläser and Laudel's (2011) framework as a guide to the content analysis.

4.4.1 Analysing the data according to the framework

The amount of data, required to develop a comprehensive infection prevention quality audit tool, demanded a structured framework to guide the data collection process. Gläser *et al* (2011) developed a framework that allows for simplification of complex data, de-bulking of high volumes of data as well as justification of the inclusion of data. The following explanation of the data collection process based on Gläser & Laudel's framework is discussed in three phases.

<u>Stage 1: Location of raw data</u>

A list of key search words were developed by the researcher based on her understanding of the meaning of a comprehensive nature of infection prevention control in the theatre environment, developed during her 25 years of OR experience. Data relevant to infection prevention control, operating room theatres as well as

quality auditing in operating rooms and hospital acquired infections were regarded as raw data. The words and phrases in the titles of the sources that determined the potential inclusion of the source in the study were: *Operating Theatre, Quality, Surgical Site Infection, Patient Safety, Infection Control and Prevention, Airborne Infections, Risks, Anaesthesia, Sterilisation, Peri-operative, Safe Staffing, Patient Choice, Sterile Technique, Nurses' Knowledge, Health Building, Clinical Practice, Antimicrobial, Surgery, Prophylaxis, Evidence-Based, Healthcare –Associated Infections, Communication in the Operating Room, Construction, Surgical Environment, Surgical Site Infection, Surveillance, Cleanliness, Injection Practices, Anaesthesia Equipment, Contamination, Decontamination, Source of Nosocomial Infection, Norms and Standards, Department of Health, Reprocessing, Medical Devices, Validation, Labelling, Private Hospitals, Health Care Unit, Practice of Nursing, Infection Control Guide, Nurse, Clinical Perspectives, Implications, Cidex, UVC Light, Ratio, Health System, Surgical Attire, Particle Count, CSSD, Specialists Units, Skin Preparation, Draping, Surgical Services, Responsibilities, Policies, Nursing Techniques, Theatre Attire, Loan Equipment, Occupation Health and Safety, Precautions, Operating Suite, Environmental Hygiene, Healthcare, Environmental Cleaning, Care, Patient, Surgery, Clinical Guide, Practice Standards, Endoscopes, Surgical Instrumentation, Corrosion, Passivation, Medical Devices, Clipping, Shaving, Laminar Air-Flow, Infection, Programmes.*

The publisher list included AORN (Association of peri-Operative Nurses), APIC (Association for Professionals in Infection Control and Epidemiology, NHS-Hospitals England, CDC (Centre for Disease Control, GESA (Gastroenterological Society of Australia), Department of Health: KwaZulu-Natal, Department of Health South Africa, Pharmaceutical Society of South Africa, AANA (American Association of Nurse Anaesthetists), Health Protection Scotland, Johnson & Johnson, Private Healthcare Providers, Private Nursing College, CFSA (CSSD Forum of South Africa), SASA (South-African Society of Anaesthesiologists), WHO (World Health Organisation).

The source list included South *African National Core Standards*, *Internal Audit Documents* of the private healthcare provider, *Internal Policies and Procedures* of the private health care provider which included Quality Alert Statements, as well as *Other Documents* which included strategies, position statements, guidelines, training modules, policies from public healthcare providers, notices, manuals, product guides,

standards, reports, editorials, text books, published academic articles, research studies and a research dissertation from South Africa as well as other countries. See Table 4.1 and Appendix A.

The dates of the publications ranges between 1996 and 2015. The oldest publication is the regulation relevant to the infrastructure and design of private health care facilities, the only published data available. (Department of Health. Regulation 158. Regulation Pertaining to Control of Private Hospitals).

Stage 2: Consolidation of raw data

Twenty-three sources contained data relevant to nursing unit (ward) management of infection prevention strategies and post-discharge prevention of surgical site infections combined with data relevant to infection prevention in the operating room. Data not related to infection prevention control in the operating room was excluded.

Stage 3: Structuring of the raw data into categories

Similar statements within the sources were identified and categorised, however, not all categories were evident in all sources. Categories identified from the raw data were extracted from the sources and are evident in column 4 of Appendix A. The comprehensiveness of the sources are illustrated in table 4.1.

Table 4.1 Categories per source after structuring of raw data

Categories	Core Standards	Internal Audit Documents	Internal Policies & Procedures	Other Sources
Hand hygiene practices	X	X	X	X
Prophylactic antibiotic management	X	X	X	X
Disinfection and sterilisation practices	X	X	X	X
Single-use item management	X	X	X	X
Targeted environmental cleaning	X	X	X	X
Towelling, draping and linen management	X	X	X	X
Personal Protective Equipment management	X	X	X	X
Medical waste and sharps management	X	X	X	X
The structure of the OR design	X	X	X	X

Categories	Core Standards	Internal Audit Documents	Internal Policies & Procedures	Other Sources
Communication strategies	X	X	X	X
IPC guidelines during building renovations and construction		X	X	X
Instrumentation management	X	X	X	X
Endoscope management	X	X	X	X
Guidelines for the management of specific diseases	X	X	X	X
Targeted OR IPC training				X
Air quality	X	X	X	X
Human tissue management	X	X	X	X
The IPC skills of the unit manager				X
Staffing in the OR	X	X	X	X
Sterilisation of loan sets	X	X	X	X
Gluteraldehyde management	X	X	X	X
Sterilisation and decontamination equipment	X	X	X	X
Sterile store and stock room management	X	X	X	X
People movement in the OR		X	X	X
Adherence to the scope of practice regulations	X	X	X	X
Patient documentation indicate IPC practices	X	X	X	X
Equipment management	X	X	X	X
An IPC programme per specific area in the OR				X
Communication of OR IPC compliance ratings to patients and stakeholders				X
Skills assessment of the multi-disciplinary team	X			X
Blood glucose control of patients in the OR	X	X	X	X
Body temperature control of patients in the OR	X	X	X	X
Hair removal practice management	X	X	X	X
Standard precautions compliance by staff members	X	X	X	X
Medication management	X	X	X	X

Categories	Core Standards	Internal Audit Documents	Internal Policies & Procedures	Other Sources
Turn-over time management	X		X	
The immunisation programme of the staff members	X	X	X	X
Pest control programme in the OR	X	X	X	X
Formal incident reporting system in the OR	X	X	X	X
The use of the SMART UVC for decontamination				X
A Hospital Theatre Committee is evident				X
An OR preventative maintenance programme	X	X	X	X
Risk assessment during OR rounds by the multi-disciplinary team				X

Forty three categories were identified to be included in a comprehensive infection prevention control audit tool from seventy sources. No specific source could be identified that provided all the categories listed to be included in a comprehensive infection prevention quality audit tool (See Table 4.1). It became evident that IPC management in an OR is a complex project with the inclusion of multiple stakeholders. The size of the statements to be included in the comprehensive audit tool appears to be overwhelming. It was hoped that the stakeholders would indicate which statements were most important to enable the researcher to include fewer standards in the audit tool, as the number of standards in the audit tool might negatively influence the auditing process.

4.5 Concourse Statements

All the categories listed in table 4.1 were listed as concourse statements (See Table 4.2.). The concourse statements in the structured q-sample were designed to be specific, objective and easily understood as well as aligned to criteria that could be included in an audit tool (Du Plessis, 2005). Sixteen concourse statements demanded *evidence based practices* to be included in the topic of the concourse statement. The standards and guidelines guiding these skills are dynamic and under

regular review due to advancements in technology and changed on a regular basis. E.g. the introduction of specialised equipment which then demands regular updated policies and guidelines relevant to its usage, cleaning, storage, inclusion in the sterile field and use of sterile attachments. It is therefore reasonable to assume that that members of the multi-disciplinary team are up to date with the latest evidence-based information as Continuous Professional Development (CPD) is required form the medical (HPCSA) and nursing council (SANC).

The concourse statements were designed to allow the content to be relevant to the research question in phase 2 of this study (Chapter 5) as well as inclusion in the audit tool (Chapter 7).

Table 4.2 Categories and related concourse statements

NO.	Category	Concourse Statement
1	Hand hygiene practices	Hand hygiene practices are evident
2	Prophylactic antibiotic management	Prophylactic antibiotics are administered according to evidence based practices
3	Disinfection and sterilisation practices	Disinfection and sterilisation procedures are implemented according to evidence based practices
4	Single-use item management	Single-use items are managed according to evidence based practices
5	Targeted environmental cleaning	Targeted environmental cleaning is evident
6	Towelling, draping and linen management	Towelling, draping and linen management is according to evidence based practices
7	Personal Protective Device management	The multi-disciplinary team's compliance to, and the availability of PPE (Personal Protective Equipment) is evident
8	Medical waste and sharps management	Medical waste and sharps management are according to evidence based practices
9	The structure of the OR design	The structure of the OR design adheres to legislation
10	Communication strategies	Communication strategies in the OR are evident

No.	Category	Concourse Statement
11	IPC guidelines during building renovations and construction	Additional IPC guidelines during building renovations and construction are adhered to
12	Instrumentation management	Instrumentation management is implemented according to evidence based practices
13	Endoscope management	Endoscope management is implemented according to evidence based practices
14	Guidelines for the management of specific diseases	Guidelines for the management of specific diseases in the OR are available and implemented
15	Targeted OR IPC training	Targeted OR IPC training and monitoring of the multi-disciplinary team is evident
16	Air quality	Air quality is monitored and managed according to evidence based practices
17	Human tissue management	Human tissue management adheres to evidence based practices
18	The IPC skills of the unit manager	The OR manager is trained and skilled in managing the IPC programme
19	Staffing in the OR	There are enough qualified staff allocated per shift to maintain IPC practices
20	Sterilisation of loan sets	Sterilisation of loan sets are managed according to evidence based practices
21	Gluteraldehyde management	Gluteraldehyde is managed according to evidence based practices
22	Sterilisation and decontamination equipment	Sterilisation and decontamination equipment are managed according to evidence based practices
23	Sterile store and stock room management	Sterile store and stock rooms are managed according to evidence based practices
24	People movement in the OR	A policy minimising people movement in the OR is available and implemented

NO.	Category	Concourse Statement
25	Adherence to scope of practice regulations	The work delegation per shift is according to the Scope of Practice of each staff member
26	Patient documentation indicate IPC practices	Patient documentation indicated IPC practices
27	Equipment management	Equipment is managed according to evidence based practices
28	An IPC programme per specific area in the OR	There is evidence of a IPC programme per area in the OR
29	Communication of OR IPC compliance ratings to patients and stakeholders	Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list
30	Skills assessment of the multi-disciplinary team	The clinical skills of the multi-disciplinary team are assessed annually
31	Blood glucose control of patients in the OR	There is evidence of regular blood glucose control of patients peri-operatively
32	Body temperature control of patients in the OR	There is evidence of regular body temperature control of patients peri-operatively
33	Hair removal practice management	Hair removal practices are according to evidence based practices
34	Standard precautions compliance by staff members	There is evidence of standard precaution compliancy by all members of the multi-disciplinary team
35	Medication management	All medication is managed to evidence based practices
36	Turn-over time management	Policies regarding turn-over time management is evident and implemented
37	The Immunisation programme of the staff	The immunisation programme of the staff is evident
38	Pest control programme in the OR	There is evidence of a pest control programme in the OR
39	Formal incident reporting system in the OR	There is evidence of a formal incident reporting system in the OR

No.	Category	Concourse Statement
40	The use of SMART UVC for decontamination	The SMART UVC for decontamination of the OR is evident
41	A Hospital Theatre Committee is evident	There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team
42	An OR preventative programme	An OR preventative maintenance programme is evident
43	Risk assessment during OR rounds by the multi-disciplinary team	There is evidence of a risks assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager, CSD Manager and Unit Manager

4.6 Conclusion

This chapter has described phase one of the research study. The concourse statements developed in this phase were used in phase two of this study which will be described in detail in chapter 5.

CHAPTER 5

5. PHASE TWO: Q-SORT – METHODS, FINDINGS AND DISCUSSIONS

5.1 Introduction

In the second phase of this study, the researcher attempted to determine what the internal and external stakeholders regard as important elements to be included in a comprehensive infection prevention control audit tool for operating room theatres. This was done by presenting the data collected in phase one (Chapter 4) as concourse statements, that participants were required to sort in the q-sorting event. The preparation of the data collection stationery is described as well as the data collection (q-sort), findings and discussion of the findings.

5.2 Research Question

What do internal and external stakeholders regard as important elements in an infection prevention control quality audit tool for operating theatres in a private health care environment?

5.3 Objective

The first objective of phase two were to determine what internal stakeholders (nurses, Infection Control and OHS Coordinators) and external stakeholders (surgeons) regard as important elements in the infection prevention control quality audit tool in an operating room theatre in a private health care environment.

5.4 Preparation for the Q-sort Event

The participants were provided with information during individual information sessions before consent was obtained from them to partake in the study. Each hospital and participant of the specific hospital was allocated a number for reference and confidentiality purposes (See table 5.1). An individual appointment was made with each participant to ensure it was convenient for them to participate.

Table 5.1 Hospital and participant reference number

Hospital	Participant number
A	A1 OHS Coordinator
	A2 CSD Manager
	A3 Anaesthetic Nurse

Hospital	Participant number
	A4 Scrub Nurse 1
	A5 Scrub Nurse 2
	A6 Infection Prevention Control Coordinator
	A7 Surgeon
B	B1 CSD Manager
	B2 Scrub Nurse 1
	B3 Scrub Nurse 2
	B4 Anaesthetic Nurse
	B5 Infection Prevention Control Coordinator
	B6 Surgeon
	B7 OHS Coordinator
C	C1 Infection Prevention Control Coordinator
	C2 OHS Coordinator
	C3 CSD Manager
	C4 Scrub Nurse 1
	C5 Anaesthetic Nurse
	C6 Scrub Nurse 2
	C7 Surgeon

5.5 Data Collection Materials

Each of the forty-three statements identified in chapter four of this study was printed on an identical card using the same colour, font and size. The allocated statement number was printed on the back of each card for reference purposes for the researcher. A Q-sort deck was designed to accommodate the forty-three statement cards which allowed the participant to place each card on the deck in the required format. Forced sorting was used that ensured each participant could only place a defined number of cards under a particular rating which ranged from most agree (+3) to most disagree (-3). See figure 5.1.

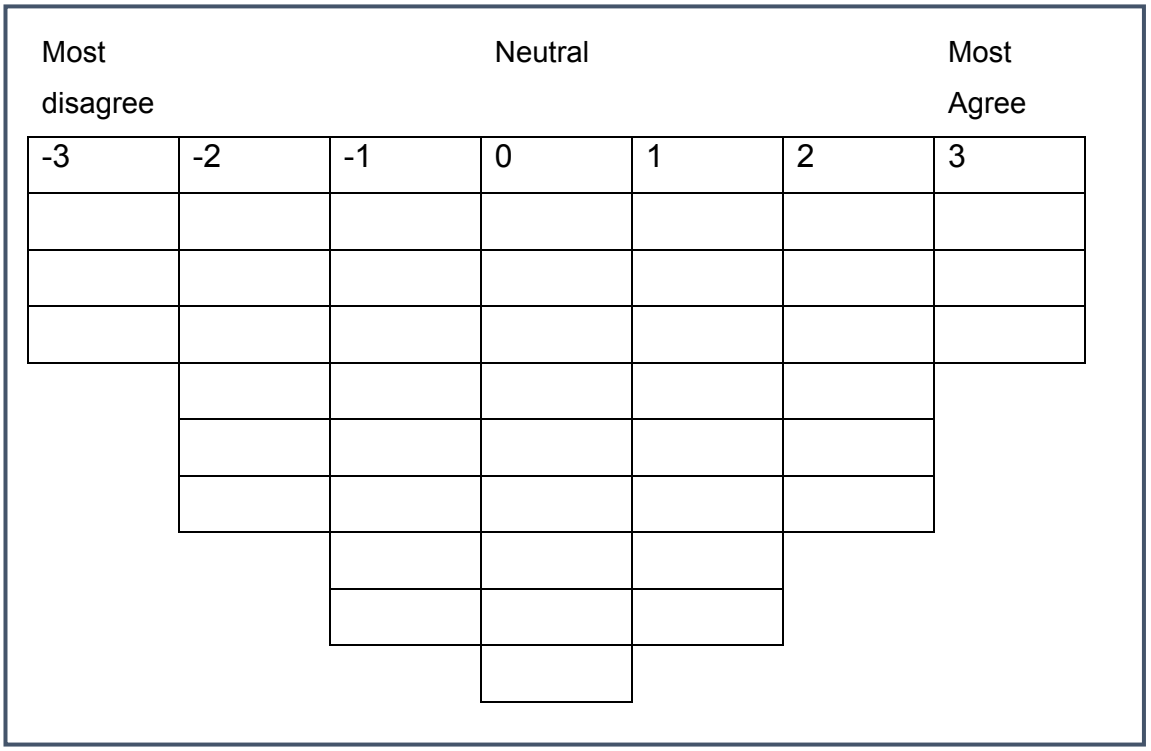


Figure 5.1 Q-sort deck

A guideline was compiled and was made available for the participant to refer to during the data collection process (See Appendix D).

An interview guide was compiled and used during the post-sorting data collection phase. During this phase the researcher confirmed extreme scores on the participant's q-sort deck during a short interview (See Appendix F).

A q-sort deck which was re-sized to fit onto an A4 document, was used by the researcher to transcribe the card numbers in the order the participant' sorting during phase two of this study (See Appendix E). This was done after the participant had left the venue.

5.6 Participant preparation

Each participant was individually orientated regarding his/her role in the data collection phase and supplied with an information sheet (See Appendix B). Once the participant had agreed to partake in the study, and had signed the informed consent (See Appendix C) he/she was orientated regarding the data collection process. The participant guideline was discussed, and the data collection stationery was explained (q-sort deck and q-sort cards). The participant was requested to familiarise him/her-self with the instruction statement for this exercise which read *"Rank the following concepts in order of importance for inclusion in an Infection Prevention Quality Audit*

Tool for the operating theatre in a private health care environment". The number allocated to the specific participant (See Table 5.1) was attached to the interview guide, the A4 deck and on the actual sorting deck for reference purposes.

5.7 The Q-sort Event

The participants completed the exercise in an area separate from, and outside the operating room theatre to minimise interruptions. The empty deck was secured onto a table. The researcher was present during each of the q- sorting events. Each participant was invited to ask questions to clarify statements at any stage during the q-sorting process. The researcher instructed the participant to first group the forty-three (43) statements into two piles according to agree and disagree and then only to proceed with the detailed sorting process. No time limit was set on the sorting process. The researcher compiled field notes throughout the exercise.

5.8 The Post-Sorting Interview

After the participant indicated that he/she was satisfied with the q-set placement the researcher used the interview guide to conduct the post sorting interview. (See Appendix F). Extreme scores were confirmed and the participant was asked to clarify their motivation for the specific score.

5.9 Data Collection

The data collection took place over a period of two months. Each participant's reaction during the sorting process was documented in field notes. Nineteen of the twenty one participants had to read the instruction more than once and during the q-sorting event. All the participants showed signs of, and verbalised frustration during the event and changed their statement scores twice after the initial scoring event. The q-sort event took between 15-45 minutes per participant.

After completion of the q- sorting event and post-sorting interview, the concourse cards were turned around so that the statement number was visible. The q-set rank order was transcribed onto the A4 document as reference. The participant's specific number was written onto the deck and a photograph was taken for reference (see figure 5.2).

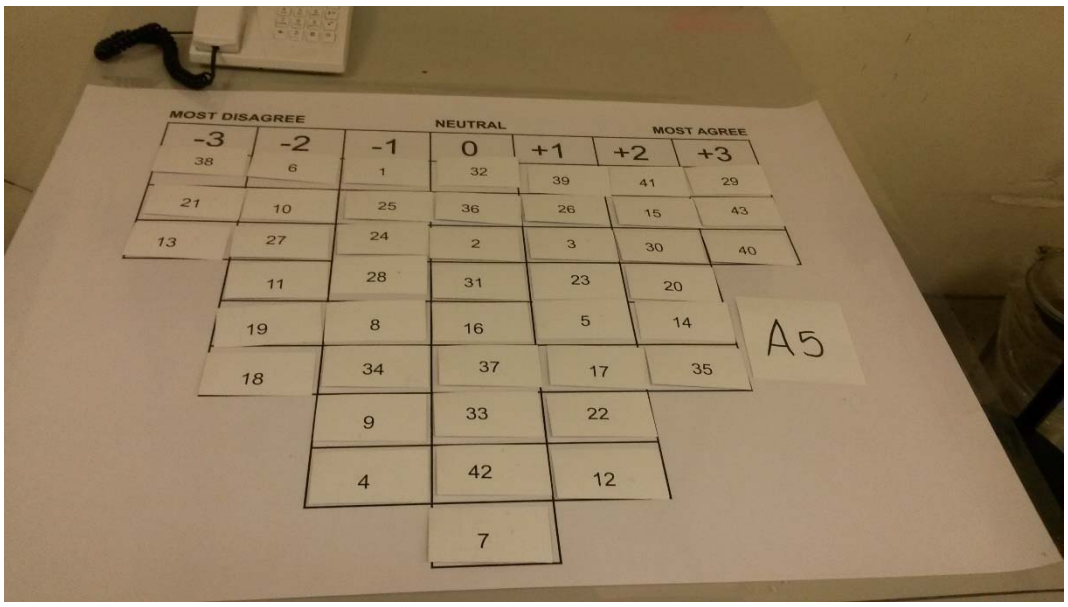


Figure 5.2 Photograph of q-sort deck as sorted by participant A5

5.10 Results of the Q-sort

Descriptive statistics were used to calculate relative scores and ranking of each element as well as means and distribution scores.

The highest value each participant could have ranked each statement is 3 with 0 as neutral and -3 as the lowest score. The mean score ($\overline{X}$) of each statement per hospital is calculated by adding all seven rank order scores ($\sum X$) and dividing the total score by the total participants (n=7) per hospital.

$$\overline{X} = \frac{\sum X}{n}$$

The highest possible mean score a statement could have scored was 3. Each statement could have scored a maximum rank order of 3, multiplied by the 7 participants (n=7) per hospital equals 21 as the highest total score divided by the seven participants (n=7) equals 3 as highest possible mean score.

Due to the amount of data collected, the data is presented in table and graph format followed by a brief description of the findings after every table or graph to allow for a comprehensive understanding of the findings.

Table 5.2 Mean scores of statements per hospital

Statement	Hospital A	Hospital B	Hospital C
Hand hygiene practices are evident	1.57	2	1.86
Prophylactic antibiotics are administered according to evidence based practices	1.71	1.71	0
Disinfection and sterilisation procedures are implemented according to evidence based practices	1.29	1.14	1.86
Single-use items are managed according to evidence based practices	0.71	0.29	0.71
Targeted environmental cleaning is evident	0.57	-0.29	-0.43
Towelling, draping and linen management is according to evidence based practices	0.43	-0.43	0.86
The multi-disciplinary team's compliance to, and availability of PPE is evident	0.29	1	0
There is evidence of medical waste and sharps management practice	0.71	1	0.57
The structure of the OR design adheres to legislation	-0.57	-1.29	-0.7
Communication strategies in the OR are evident	-1.43	-0.14	-0.14
Additional IPC guidelines during building renovations and construction are evident	-0.14	0	-0.57
Instrumentation management is implemented according to evidence based practices	0.86	0.7	1.29
Endoscope management is implemented according to evidence based management	0.71	0.14	0.86
Guidelines for the management of specific diseases in the OR are available and implemented	0.86	0.29	0.7
Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-0.29	0	-1.57
Air quality is monitored and managed according to evidence based practices	-0.29	0	0.29
Human tissue management adheres to evidence based practices	0.43	0.7	0
The OR manager is trained and skilled in managing the IPC programme	1.57	1.29	-0.14
There are enough qualified staff allocated per shift to maintain IPC practices	0	-0.14	0.57
Sterilisation of loan sets are managed according to evidence based practices	1.43	-0.14	0.71
Gluteraldehyde is managed according to evidence based practices	-0.71	-0.86	0.14
Sterilisation and decontamination equipment are managed according to evidence based practices	1	1	1.14
Sterile store and stock rooms are managed according to evidence based practices	0.57	-0.29	0.43
A policy minimising people movement in the OR is available and implemented	-1	-0.29	0.71

Statement	Hospital A	Hospital B	Hospital C
The work delegation per shift is according to the Scope of Practice of each staff member	-0.43	-0.58	0.43
Patient documentation indicate IPC practices	-0.43	-0.58	-0.29
Equipment is managed according to evidence based practices	-1.57	0	-0.29
There is evidence of an IPC programme per area in the OR	0	0	-0.71
Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	0	-0.43	-1
The clinical skills of the multi-disciplinary team are assessed annually	-1	-1.58	-1
There is evidence of regular blood glucose control of patients peri-operatively	-0.71	0	-1
There is evidence of regular body temperature control of patients peri-operatively	-0.86	0.58	0.29
Hair removal practices are according to evidence based practices	-0.14	-0.14	-0.43
There is evidence of standard precautions compliancy by all members of the multi-disciplinary team	0.29	-0.29	0.29
All medication is managed according to evidence based practices	0.43	-0.14	-1.14
Policies regarding turn-over time management is evident and implemented	-1.57	-0.58	-0.86
The immunisation programme of the staff is evident	-0.43	0.58	-0.29
There is evidence of a pest control programme in the OR	-0.71	-0.43	-0.71
There is evidence of a formal incident reporting system in the OR	-0.43	-0.71	0
The SMART UVC for decontamination of the OR is evident	-0.14	-0.86	-0.57
There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team	-0.86	-0.7	-0.57
An OR preventative maintenance programme is evident	-1.14	-0.58	-0.43
There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-0.57	-0.7	-0.7

No statement was scored equally by participants in all three hospitals. Seven statements was scored negatively by participants in all three hospitals. The following statements rated by the stakeholders of the three hospitals scored two out of three equal mean scores. The mean score is indicated after each statement below.

Prophylactic antibiotics are administered according to evidence based practices (1.71). Single-use items are managed according to evidence based practices (0.71). Communication strategies in the OR are evident (-0.14). Sterilisation and decontamination equipment are managed according to evidence based practices (1). There is evidence of an IPC programme per area in the OR (0). The clinical skills of the multi-disciplinary team are assessed annually (-1). Hair removal practices are according to evidence based practices (-0.14). There is evidence of standard precautions compliance by all members of the multi-disciplinary team (0.29). There is evidence of pest control programme in the OR (-0.71). There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager (-0.7).

The significance of this is that stakeholders in the three hospitals did not rank a single statement equally, although they are part of the same hospital group and situated in the same region. The mean score per stakeholder group per statement of all three hospitals is indicated in Table 5.3. The information per statement is also presented in graph format. See Figure 5.3 – 5.45.

Table 5.3 Total mean score per stakeholder group per statement of all three hospitals

Statement	OHS Coordinators	Surgeons	CSD Managers	Anaesthetic Nurses	Scrub Nurses	IPC Coordinators
Hand hygiene practices are evident	1.67	3	1.33	2.67	0.5	3
Prophylactic antibiotics are administered according to evidence based practices	1	2	1.33	2.33	0.17	1
Disinfection and sterilisation procedures are implemented according to evidence based practices	1.33	1.33	2	1.67	1.5	0.67
Single-use items are managed according to evidence based practices	2	0.33	0.67	0	0.33	0.33

Statement	OHS Coordinators	Surgeons	CSD Managers	Anaesthetic Nurses	Scrub Nurses	IPC Coordinators
Targeted environmental cleaning is evident	0.3	0	-0.67	-0.67	-0.5	1.67
Towelling, draping and linen management is according to evidence based practices	0.67	2	-0.67	-1	0.83	-0.67
The multi-disciplinary team's compliance to, and availability of PPE is evident	1.33	-1	1	1.33	-0.67	1.67
There is evidence of medical waste and sharps management practice	1	0	1	1.67	0.17	1.33
The structure of the OR design adheres to legislation	-1.67	-2	-1.33	-0.33	-0.5	-1.33
Communication strategies in the OR are evident	-2	0	-0.67	0	0	-1.33
IPC guidelines during building renovations and construction are evident	-0.33	-0.33	-1.33	0.33	-0.33	0.67
Instrumentation management is implemented according to evidence based practices	0.67	2	1	-0.33	2	1
Endoscope management is implemented according to evidence based management	2.33	0	1.67	0.33	-0.67	1
Guidelines for the management of specific diseases in the OR are available and implemented	1	-0.33	1.67	0.67	1	1
Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-1.67	-1	-0.67	-0.67	0	-0.33
Air quality is monitored and managed according to evidence based practices	1.33	0.33	-0.33	-1.67	-0.33	1
Human tissue management adheres to evidence based practices	0.67	0.33	1.33	1	0.17	0.67
The OR manager is trained and skilled in managing the IPC programme	1	2	1	0.33	0.17	1.67
There are enough qualified staff allocated per shift to maintain IPC practices	-1.67	1.33	-0.67	-0.33	1	0.33

Statement	OHS Coordinators	Surgeons	CSD Managers	Anaesthetic Nurses	Scrub Nurses	IPC Coordinators
Sterilisation of loan sets are managed according to evidence based practices	0.33	2	1	0	0.67	0
Gluteraldehyde is managed according to evidence based practices	0.33	1	-1	-0.33	-1	-1.33
Sterilisation and decontamination equipment are managed according to evidence based practices	1.67	1.33	0.33	1	1	1
Sterile store and stock rooms are managed according to evidence based practices	0.67	0	-0.33	1.33	0.67	-1.33
A policy minimising people movement in the OR is available and implemented	0.33	0.33	0.67	-1	-0.67	-0.33
The work delegation per shift is according to the Scope of Practice of each staff member	-0.33	0.33	0	0.67	-0.17	-1.67
Patient documentation indicate IPC practices	-1	-0.67	-1	-0.67	0.67	1
Equipment is managed according to evidence based practices	-1.33	0	-0.67	-0.33	-0.5	-1
There is evidence of an IPC programme per area in the OR	1	-0.67	0.33	-1.67	-1	1.33
Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	-1.33	-1.33	-1	-1.67	0.17	1.67
The clinical skills of the multi-disciplinary team are assessed annually	-1	-2.67	-0.33	-1	-0.33	-2.67
There is evidence of regular blood glucose control of patients peri-operatively	-1	-1.67	-1.33	0.67	0.33	-1.33
There is evidence of regular body temperature control of patients peri-operatively	-0.67	-1	-0.33	1	0.67	-0.33
Hair removal practices are according to evidence based practices	0	-0.33	0.67	-0.33	-1.17	0.67

Statement	OHS Coordinators	Surgeons	CSD Managers	Anaesthetic Nurses	Scrub Nurses	IPC Coordinators
There is evidence of standard precautions compliancy by all members of the multi-disciplinary team	0	-0.33	0	1	-0.67	1.33
All medication is managed according to evidence based practices	-1.33	0.33	-0.33	1.33	-0.5	-1
Policies regarding turn-over time management is evident and implemented	-1	-1	0	-1.67	-0.67	-2
The immunisation programme of the staff is evident	0.67	-1	-0.33	-1	-0.17	1.67
There is evidence of a pest control programme in the OR	-1	-1	-1	-0.67	0.17	-1
There is evidence of a formal incident reporting system in the OR	-1.33	-0.33	0.67	0	-0.33	-1
The SMART UVC for decontamination of the OR is evident	1.33	-1.66	-1.33	-0.67	0	-1.3
There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team	-1	-0.67	-2.33	-1	0	-1.67
An OR preventative maintenance programme is evident	-2	0	1	-0.67	-0.83	-1.67
There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-1	-1	-2.33	-1.67	-0.83	-0.33

The results of each statement per participant group indicated in table 5.3 are illustrated in graph format followed by an explanation of the findings.

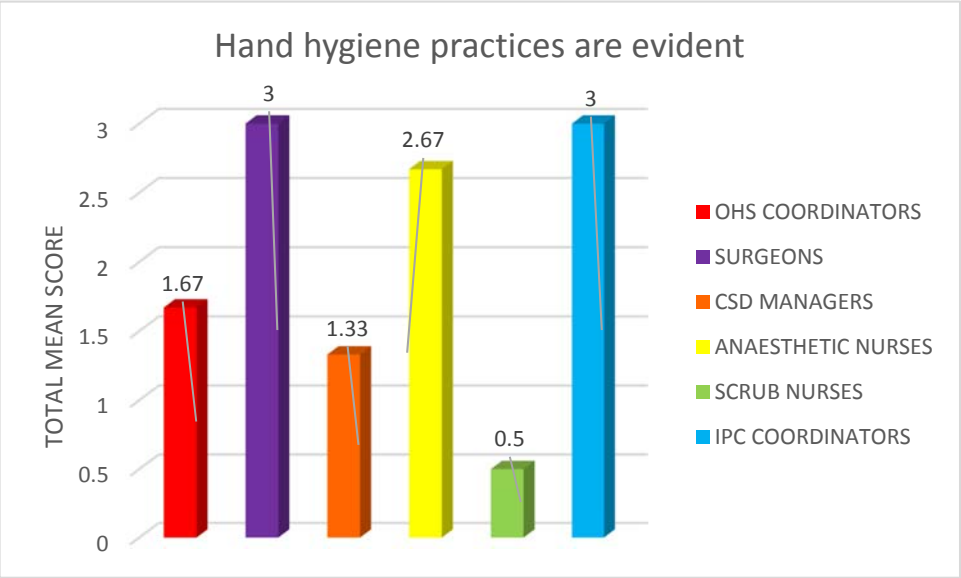


Figure 5.3 Comparison of mean scores per stakeholder group: Statement – Hand hygiene practices are evident

The surgeons and IPC coordinators scored this statement high at 3, followed by the anaesthetic nurses at 2.67, and the scrub nurses' score is the lowest at 0.5. All participants scored positively. The mean score for this statement is the highest overall score at 1.81.

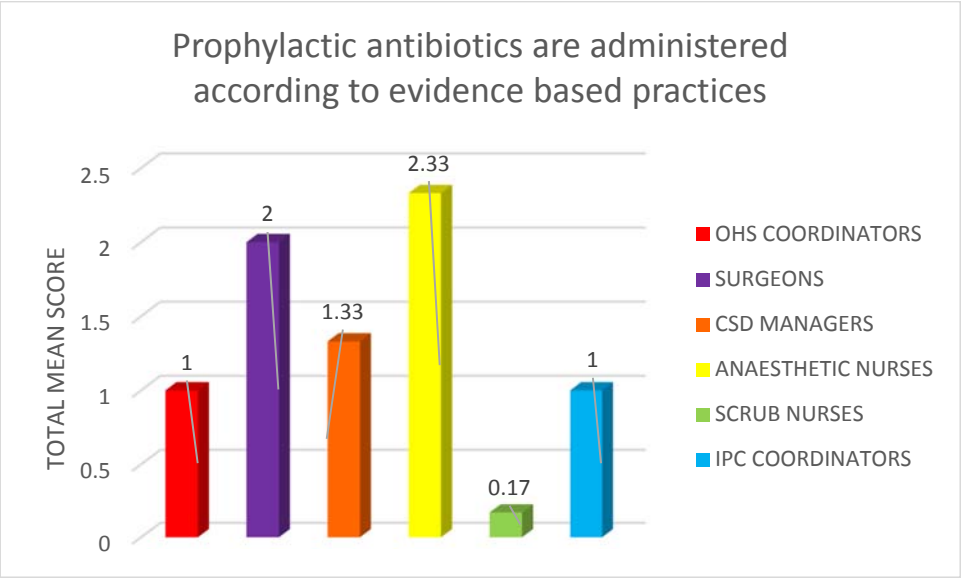


Figure 5.4 Comparison of mean scores per stakeholder group: Statement – Prophylactic antibiotics are administered according to evidence based practices

The anaesthetic nurses scored the highest at 2.33, followed by the surgeons at 2, and the scrub nurses scored the lowest with 0.17. Both the OHS Coordinators and the IPC Coordinators scored equal at 1. The mean score for this statement is 1.14.

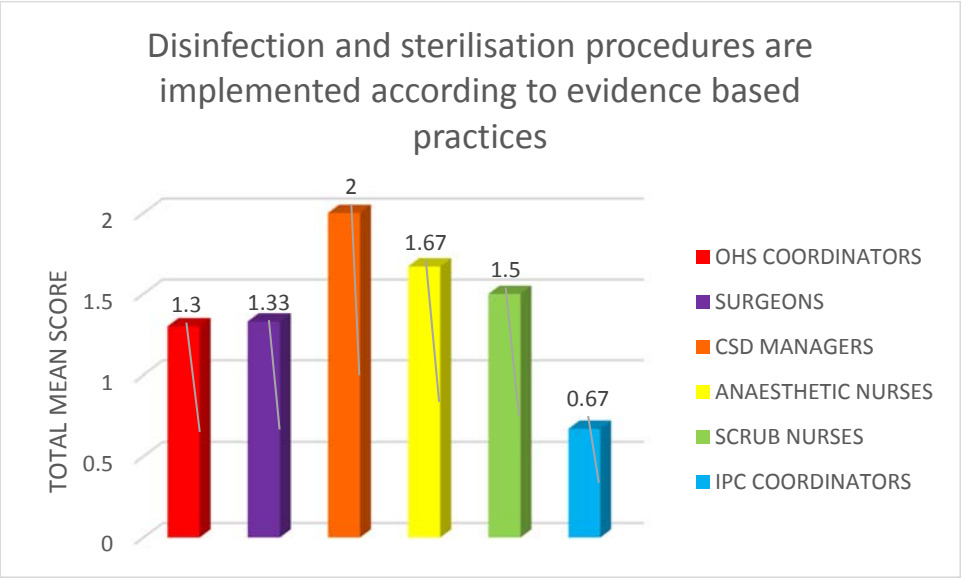


Figure 5.5 Comparison of mean scores per stakeholder group: Statement – Disinfection and sterilisation procedures are implemented according to evidence based practices

The CSD Managers scored the highest at 2, followed by the anaesthetic nurses at 1.67, higher than the scrub nurses at 1.5. Both the surgeons and the OHS Coordinators scored the same. The mean score of this statement is 1.43.

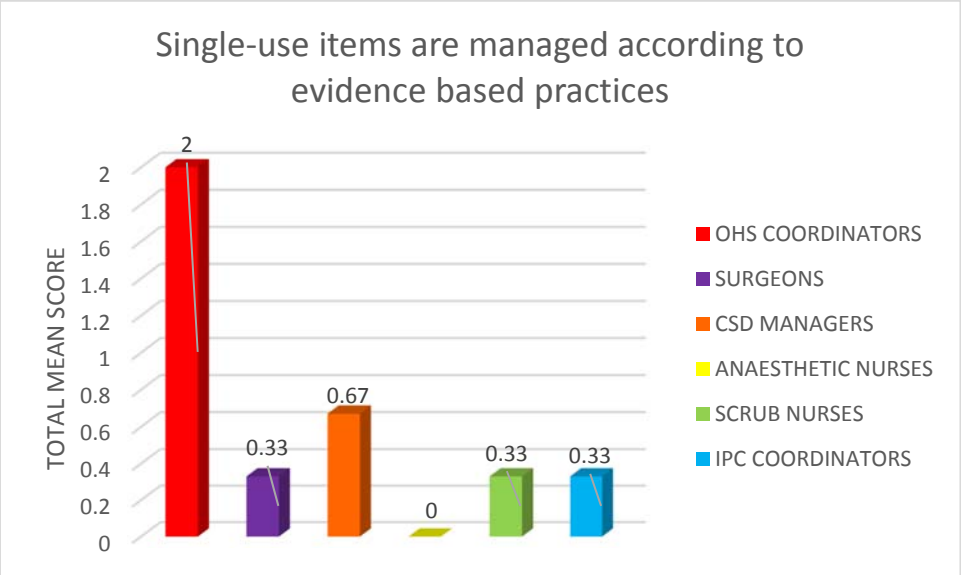


Figure 5.6 Comparison of mean scores per stakeholder group: Statement – Single-use items are managed according to evidence based practices

The OHS Coordinators scored the highest at 2. There is a big difference between the second highest score of 0.67 of the CSD managers with the surgeons, scrub nurses and IPC Coordinators at equal scores of 0.33. The mean score is 0.57.

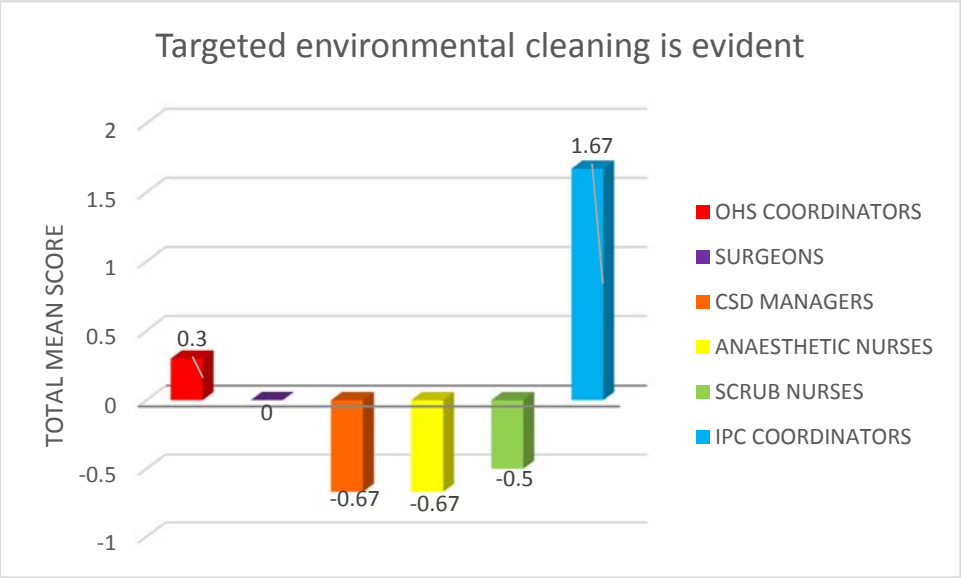


Figure 5.7 Comparison of mean scores per stakeholder group: Statement - Targeted environmental cleaning is evident

The IPC coordinators scored the highest at 1.67. The difference between the highest and second highest score of 0.3 by the OHS Coordinators is noticeable. Similar scores of -0.67 are evident by the CSD Managers and Anaesthetic nurses. The scrub nurses scored the second lowest at -0.5. The mean score is -0.05.

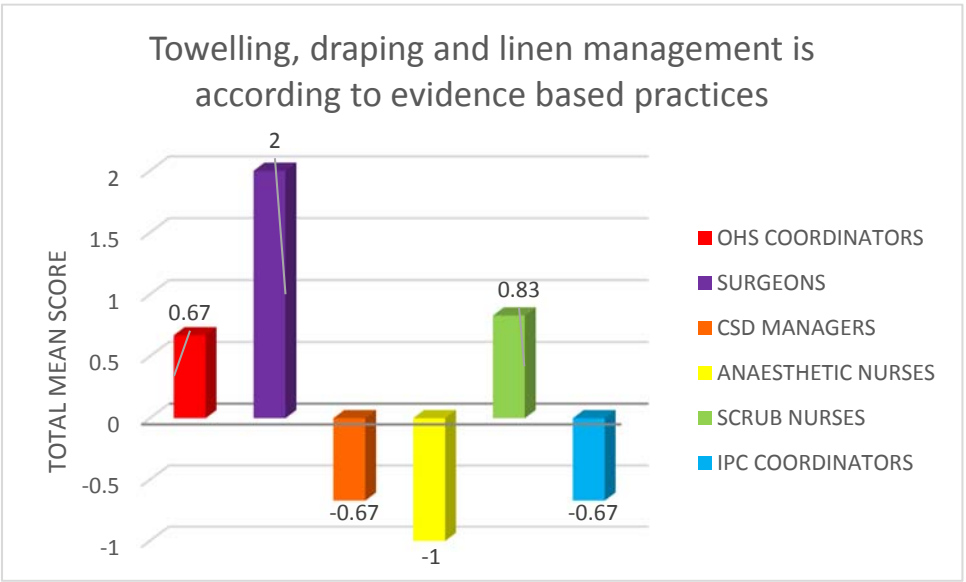


Figure 5.8 Comparison of mean scores per stakeholder group: Statement – Towelling, draping and linen management is according to evidence based practices

The surgeons scored the highest at 2 and the scrub nurses scored second highest at 0.83. The difference between the two scores is significant. The OHS Coordinators scored at 0.67 as third highest score. The mean score for this statement is 0.29.

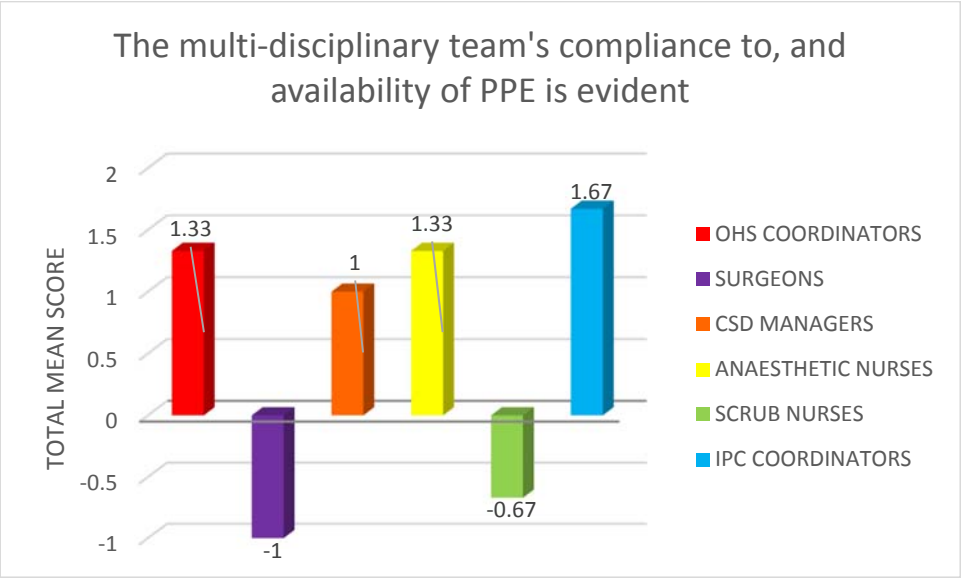


Figure 5.9 Comparison of mean scores per stakeholder group: Statement – The multi-disciplinary team's compliance to, and availability of PPE is evident

The IPC Coordinators scores the highest at 1.67, followed by both the OHS Coordinators and Anaesthetic nurses at 1.33. The low scores of both the surgeons at -1 and the scrub nurses at -0.67 are evident. The mean score for this statement is 0.43.

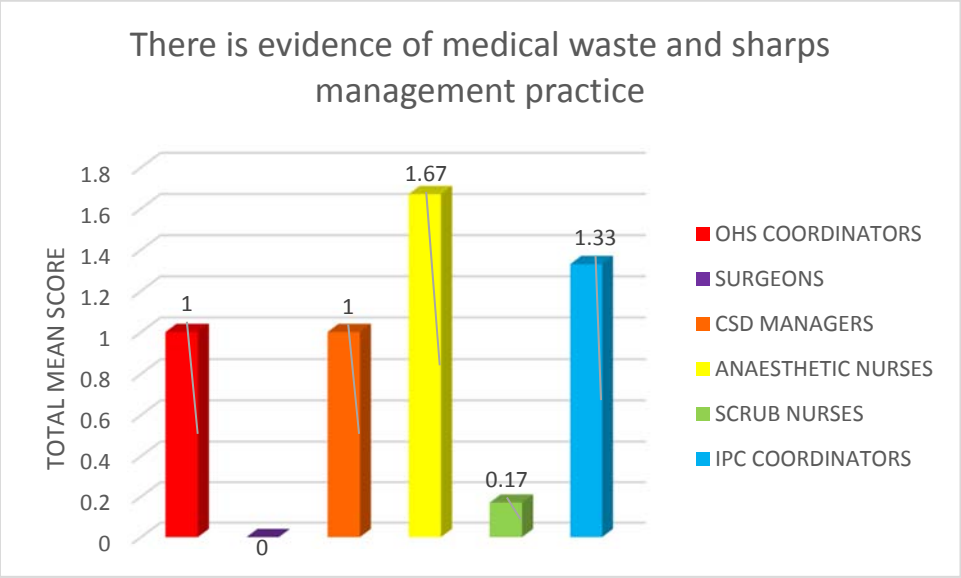


Figure 5.10 Comparison of mean scores per stakeholder group: Statement – There is evidence of medical waste and sharps management practice

The anaesthetic nurses scored the highest at 1.67 followed by the IPC Coordinators at 1.33. The OHS Coordinators and CSD Managers scored equal at 1. The low score of both the scrub nurses (0.17) and the surgeons (0) is significant. The mean score is 0.76.

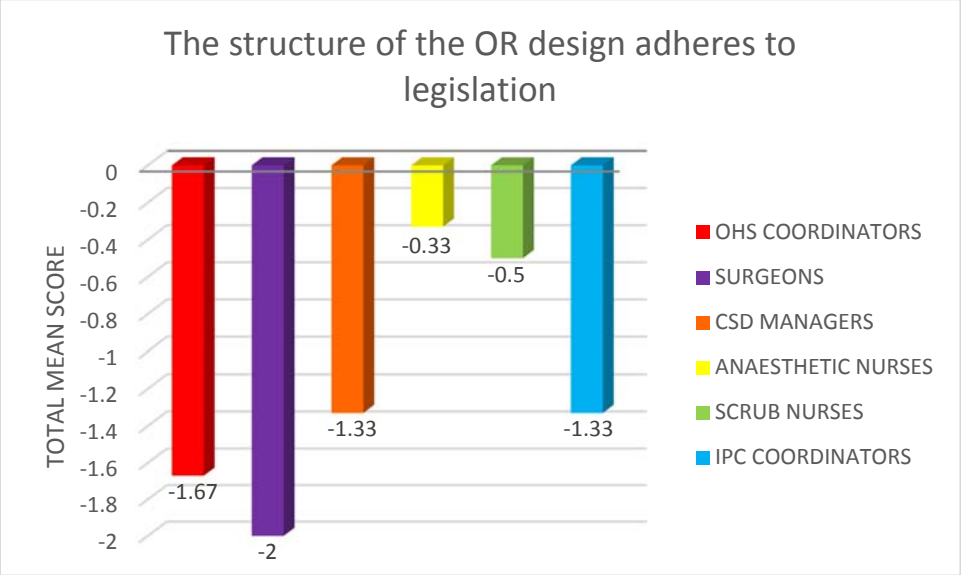


Figure 5.11 Comparison of mean scores per stakeholder group: Statement – The structure of the OR design adheres to legislation

All the stakeholders scored this statement low and negatively with the surgeons (-2) as the lowest score. The second lowest score is of the OHS Coordinators (-1.67). The scrub nurses scored at -0.5 lower than the anaesthetic nurses at -0.33. The mean score is -1.10.

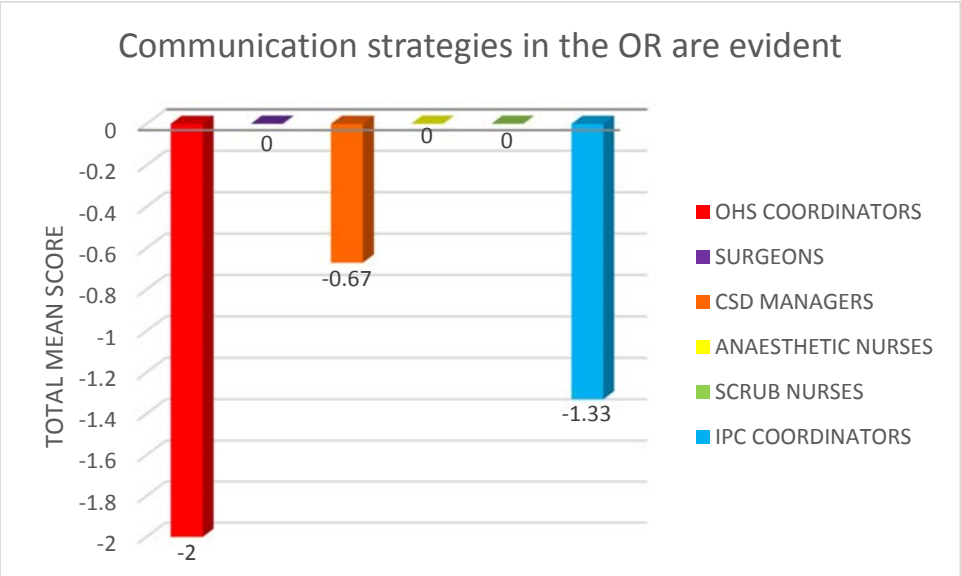


Figure 5.12 Comparison of mean scores per stakeholder group: Statement – Communication strategies in the OR are evident

The OHS Coordinators scored the lowest at -2 followed by the IPC Coordinators at -1.33, and the CSD Managers score -0.67. The surgeons, anaesthetic nurses and scrub nurses scored neutral. The mean score is -0.57.

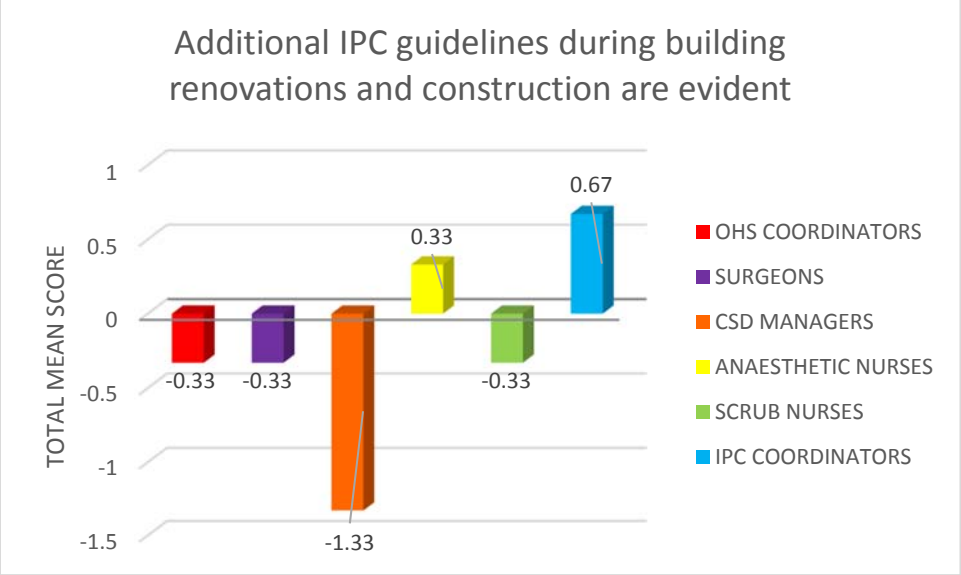


Figure 5.13 Comparison of mean scores per stakeholder group: Statement – Additional IPC guidelines during building renovations and construction are evident

All the stakeholders scored this statement negatively except the anaesthetic nurses (0.33) and the IPC Coordinators (0.67). The surgeons and scrub nurses scored the same at -0.33. The CSD Managers scored the lowest at -1.33. The low score of -0.33 of the OHS Coordinators is surprising. The mean score is -0.24.

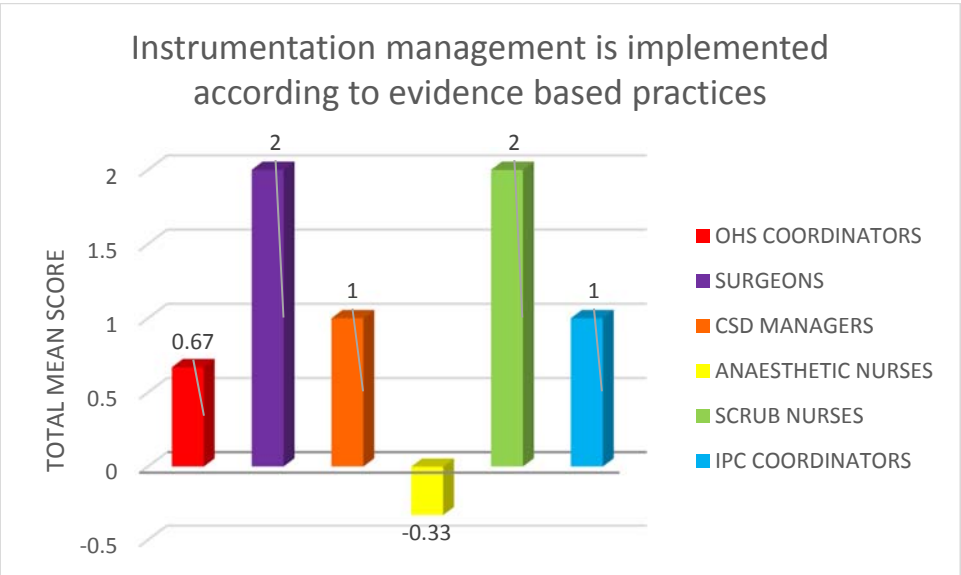


Figure 5.14 Comparison of mean scores per stakeholder group: Statement – Instrumentation management is implemented according to evidence based practices

The surgeons and scrub nurses scored the highest at 2 followed by the CSD Managers and IPC Coordinators at 1. The anaesthetic nurses scored the lowest at -0.33. The mean score for this statement is 1.19.

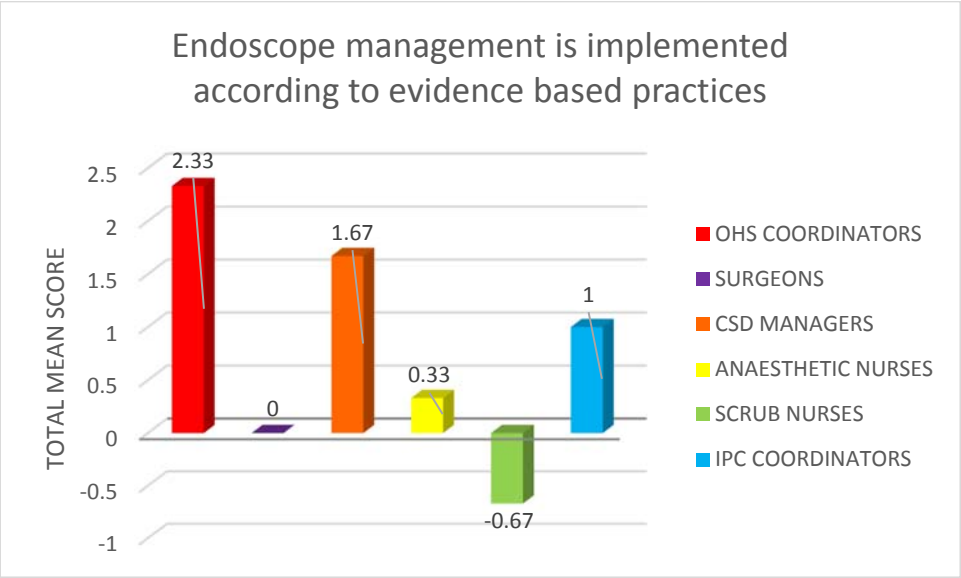


Figure 5.15 Comparison of mean scores per stakeholder group: Statement – Endoscope management is implemented according to evidence based practices

The OHS Coordinators scored the highest at 2.33 followed by the CSD Managers at 1.67. The scores of the surgeons (0) and scrub nurses (-0.67) are noted. The mean score is 0.57.

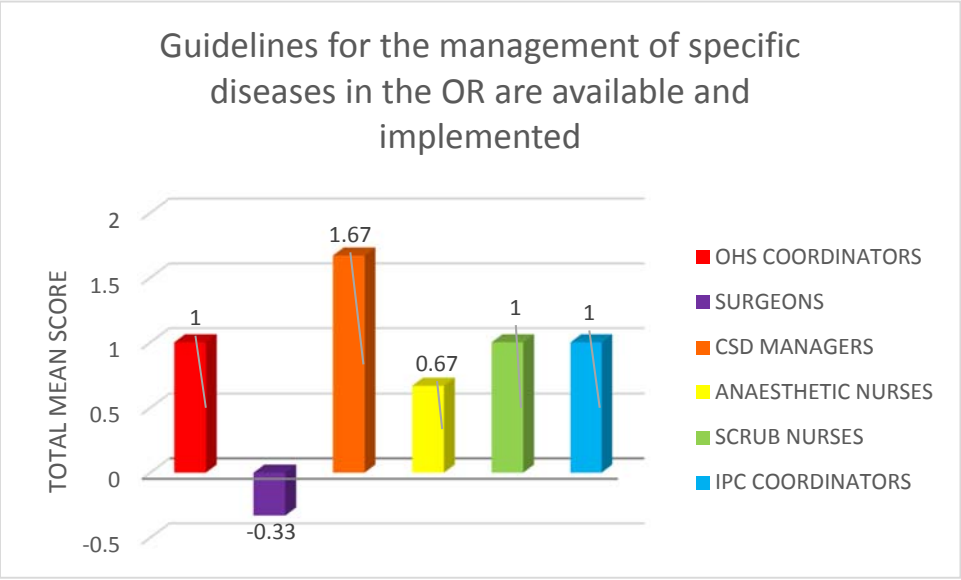


Figure 5.16 Comparison of mean scores per stakeholder group: Statement – Guidelines for the management of specific diseases in the OR are available and implemented

All the stakeholders scored positively except the surgeons -0.33. The CSD Managers score of 1.67 is noticeable compared to the score of the scrub nurses at 1. The OHS

Coordinators, scrub nurses and IPC Coordinators scored equal at 1. The mean score for this statement is 0.86.

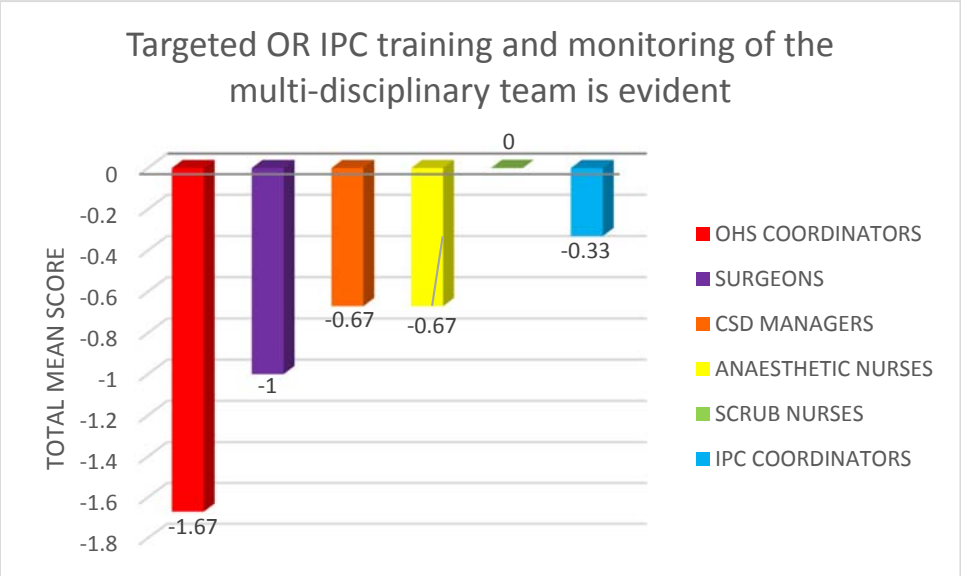


Figure 5.17 Comparison of mean scores per stakeholder group: Statement – Targeted OR training and monitoring of the multi-disciplinary team is evident

All the stakeholders scored this element negatively, with the OHS Coordinators -1.67 and surgeons -1 at the lowest. Interesting is the negative score -0.33 of the IPC Coordinators. Both the CSD Managers and the Anaesthetic nurses scored -0.67. The mean score is -0.62.

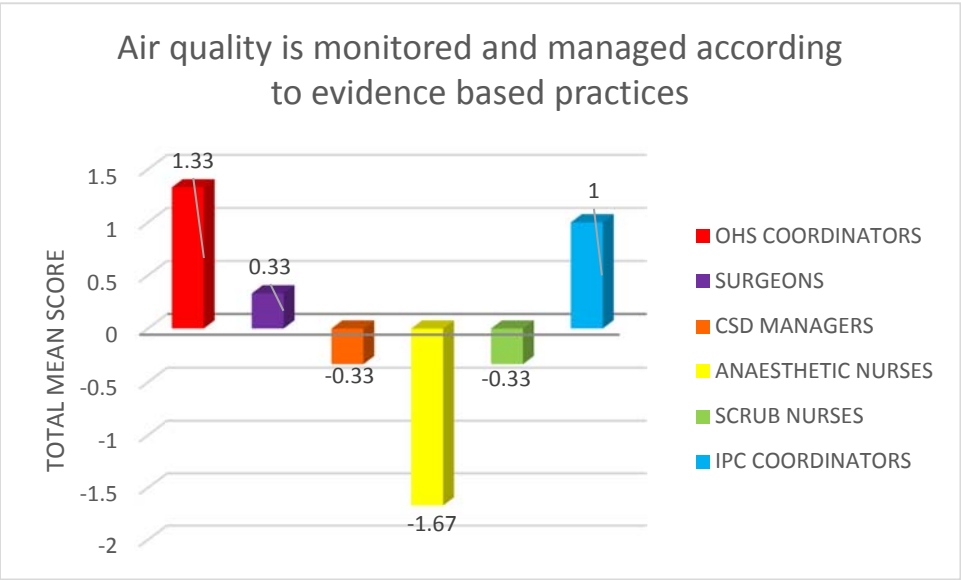


Figure 5.18 Comparison of mean scores per stakeholder group: Statement – Air quality is monitored and managed according to evidence based practices

The OHS Coordinators scored the highest at 1.33 followed by the IPC Coordinators at 1. The negative scores of the CSD Managers and scrub nurses is equal at -0.33. The lowest score of the anaesthetic nurses at -1.67. The mean score for this statement is 0.

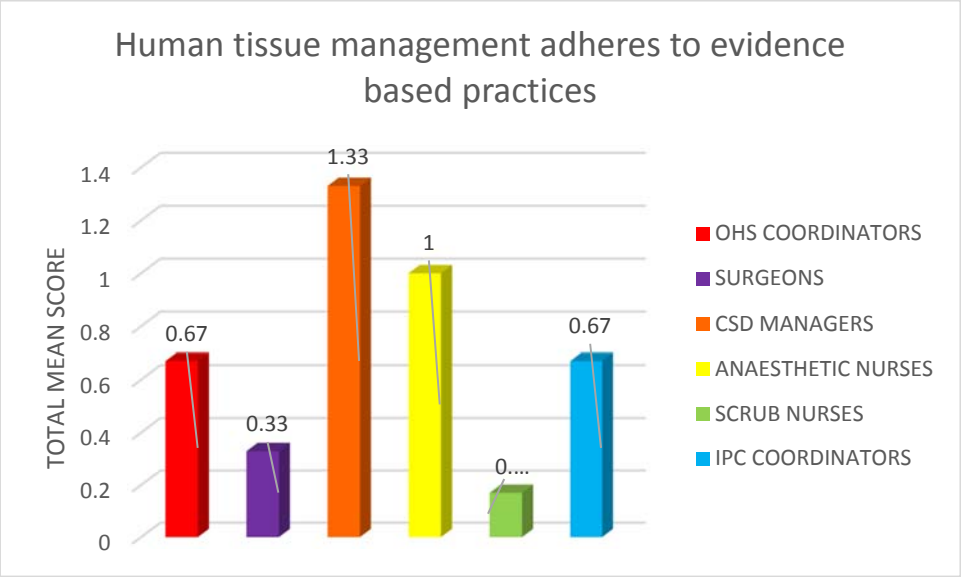


Figure 5.19 Comparison of mean scores per stakeholder group: Statement – Human tissue management adheres to evidence based practices

All the stakeholders scored positively with the CSD Managers the highest at 1.33 followed by the anaesthetic nurses at 1. The surgeons and scrub nurses scored the lowest at 0.33 and 0.17. The mean score is 0.62.

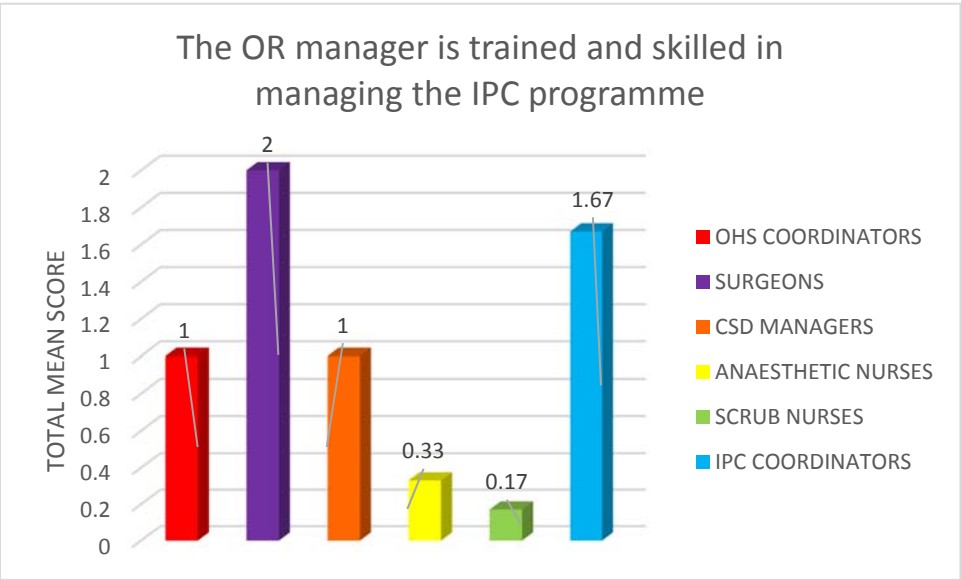


Figure 5.20 Comparison of mean scores per stakeholder group: Statement – The OR manager is trained and skilled in managing the IPC programme

All stakeholders scored positively with the surgeons the highest at 2, followed by the IPC Coordinators, the OHS Coordinators and CSD Managers scored equal at 1. The scrub nurses scored the lowest at 0.17. The mean score is 0.90.

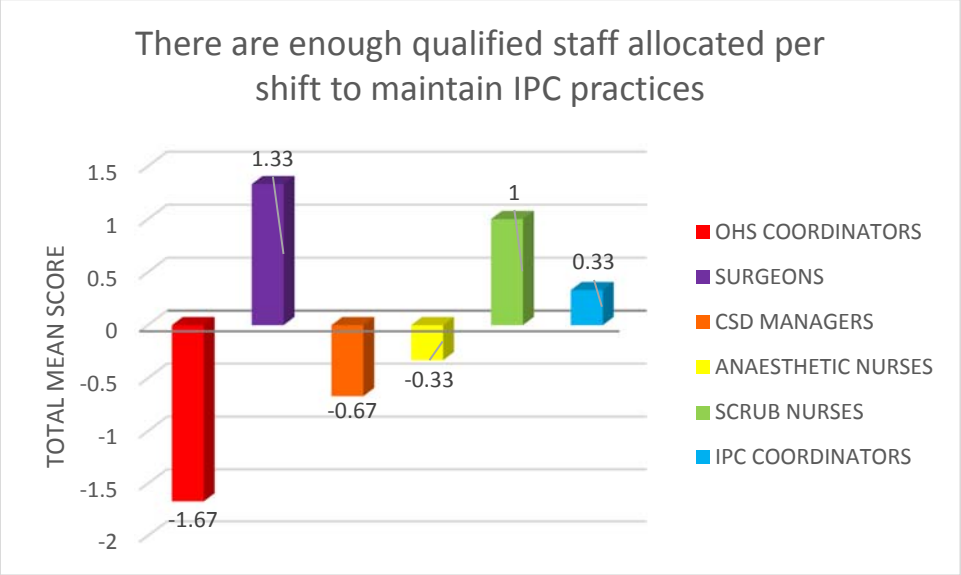


Figure 5.21 Comparison of mean scores per stakeholder group: Statement – There are enough qualified staff allocated per shift to maintain IPC practices

An equal distribution of positive and negative scores are evident. The surgeons and scrub nurses scored the highest at 1.33 and 1, followed by the IPC Coordinators at 0.33. The OHS Coordinators scored the lowest at -1.67 followed by the CSD Managers and anaesthetic nurses at -0.67 and -0.33. The mean score is 0.14.

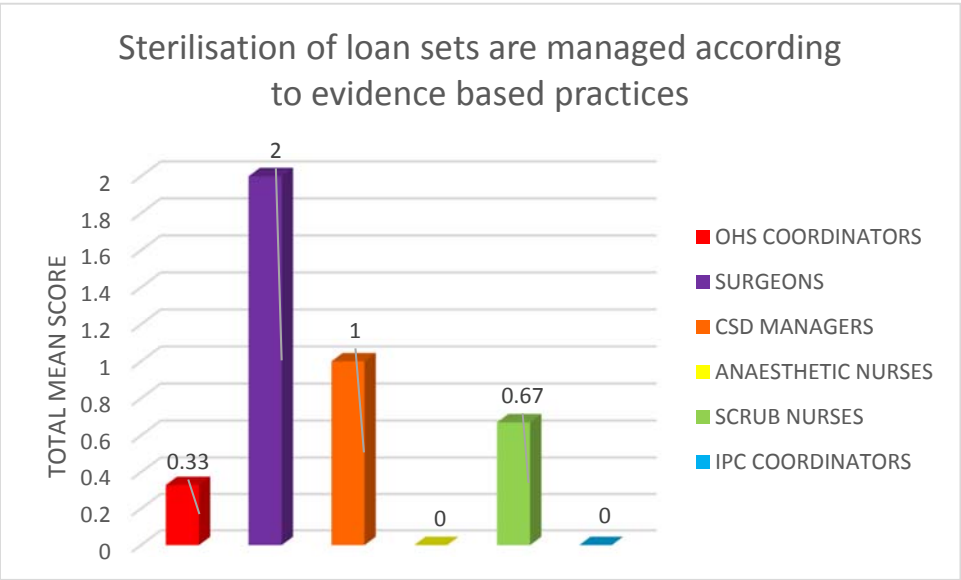


Figure 5.22 Comparison of mean scores per stakeholder group: Statement – Sterilisation of loan sets are managed according to evidence based practices

Four out of seven stakeholders scored positively with the surgeons the highest at 2 followed by the CSD Managers at 1. Both the anaesthetic nurses and the IPC Coordinators scored 0. The mean score is 0.67.

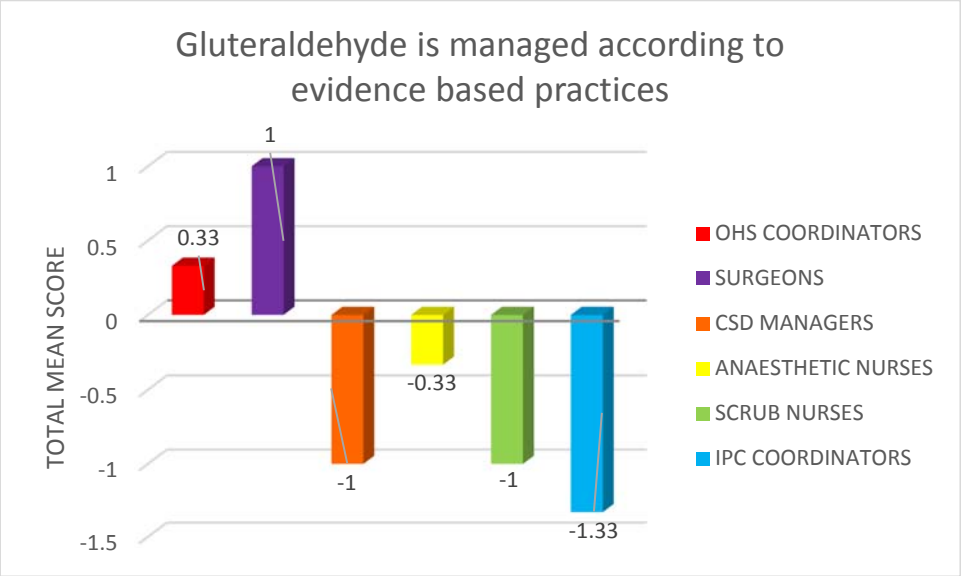


Figure 5.23 Comparison of mean scores per stakeholder group: Statement – Gluteraldehyde is managed according to evidence based practices

Four out of six stakeholder groups scored negatively. Only the OHS Coordinators and surgeons scored positive with the surgeons score being the highest at 1. The mean score is -0.48.

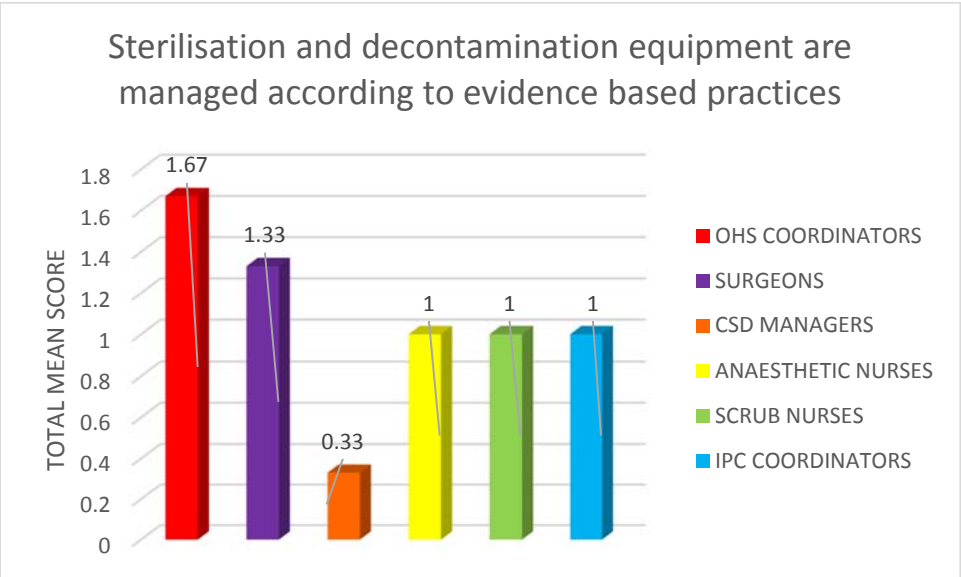


Figure 5.24 Comparison of mean scores per stakeholder group: Statement – Sterilisation and decontamination equipment are managed according to evidence based practices

All the stakeholders scored positively. The lowest score of 0.33 of the CSD Managers is noticeable. The anaesthetic nurses, scrub nurses and IPC Coordinators scored equal at 1. The mean score for this statement is 1.05.

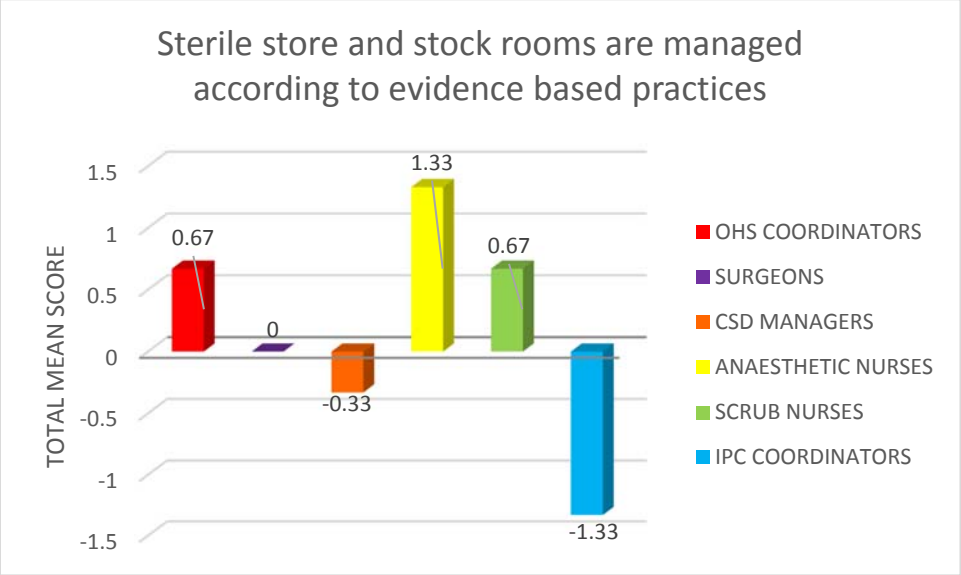


Figure 5.25 Comparison of mean scores per stakeholder group: Statement – Sterile store and stock rooms are managed according to evidence based practices

The anaesthetic nurses scored the highest at 1.33 followed by both the OHS Coordinators and scrub nurses at 0.67. The CSD Managers scored negatively at -0.33. The IPC Coordinators score the lowest at -1.33. The mean score is 0.24.

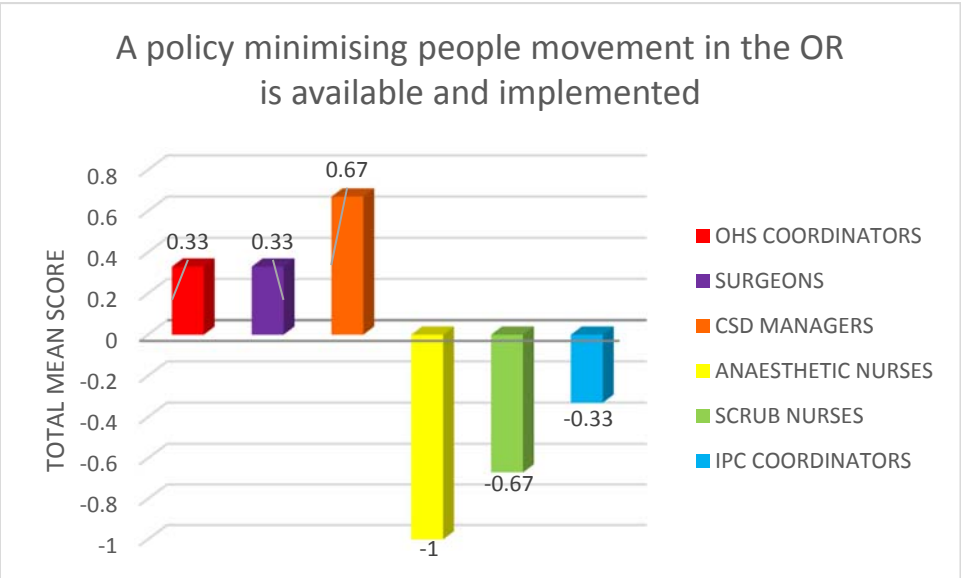


Figure 5.26 Comparison of mean scores per stakeholder group: Statement – A policy minimising people movement in the OR is available and implemented

An equal distribution of positive and negative scores are noted. The surgeons and the OHS Coordinators scored positively at 0.33, with the lowest score of the anaesthetic nurses at -1. The CSD Coordinators scored the highest at 0.67. The mean score is -0.19.

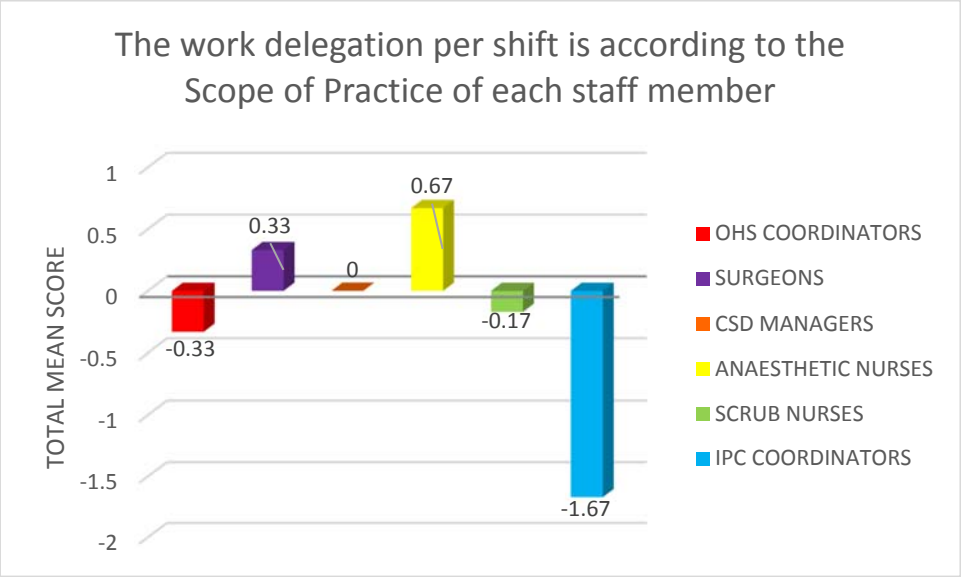


Figure 5.27 Comparison of mean scores per stakeholder group: Statement – The work delegation per shift is according to the Scope of Practice of each staff member

The anaesthetic nurses scored the highest at 0.67, followed by the surgeons at 0.33. The OHS Coordinators, scrub nurses scored negatively at -0.33 and -0.17. The IPC Coordinators scored the lowest at -1.67. The mean score is -0.19.

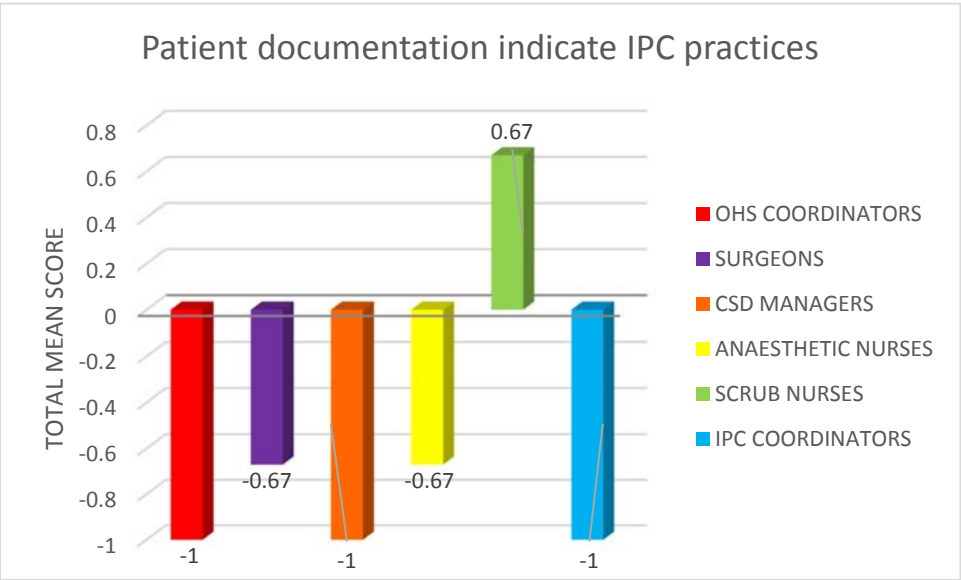


Figure 5.28 Comparison of mean scores per stakeholder group: Statement – Patient documentation indicate IPC practices

All the stakeholders scored negatively except the scrub nurses at 0.67. The lowest scores are of the OHS Coordinators and CSD Managers. The surgeons and anaesthetic nurses' score is equal at -0.67. The mean score is -0.43.

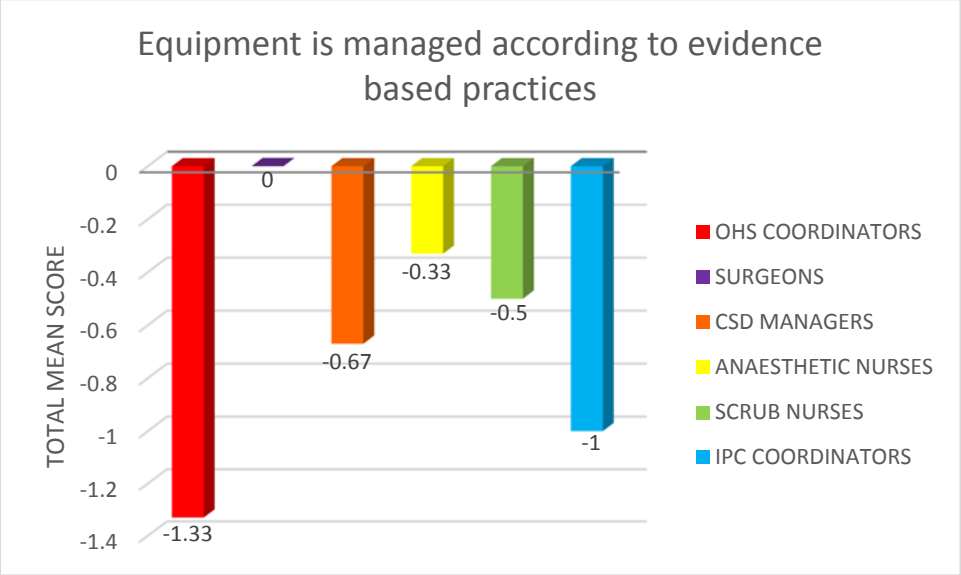


Figure 5.29 Comparison of mean scores per stakeholder group: Statement – Equipment is managed according to evidence based practices

All participants scored negatively with the OHS Coordinators the lowest at -1.33, followed by the IPC Coordinators at -1. The surgeons scored the highest at 0, with the anaesthetic nurses at -0.33. The mean score is -0.62.

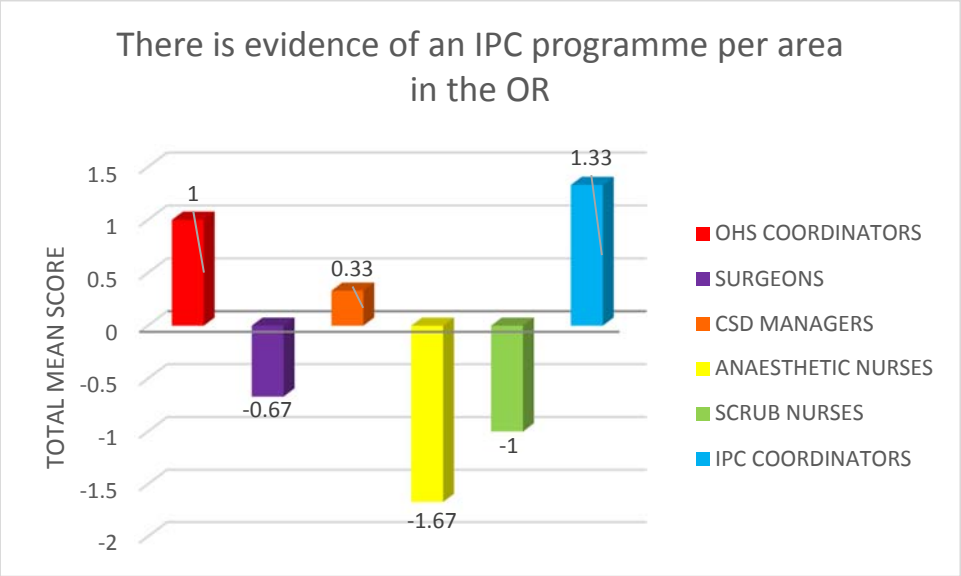


Figure 5.30 Comparison of mean scores per stakeholder group: Statement – There is evidence of an IPC programme per area in the OR

Three out of six stakeholder groups scored positively with the anaesthetic nurses the lowest at -1.67 followed by the scrub nurses at -1. The IPC Coordinators scored the highest at 1.33. The mean score is -0.24.

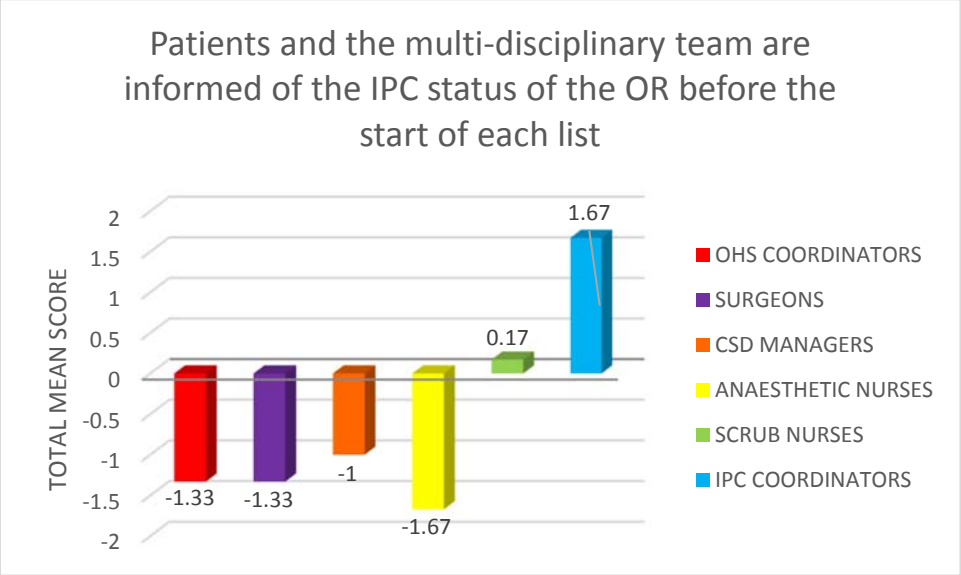


Figure 5.31 Comparison of mean scores per stakeholder group: Statement – Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list

All the participants except the scrub nurses and IPC Coordinators scored negatively. The IPC Coordinators scored the highest at 1.67. The anaesthetic nurses scored the lowest at -1.67 followed by both the OHS Coordinators and surgeons at -1.33. The mean score is -0.48.

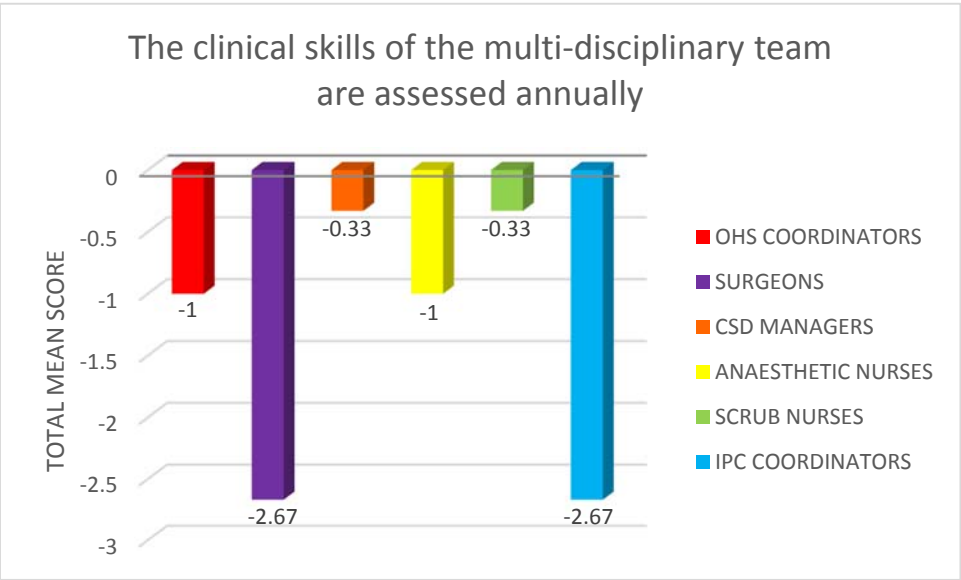


Figure 5.32 Comparison of mean scores per stakeholder group: Statement – The clinical skills of the multi-disciplinary team are assessed annually

All the participants scored negatively with the surgeons and IPC Coordinators the lowest at -2.67. Both the CSD Managers and the scrub nurses scored the highest at -0.33. The OHS Coordinators and the anaesthetic nurses scored -1.The mean score for this statement is -1.19 and is the lowest of all 43 statements.

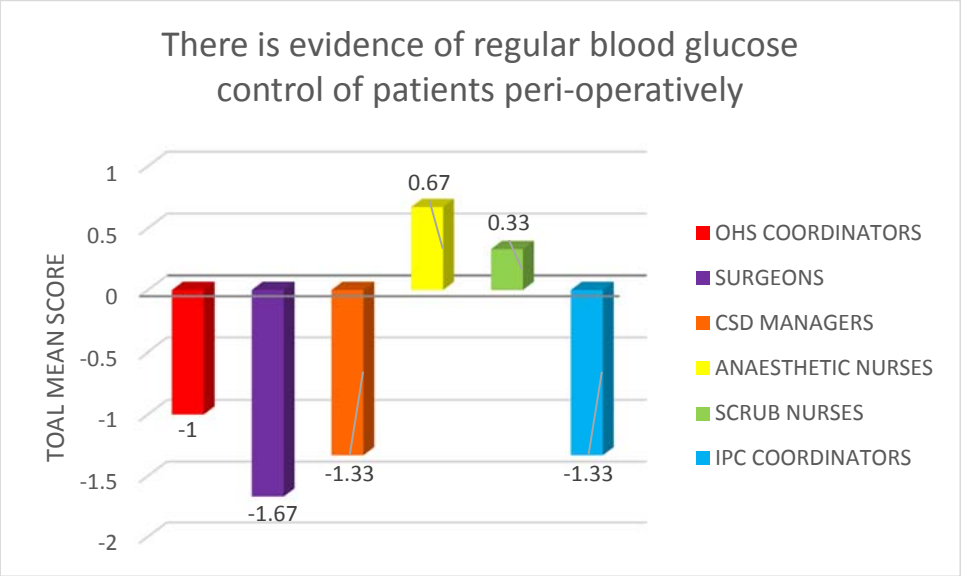


Figure 5.33 Comparison of mean scores per stakeholder group: Statement – There is evidence of regular blood glucose control of patients peri-operatively

Four of the six stakeholder groups scored negatively with the surgeons at -1.67 at the lowest. The anaesthetic nurses scored the highest at 0.67, with the scrub nurses at 0.33. Both the CSD Managers and IPC Coordinators scored -1.33. The mean score is -0.57.

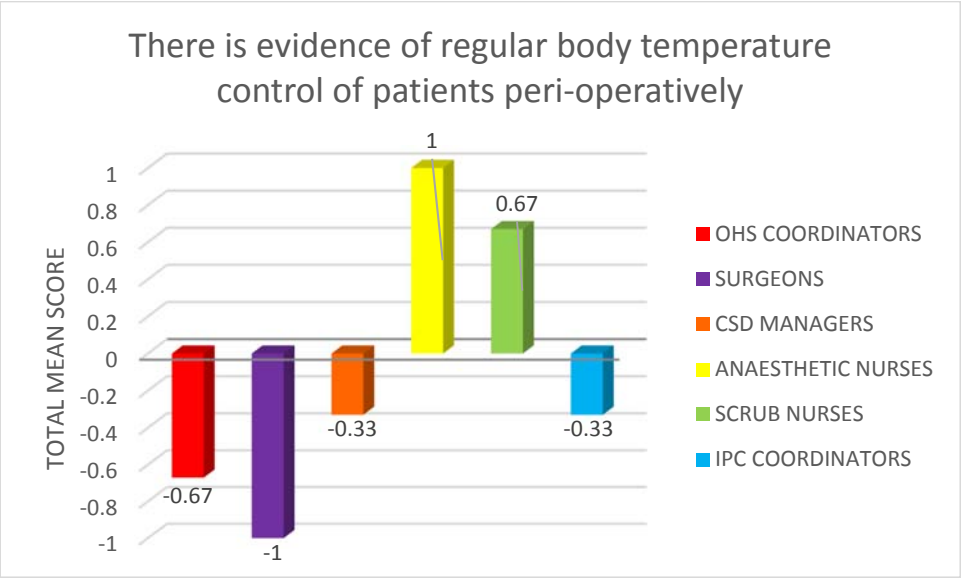


Figure 5.34 Comparison of mean scores per stakeholder group: Statement – There is evidence of regular body temperature control of patients peri-operatively

The anaesthetic nurses scored the highest at 1 followed by the scrub nurses at 0.67. All the other stakeholders scored negatively with the surgeons the lowest at -1. Both the CSD Managers and IPC Coordinators scored -0.33. The OHS Coordinators scored -0.67. The mean score is 0.

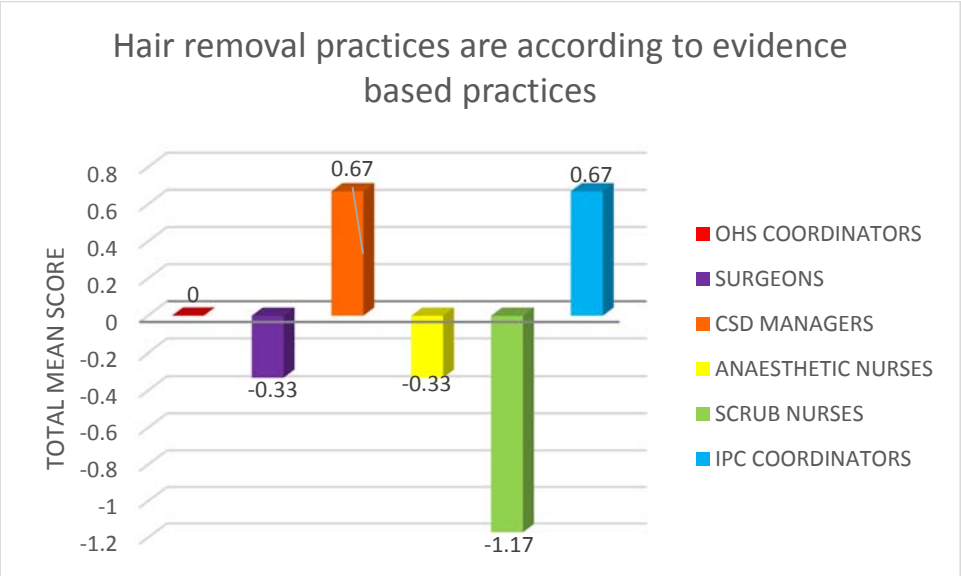


Figure 5.35 Comparison of mean score per stakeholder group: Statement – Hair removal practices are according to evidence based practices

The CSD Managers and IPC Coordinators scored the highest at 0.67, with the scrub nurses the lowest at -1.17. Both the surgeons and anaesthetic nurses scored -0.33.The mean score is -0.24.

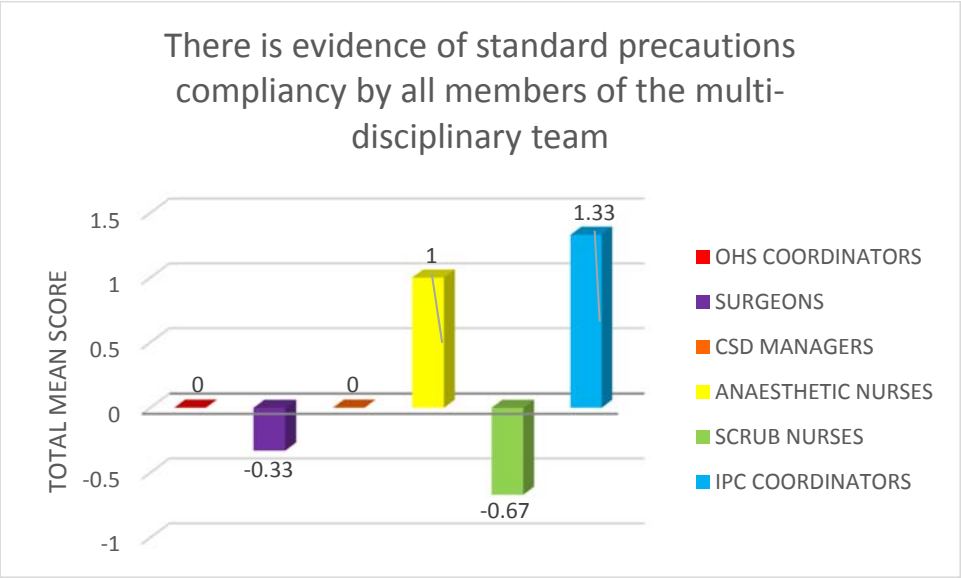


Figure 5.36 Comparison of mean score per stakeholder group: Statement – There is evidence of standard precautions compliancy by all members of the multi-disciplinary team

The anaesthetic nurses and IPC Coordinators scored the highest at 1 and 1.33. The negative scores of the surgeons and scrub nurses is evident as well as the 0 scores of the OHS Coordinators and CSD Managers. The mean score is 0.10.

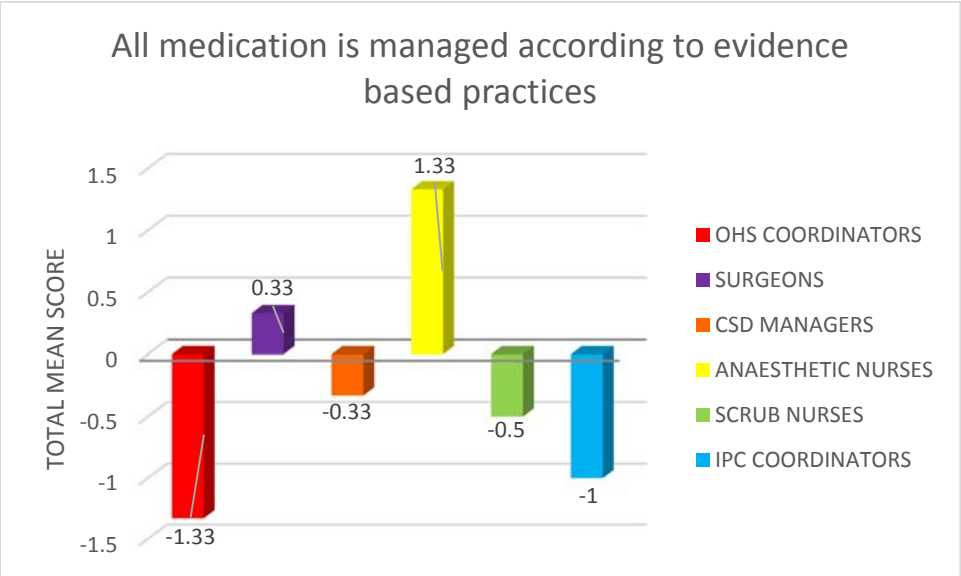


Figure 5.37 Comparison of mean scores per stakeholder group: Statement- All medication is managed according to evidence based practices

The anaesthetic nurses scored the highest at 1.33 followed by the surgeons at 0.33. The CSD Managers, scrub nurses, IPC Coordinators as well as the OHS

Coordinators scored negatively. The OHS Coordinators sccored the lowest at -1.33. The mean score for this statement is -0.29.

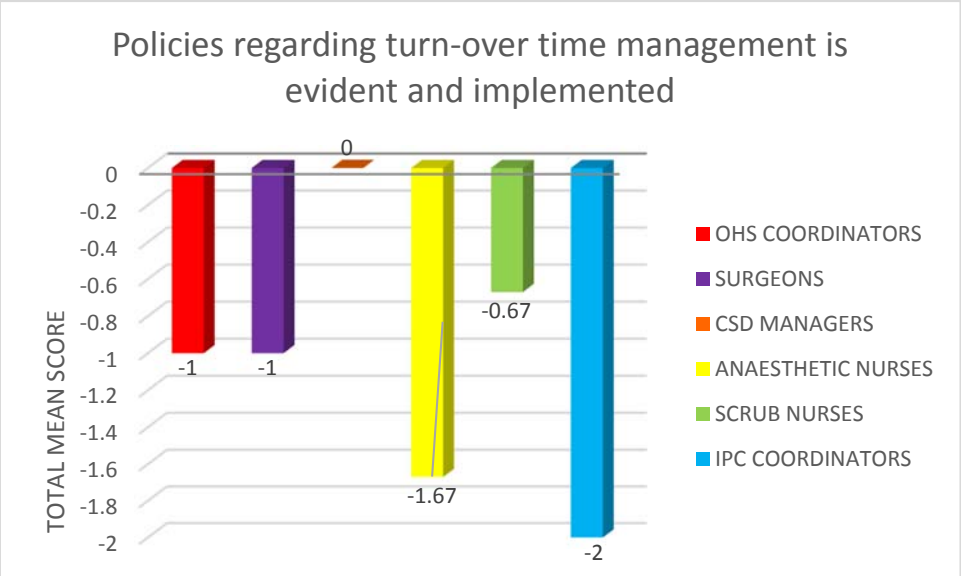


Figure 5.38 Comparison of mean scores per stakeholder group: Statement – Policies regarding turn-over time management is evident and implemented

All the stakeholders scored this statement negatively. The lowest score of the IPC Coordinators (-2) is noticeable, followed by the anaesthetic nurses at -1.67. Both the OHS Coordinators and the surgeons scored equal at -1. The mean score is -1.

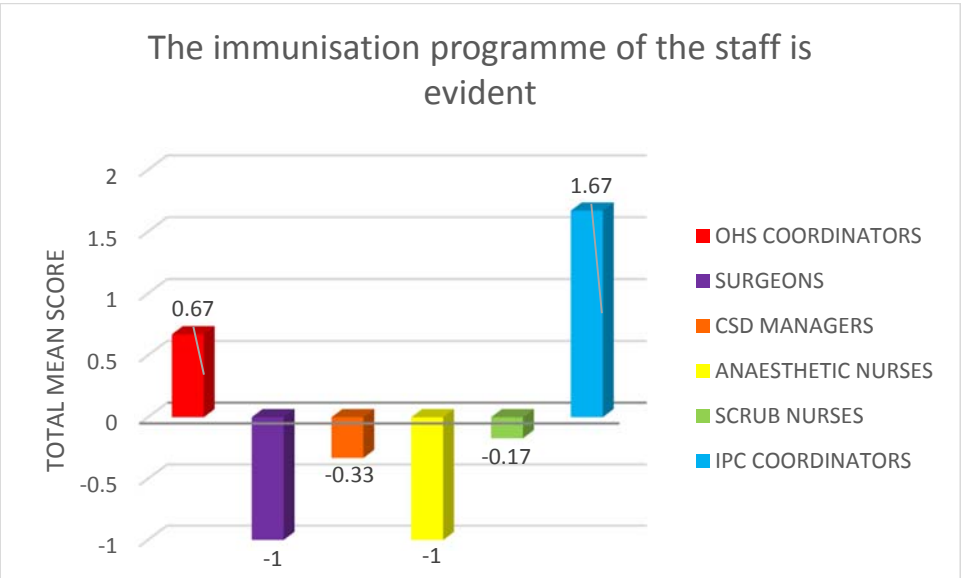


Figure 5.39 Comparison of mean scores per stakeholder group: Statement – The immunisation programme of the staff is evident

The IPC Coordinators scored the highest at 1.67 followed by the OHS Coordinators at 0.67. All the other participants scored negatively with the surgeons and anaesthetic nurses the lowest at -1. The mean score is -0.05.

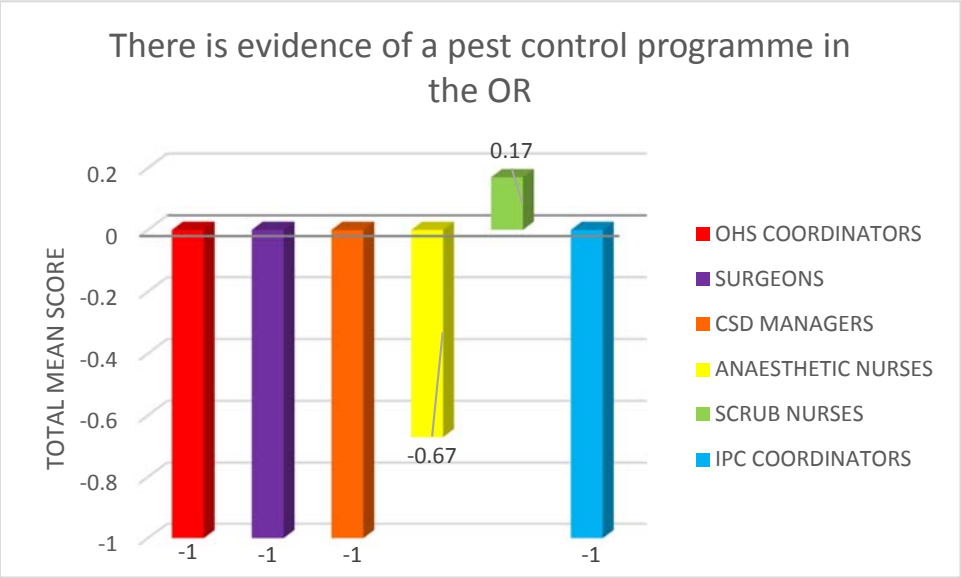


Figure 5.40 Comparison of mean scores per stakeholder group: Statement – There is evidence of a pest control programme in the OR

All the participants, except the scrub nurses, sored negatively. The OHS Coordinators, surgeons, CSD Managers and IPC Coordinators all scored -1. The anaesthetic nurses scored -0.67. The mean score is -0.62.

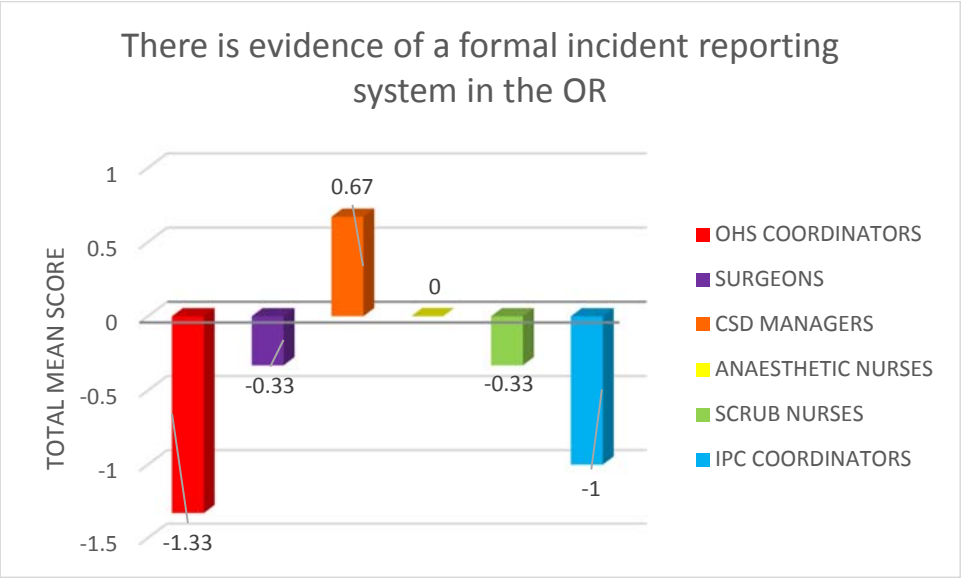


Figure 5.41 Comparison of mean scores per stakeholder group: Statement – There is evidence of a formal incident reporting system in the OR

All the participants except the CSD Managers scored negatively, with the OHS Coordinators the lowest at -1.33, followed by the IPC Coordinators at -1. The surgeons and scrub nurses scored -0.33. The mean score is -0.38.

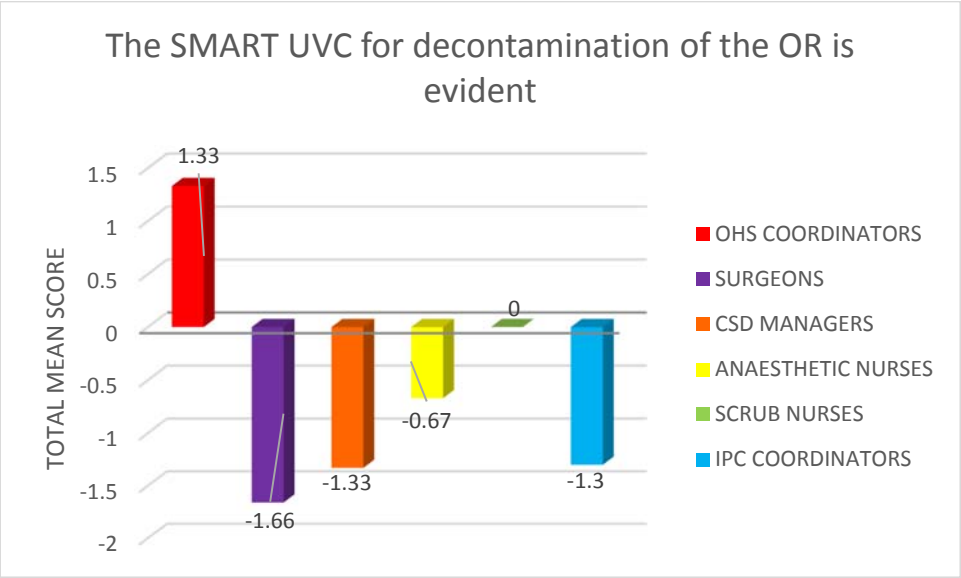


Figure 5.42 Comparison of mean scores per stakeholder group: Statement – The SMART UVC for decontamination of the OR is evident

All participants scored negatively except the OHS Coordinators at 1.33 with the lowest score of the surgeons at -1.66 and CSD Managers at -1.33. The mean score is -0.52.

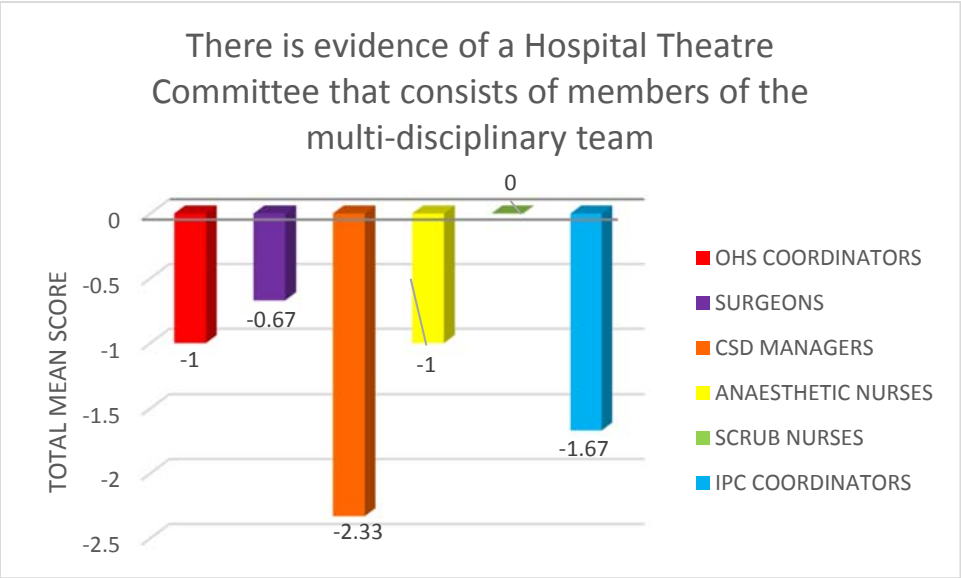


Figure 5.43 Comparison of mean scores per stakeholder group: Statement – There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team

All the participants scored negatively with the CSD Managers the lowest at -2.33. The scrub nurses scored the highest at 0. The OHS Coordinators and anaesthetic nurses scored -1. The mean score is -0.95.

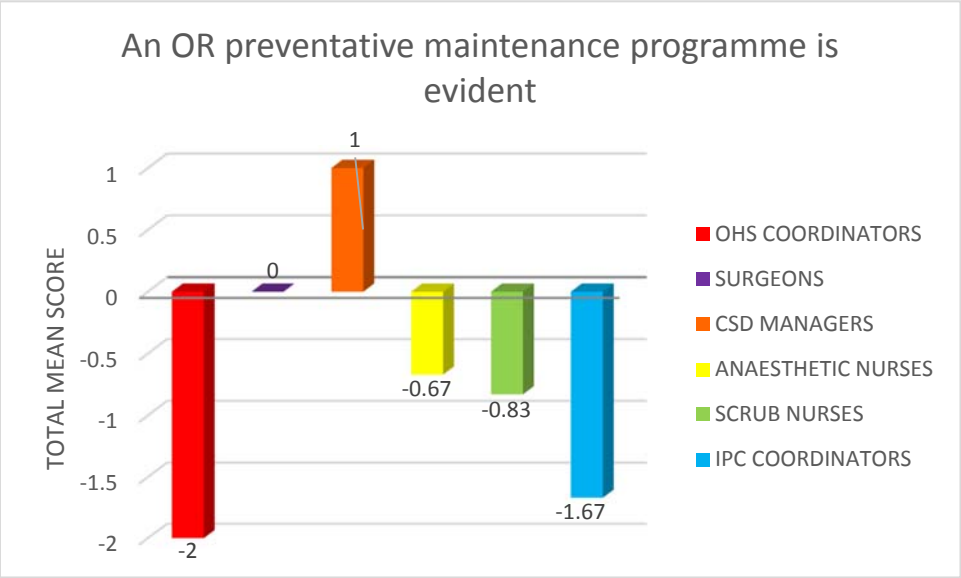


Figure 5.44 Comparison of mean scores per stakeholder group: Statement – An OR preventative maintenance programme is evident

All the participants scored negatively except the CSD Managers at 1 with the OHS Coordinators at -2 as the lowest score. The mean score is -0.71.

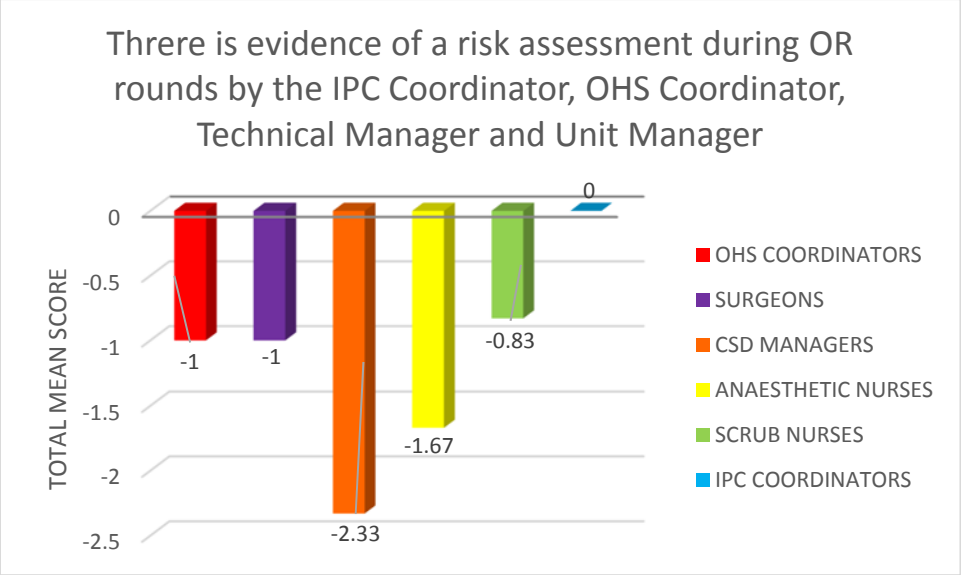


Figure 5.45 Comparison of mean scores per stakeholder group: Statement – There is evidence of a risk assessment during OR rounds by the IPC Coordinator, OHS Coordinator, Technical Manager and Unit Manager

All the participants scored negatively with the IPC Coordinators the highest at 0. The CSD Managers scored the lowest at -2.33. The OHS Coordinators and surgeons scored -1.The mean score is -1.14.

5.11 Discussion of Findings

Table 5.4 – 5.9 indicates the mean scores of statements from the highest to the lowest score to illustrate what the different groups regard as the most important statements to be included in an infection prevention quality audit tool. Findings and discussions are included after every table.

Table 5.4 Mean score values of the statements ranked by the OHS Coordinators from highest to lowest score

Statement	Mean score
Endoscope management is implemented according to evidence based management	2.33
Single-use items are managed according to evidence based practices	2
Hand hygiene practices are evident	1.67
Sterilisation and decontamination equipment are managed according to evidence based practices	1.67
The multi-disciplinary team's compliance to, and availability of PPE is evident	1.33
Air quality is monitored and managed according to evidence based practices	1.33
The SMART UVC for decontamination of the OR is evident	1.33
Disinfection and sterilisation procedures are implemented according to evidence based practices	1.3
Prophylactic antibiotics are administered according to evidence based practices	1
There is evidence of medical waste and sharps management practice	1
Guidelines for the management of specific diseases in the OR are available and implemented	1
The OR manager is trained and skilled in managing the IPC programme	1
There is evidence of an IPC programme per area in the OR	1
Towelling, draping and linen management is according to evidence based practices	0.67
Instrumentation management is implemented according to evidence based practices	0.67
Human tissue management adheres to evidence based practices	0.67
Sterile store and stock rooms are managed according to evidence based practices	0.67
The immunisation programme of the staff is evident	0.67
Sterilisation of loan sets are managed according to evidence based practices	0.33
Gluteraldehyde is managed according to evidence based practices	0.33

Statement	Mean Score
A policy minimising people movement in the OR is available and implemented	0.33
Targeted environmental cleaning is evident	0.3
Hair removal practices are according to evidence based practices	0
There is evidence of standard precautions compliancy by all members of the multi-disciplinary team	0
Additional IPC guidelines during building renovations and construction are evident	-0.33
The work delegation per shift is according to the Scope of Practice of each staff member	-0.33
There is evidence of regular body temperature control of patients peri-operatively	-0.67
Patient documentation indicate IPC practices	-1
The clinical skills of the multi-disciplinary team are assessed annually	-1
There is evidence of regular blood glucose control of patients peri-operatively	-1
Policies regarding turn-over time management is evident and implemented	-1
There is evidence of a pest control programme in the OR	-1
There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team	-1
There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-1
Equipment is managed according to evidence based practices	-1.33
Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	-1.33
All medication is managed according to evidence based practices	-1.33
There is evidence of a formal incident reporting system in the OR	-1.33
The structure of the OR design adheres to legislation	-1.67
Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-1.67
There are enough qualified staff allocated per shift to maintain IPC practices	-1.67
Communication strategies in the OR are evident	-2
An OR preventative maintenance programme is evident	-2

Table 5.4 reflects the mean score values of the OHS Coordinators from highest to the lowest score. Endoscope management has the highest score as 2.33 with the OR preventative maintenance programme and communication strategies the lowest at -2.

Table 5.5 Mean score values of the statements ranked by the surgeons from highest to lowest score

Statement	Mean Score
Hand hygiene practices are evident	3
Prophylactic antibiotics are administered according to evidence based practices	2
Towelling, draping and linen management is according to evidence based practices	2
Instrumentation management is implemented according to evidence based practices	2
The OR manager is trained and skilled in managing the IPC programme	2
Sterilisation of loan sets are managed according to evidence based practices	2
Disinfection and sterilisation procedures are implemented according to evidence based practices	1.33
There are enough qualified staff allocated per shift to maintain IPC practices	1.33
Sterilisation and decontamination equipment are managed according to evidence based practices	1.33
Gluteraldehyde is managed according to evidence based practices	1
Single-use items are managed according to evidence based practices	0.33
Air quality is monitored and managed according to evidence based practices	0.33
Human tissue management adheres to evidence based practices	0.33
A policy minimising people movement in the OR is available and implemented	0.33
The work delegation per shift is according to the Scope of Practice of each staff member	0.33
All medication is managed according to evidence based practices	0.33
Targeted environmental cleaning is evident	0
There is evidence of medical waste and sharps management practice	0
Communication strategies in the OR are evident	0
Endoscope management is implemented according to evidence based management	0
Sterile store and stock rooms are managed according to evidence based practices	0
Equipment is managed according to evidence based practices	0
An OR preventative maintenance programme is evident	0
Additional IPC guidelines during building renovations and construction are evident	-0.33
Guidelines for the management of specific diseases in the OR are available and implemented	-0.33

Statement	Mean Score
Hair removal practices are according to evidence based practices	-0.33
There is evidence of standard precautions compliancy by all members of the multi-disciplinary team	-0.33
There is evidence of a formal incident reporting system in the OR	-0.33
Patient documentation indicate IPC practices	-0.67
There is evidence of an IPC programme per area in the OR	-0.67
There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team	-0.67
The multi-disciplinary team's compliance to, and availability of PPE is evident	-1
Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-1
There is evidence of regular body temperature control of patients peri-operatively	-1
Policies regarding turn-over time management is evident and implemented	-1
The immunisation programme of the staff is evident	-1
There is evidence of a pest control programme in the OR	-1
There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-1
Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	-1.33
The SMART UVC for decontamination of the OR is evident	-1.66
There is evidence of regular blood glucose control of patients peri-operatively	-1.67
The structure of the OR design adheres to legislation	-2
The clinical skills of the multi-disciplinary team are assessed annually	-2.67

Table 5.5 reflects the mean score values of the surgeons from highest to lowest score. The surgeons scored hand hygiene practices as 3, followed by prophylactic antibiotic use, towelling, draping and linen management, instrumentation management, loan set management and the ability of the UM to manage the IPC programme as important as 2. The assessment of clinical skills of the multi-disciplinary team scored the lowest as -2.67.

Table 5.6 Mean score values of the statements ranked by the CSD Managers from highest to lowest score

Statement	Mean Score
Disinfection and sterilisation procedures are implemented according to evidence based practices	2
Endoscope management is implemented according to evidence based management	1.67
Guidelines for the management of specific diseases in the OR are available and implemented	1.67
Hand hygiene practices are evident	1.33
Prophylactic antibiotics are administered according to evidence based practices	1.33
Human tissue management adheres to evidence based practices	1.33
The multi-disciplinary team's compliance to, and availability of PPE is evident	1
There is evidence of medical waste and sharps management practice	1
Instrumentation management is implemented according to evidence based practices	1
The OR manager is trained and skilled in managing the IPC programme	1
Sterilisation of loan sets are managed according to evidence based practices	1
An OR preventative maintenance programme is evident	1
Single-use items are managed according to evidence based practices	0.67
A policy minimising people movement in the OR is available and implemented	0.67
Hair removal practices are according to evidence based practices	0.67
There is evidence of a formal incident reporting system in the OR	0.67
Sterilisation and decontamination equipment are managed according to evidence based practices	0.33
There is evidence of an IPC programme per area in the OR	0.33
The work delegation per shift is according to the Scope of Practice of each staff member	0
There is evidence of standard precautions compliancy by all members of the multi-disciplinary team	0
Policies regarding turn-over time management is evident and implemented	0
Air quality is monitored and managed according to evidence based practices	-0.33
Sterile store and stock rooms are managed according to evidence based practices	-0.33
The clinical skills of the multi-disciplinary team are assessed annually	-0.33

Statement	Mean Score
There is evidence of regular body temperature control of patients peri-operatively	-0.33
All medication is managed according to evidence based practices	-0.33
The immunisation programme of the staff is evident	-0.33
Targeted environmental cleaning is evident	-0.67
Towelling, draping and linen management is according to evidence based practices	-0.67
Communication strategies in the OR are evident	-0.67
Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-0.67
There are enough qualified staff allocated per shift to maintain IPC practices	-0.67
Equipment is managed according to evidence based practices	-0.67
Gluteraldehyde is managed according to evidence based practices	-1
Patient documentation indicate IPC practices	-1
Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	-1
There is evidence of a pest control programme in the OR	-1
The structure of the OR design adheres to legislation	-1.33
Additional IPC guidelines during building renovations and construction are evident	-1.33
There is evidence of regular blood glucose control of patients peri-operatively	-1.33
The SMART UVC for decontamination of the OR is evident	-1.33
There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team	-2.33
There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-2.33

Table 5.6 reflects the mean scores of the statements from highest to the lowest score as ranked by the CSD Managers. Disinfection and sterilisation procedures are implemented according to evidence based practices scored the highest as 2. Endoscope management scored 1.67. Medical waste and sharps management scored as well as instrumentation management scored 1. Sterilisation of loan sets scored 1 as well as the implementation of an OR preventative maintenance programme. Sterilisation and decontamination equipment management scored 0.33 as well the inclusion of an IPC programme per area in the OR. Risk assessment during OR rounds scored the lowest as -2.33.

Table 5.7 Mean score values of the statements ranked by the anaesthetic nurses from highest to lowest score

Statement	Mean Score
Hand hygiene practices are evident	2.67
Prophylactic antibiotics are administered according to evidence based practices	2.33
Disinfection and sterilisation procedures are implemented according to evidence based practices	1.67
There is evidence of medical waste and sharps management practice	1.67
The multi-disciplinary team's compliance to, and availability of PPE is evident	1.33
Sterile store and stock rooms are managed according to evidence based practices	1.33
All medication is managed according to evidence based practices	1.33
Human tissue management adheres to evidence based practices	1
Sterilisation and decontamination equipment are managed according to evidence based practices	1
There is evidence of regular body temperature control of patients peri-operatively	1
There is evidence of standard precautions compliancy by all members of the multi-disciplinary team	1
Guidelines for the management of specific diseases in the OR are available and implemented	0.67
The work delegation per shift is according to the Scope of Practice of each staff member	0.67
There is evidence of regular blood glucose control of patients peri-operatively	0.67
Additional IPC guidelines during building renovations and construction are evident	0.33
Endoscope management is implemented according to evidence based management	0.33
The OR manager is trained and skilled in managing the IPC programme	0.33
Single-use items are managed according to evidence based practices	0
Communication strategies in the OR are evident	0
Sterilisation of loan sets are managed according to evidence based practices	0
There is evidence of a formal incident reporting system in the OR	0
The structure of the OR design adheres to legislation	-0.33
Instrumentation management is implemented according to evidence based practices	-0.33
There are enough qualified staff allocated per shift to maintain IPC practices	-0.33

Statement	Mean Score
Gluteraldehyde is managed according to evidence based practices	-0.33
Equipment is managed according to evidence based practices	-0.33
Hair removal practices are according to evidence based practices	-0.33
Targeted environmental cleaning is evident	-0.67
Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-0.67
Patient documentation indicate IPC practices	-0.67
There is evidence of a pest control programme in the OR	-0.67
The SMART UVC for decontamination of the OR is evident	-0.67
An OR preventative maintenance programme is evident	-0.67
Towelling, draping and linen management is according to evidence based practices	-1
A policy minimising people movement in the OR is available and implemented	-1
The clinical skills of the multi-disciplinary team are assessed annually	-1
The immunisation programme of the staff is evident	-1
There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team	-1
Air quality is monitored and managed according to evidence based practices	-1.67
There is evidence of an IPC programme per area in the OR	-1.67
Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	-1.67
Policies regarding turn-over time management is evident and implemented	-1.67
There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-1.67

Table 5.7 indicates the mean score values of the anaesthetic nurses from highest to lowest score. Hand hygiene practices scored the highest as 2.67. Prophylactic antibiotic administration scored 2.33. Risk assessment during OR rounds scored the lowest as -1.67.

Table 5.8 Mean score values of the statements ranked by the scrub nurses from highest to lowest score

Statement	Mean Score
Instrumentation management is implemented according to evidence based practices	2
Disinfection and sterilisation procedures are implemented according to evidence based practices	1.5
Guidelines for the management of specific diseases in the OR are available and implemented	1
There are enough qualified staff allocated per shift to maintain IPC practices	1
Sterilisation and decontamination equipment are managed according to evidence based practices	1
Towelling, draping and linen management is according to evidence based practices	0.83
Sterilisation of loan sets are managed according to evidence based practices	0.67
Sterile store and stock rooms are managed according to evidence based practices	0.67
Patient documentation indicate IPC practices	0.67
There is evidence of regular body temperature control of patients peri-operatively	0.67
Hand hygiene practices are evident	0.5
Single-use items are managed according to evidence based practices	0.33
There is evidence of regular blood glucose control of patients peri-operatively	0.33
Prophylactic antibiotics are administered according to evidence based practices	0.17
There is evidence of medical waste and sharps management practice	0.17
Human tissue management adheres to evidence based practices	0.17
The OR manager is trained and skilled in managing the IPC programme	0.17
Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	0.17
There is evidence of a pest control programme in the OR	0.17
Communication strategies in the OR are evident	0
Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	0
The SMART UVC for decontamination of the OR is evident	0
There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team	0
The work delegation per shift is according to the Scope of Practice of each staff member	-0.17
The immunisation programme of the staff is evident	-0.17
Additional IPC guidelines during building renovations and construction are evident	-0.33

Statement	Mean Score
Air quality is monitored and managed according to evidence based practices	-0.33
The clinical skills of the multi-disciplinary team are assessed annually	-0.33
There is evidence of a formal incident reporting system in the OR	-0.33
Targeted environmental cleaning is evident	-0.5
The structure of the OR design adheres to legislation	-0.5
Equipment is managed according to evidence based practices	-0.5
All medication is managed according to evidence based practices	-0.5
The multi-disciplinary team's compliance to, and availability of PPE is evident	-0.67
Endoscope management is implemented according to evidence based management	-0.67
A policy minimising people movement in the OR is available and implemented	-0.67
There is evidence of standard precautions compliancy by all members of the multi-disciplinary team	-0.67
Policies regarding turn-over time management is evident and implemented	-0.67
An OR preventative maintenance programme is evident	-0.83
There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-0.83
Gluteraldehyde is managed according to evidence based practices	-1
There is evidence of an IPC programme per area in the OR	-1
Hair removal practices are according to evidence based practices	-1.17

Table 5.8 indicates the mean score values of the scrub nurses from highest to lowest score. The highest mean score is evident when instrumentation management is discussed and scores 2, supported by disinfection and sterilisation procedure management as 1.5. Management of sterilisation and decontamination equipment also scored positive as 1 and management of loan sets as 0.67. Hair removal practices scored the lowest as -1.17.

Table 5.9 Mean score values of the statements ranked by IPC Coordinators from highest to lowest score

Statement	Mean score
Hand hygiene practices are evident	3
Targeted environmental cleaning is evident	1.67
The multi-disciplinary team's compliance to, and availability of PPE is evident	1.67
The OR manager is trained and skilled in managing the IPC programme	1.67
Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	1.67
The immunisation programme of the staff is evident	1.67
There is evidence of medical waste and sharps management practice	1.33
There is evidence of an IPC programme per area in the OR	1.33
There is evidence of standard precautions compliancy by all members of the multi-disciplinary team	1.33
Prophylactic antibiotics are administered according to evidence based practices	1
Instrumentation management is implemented according to evidence based practices	1
Endoscope management is implemented according to evidence based management	1
Guidelines for the management of specific diseases in the OR are available and implemented	1
Air quality is monitored and managed according to evidence based practices	1
Sterilisation and decontamination equipment are managed according to evidence based practices	1
Disinfection and sterilisation procedures are implemented according to evidence based practices	0.67
Additional IPC guidelines during building renovations and construction are evident	0.67
Human tissue management adheres to evidence based practices	0.67
Hair removal practices are according to evidence based practices	0.67
Single-use items are managed according to evidence based practices	0.33
There are enough qualified staff allocated per shift to maintain IPC practices	0.33
Sterilisation of loan sets are managed according to evidence based practices	0
Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-0.33
A policy minimising people movement in the OR is available and implemented	-0.33

Statement	Mean Score
There is evidence of regular body temperature control of patients peri-operatively	-0.33
There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-0.33
Towelling, draping and linen management is according to evidence based practices	-0.67
Patient documentation indicate IPC practices	-1
Equipment is managed according to evidence based practices	-1
All medication is managed according to evidence based practices	-1
There is evidence of a pest control programme in the OR	-1
There is evidence of a formal incident reporting system in the OR	-1
The SMART UVC for decontamination of the OR is evident	-1.3
The structure of the OR design adheres to legislation	-1.33
Communication strategies in the OR are evident	-1.33
Gluteraldehyde is managed according to evidence based practices	-1.33
Sterile store and stock rooms are managed according to evidence based practices	-1.33
There is evidence of regular blood glucose control of patients peri-operatively	-1.33
The work delegation per shift is according to the Scope of Practice of each staff member	-1.67
There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team	-1.67
An OR preventative maintenance programme is evident	-1.67
Policies regarding turn-over time management is evident and implemented	-2
The clinical skills of the multi-disciplinary team are assessed annually	-2.67

Table 5.9 indicates the mean score value of the IPC Coordinators ranked from highest to lowest score. Hand hygiene practices scored the highest at 3 with the lowest score of -2.67 was allocated to the assessment of the multi-disciplinary team's clinical skills assessment.

The mean score values of the statements as ranked by all the participants from highest to the lowest score are presented in Table 5.10.

Table 5.10 Mean score values of the statements as ranked by all the participants from highest to lowest score

Statement	Mean score
Hand hygiene practices are evident	1.81
Disinfection and sterilisation procedures are implemented according to evidence based practices	1.43
Instrumentation management is implemented according to evidence based practices	1.19
Prophylactic antibiotics are administered according to evidence based practices	1.14
Sterilisation and decontamination equipment are managed according to evidence based practices	1.05
The OR manager is trained and skilled in managing the IPC programme	0.90
Guidelines for the management of specific diseases in the OR are available and implemented	0.86
There is evidence of medical waste and sharps management practice	0.76
Sterilisation of loan sets are managed according to evidence based practices	0.67
Human tissue management adheres to evidence based practices	0.62
Single-use items are managed according to evidence based practices	0.57
Endoscope management is implemented according to evidence based management	0.57
The multi-disciplinary team's compliance to, and availability of PPE is evident	0.43
Towelling, draping and linen management is according to evidence based practices	0.29
Sterile store and stock rooms are managed according to evidence based practices	0.24
There are enough qualified staff allocated per shift to maintain IPC practices	0.14
There is evidence of standard precautions compliancy by all members of the multi-disciplinary team	0.10
Air quality is monitored and managed according to evidence based practices	0.00
There is evidence of regular body temperature control of patients peri-operatively	0.00
Targeted environmental cleaning is evident	-0.05
The immunisation programme of the staff is evident	-0.05
A policy minimising people movement in the OR is available and implemented	-0.19
The work delegation per shift is according to the Scope of Practice of each staff member	-0.19
Additional IPC guidelines during building renovations and construction are evident	-0.24

Statement	Mean Score
There is evidence of an IPC programme per area in the OR	-0.24
Hair removal practices are according to evidence based practices	-0.24
All medication is managed according to evidence based practices	-0.29
There is evidence of a formal incident reporting system in the OR	-0.38
Patient documentation indicate IPC practices	-0.43
Gluteraldehyde is managed according to evidence based practices	-0.48
Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	-0.48
The SMART UVC for decontamination of the OR is evident	-0.52
Communication strategies in the OR are evident	-0.57
There is evidence of regular blood glucose control of patients peri-operatively	-0.57
Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-0,62
Equipment is managed according to evidence based practices	-0.62
There is evidence of a pest control programme in the OR	-0.62
An OR preventative maintenance programme is evident	-0.71
There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team	-0.95
Policies regarding turn-over time management is evident and implemented	-1
The structure of the OR design adheres to legislation	-1.10
There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-1.14
The clinical skills of the multi-disciplinary team are assessed annually	-1.19

The highest score is 1.81 and is allocated to hand hygiene practices. The lowest score is -1.19 and is allocated to the annual assessment of the clinical skills of the multi-disciplinary team.

Understanding of the amount of data provided by the participants is challenging. (Dariel et al, 2010) made a suggestion in this regard i.e. “The act of ranking each statement in relation to others, rather than evaluating them individually, is designed to capture the way people think about ideas in relation to other ideas rather than in isolation...” (Dariel *et al*, 2010). Statements related to each other are therefore

grouped together in an attempt to understand the data provided by the participants. . The data is presented in Table 5.11 - 5.19.

Table 5.11 Mean score values of statements relevant to the physical environment in the OR

Positive Scoring	Score	Negative Scoring	Score
Air quality is monitored according to evidence based practices	0(neutral)	Targeted environmental cleaning is evident	-0.05
		Additional IPC guidelines during building renovations and construction are evident	-0.24
		There is evidence of a pest control programme in the OR	-0.62
		An OR preventative maintenance programme is evident	-0.71
		The structure of the OR design adheres to legislation	-1.10
		There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-1.19
		A policy minimising people movement in the OR is available and implemented	-0.19

All the statements relevant to the physical environment in the OR scored negatively except the monitoring of air quality.

Table 5.12 Mean score values of statements relevant to OR specific procedures and clinical governance

Positive Scoring	Score	Negative Scoring	Score
Guidelines for the management of specific diseases in the OR are available and implemented	0,86	The clinical skills of the multi-disciplinary team are assessed annually	-1.19
Instrumentation management is implemented according to evidence based practices	1.19	Policies regarding turn-over time management is evident and implemented	-1

Positive Scoring	Score	Negative Scoring	Score
There is evidence of medical waste and sharps management practice	0.76	Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-0.62
Human tissue management adheres to evidence based practices	0.62	Hair removal practices are according to evidence based practices	-0.24
Single –use items are managed according to evidence based practices	0.57	All medication is managed according to evidence based practices	-0.29
Towelling, draping and linen management is according to evidence based practices	0.29	Gluteraldehyde is managed according to evidence based practices	-0.48
		Equipment is managed according to evidence based practices	-0.62

The assessment of the clinical skills of the multi-disciplinary team scored the lowest as -1.19. None of the stakeholder groups scored this statement positively. Policies regarding turn-over time management, OR IPC training, hair removal practices, medication management, management of gluteraldehyde as well as equipment management scored negatively. Positive scores included a guideline for the management of specific diseases, instrumentation management, medical waste and sharps management, single-use item as well as towelling, draping and linen management.

Table 5.13 Mean score values of statements relevant to human resource management

Positive Scoring	Score	Negative Scoring	Score
There is enough qualified staff allocated per shift to maintain IPC practices	0.14	The immunisation programme of the staff is evident	-0.05
		The work delegation per shift is according to the Scope of Practice of each staff member	-0.19
		Communication strategies in the OR is evident	-0.52

The only statement that scored positively is that there must be enough qualified staff per shift to maintain IPC practices. This relates only to the amount of staff available per shift and not their actual qualifications. This is evident as the statement addressing staff members' Scope of Practice scored negatively. The implementation

of the immunisation programme of the staff as well as communication strategies scored negatively.

Table 5.14 Mean score values of statements relevant to a multi-disciplinary team approach in the OR

Positive Scoring	Score	Negative Scoring	Score
The multi-disciplinary team's compliance to, and availability of PPE is evident	0.43	Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	-0.48
There is evidence of standard precautions compliancy by all members off the multi-disciplinary team	0.10	Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-0.62
		There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team	-0.95
		There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-1.14
		The clinical skills of the multi-disciplinary team are assessed annually	-1.19

The information in Table 5.14 indicates that the extent of involvement of the multi-disciplinary team is to be compliant with PPE and standard precautions in the OR. All statements suggesting input and participation in the form of monitoring, training, partaking in IPC decisions, risk assessments scored negatively. All participants indicated that the Unit Manager should be trained and skilled in managing the IPC programme and the statement scored 0.86.

Table 5.15 Mean score values of statements relevant to documentation management in the OR

Positive Scoring	Score	Negative Scoring	Score
		There is evidence of a formal incident reporting system in the OR	-0.38
		Patient documentation indicate IPC practices	-0.43

Positive Scoring	Score	Negative Scoring	Score
		There is evidence of an IPC programme per area in the OR	-0.24
		Communication strategies in the OR are evident	-0.57
		There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-1.14
		An OR preventative programme is evident	-0.71

All the statements relevant to documentation management scored negatively.

Table 5.16 Mean score values of statements regarding the management of equipment in the OR

Positive Scoring	Score	Negative Scoring	Score
Sterilisation and decontamination equipment are managed according to evidence based practices	1.05	Equipment is managed according to evidence-based practices	-0.62
Endoscope management is implemented according to evidence based practices	0.57		

Specified equipment: sterilisation and decontamination as well as endoscopic equipment scored positively. Equipment in general that includes anaesthetic equipment, tables, trolleys, tourniquets and electrical devices scored negative as -0.62.

Table 5.17 Mean score values of statements regarding CSD management

Positive Scoring	Score	Negative Scoring	Score
Disinfection and sterilisation procedures are implemented according to evidence based practices	1.43	There is evidence of an IPC programme per area in the OR	-0.24
Instrumentation management is implemented according to evidence based practices	1.19	An OR preventative maintenance programme is evident	-0.71
Sterilisation of loan sets are managed according to evidence based practices	0.67	Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-0.62

Positive Scoring	Score	Negative Scoring	Score
Sterile store and stock rooms are managed according to evidence based practices	0.24	Targeted environmental cleaning is evident	-0.05
There is evidence of standard precaution compliancy by all members of the multi-disciplinary team	0.10		
Single-use items are managed according to evidence based practices	0.57		

Disinfection and sterilisation procedures, instrumentation management, loan set management, sterile store and stock room management, standard precaution compliance and single-use item management scored positively. IPC programme management, an OR preventative maintenance programme, targeted OR IPC training and targeted environmental cleaning scored negatively.

Table 5.18 Mean score values of statements relevant to medication management in the OR

Positive Scoring	Score	Negative Scoring	Score
Prophylactic antibiotics are administered according to evidence based practices	1.14	All medication is managed according to evidence based practices	-0.29
Sterile store and stock rooms are managed according to evidence based practices	0.24		

The statement relevant to prophylactic antibiotics, sterile store and stock room management scored positively. Medication management scored negatively.

Table 5.19 Mean score values of statements relevant to waste management in the OR

Positive Scoring	Score	Negative Scoring	Score
There is evidence of medical waste and sharps management practice	0.76		
Human tissue management adheres to evidence based practices	0.62		

All the statements relevant to waste management in the OR scored positively.

The dominant negative scores of statements relevant to the physical environment, OR specific procedures, human resource management, the multi-disciplinary team

approach, documentation, equipment management, CSD management and medication management in the OR is evident.

The following could have contributed to the score values of statements: The inability of the participants to relate the impact of clinical skills to surgical site infections. The absence of a systems approach to infection prevention in the OR. The physical isolation of the OR from other health-care practitioners and the public that can report incidents. Absence of clinical specialists in the OR, ineffective staff development programmes and OR specific CPD programmes. The introduction of lower categories and non-nursing staff into the OR environment which resulted in the multi-disciplinary team's misunderstanding of their scope of practice should be considered as a contributing factor. The absence of evidence-based practice guidelines as well as a lack of focus on policy development could have contributed to the results. The absence of a shared vision of IPC in the OR became evident as well as the stakeholders' concern for individualised roles.

5.12 Conclusion

It is evident that the stakeholders included in this study have diverse opinions regarding important elements that should be included in a comprehensive infection prevention quality audit tool.

CHAPTER 6

6. LITERATURE VERIFICATION

6.1 Introduction

Prior to developing the audit tool, a literature review of all the concepts included in the concourse statement was done to verify the meaning and importance of the concept as well as gaining an understanding of how each concept is applied in an operating room theatre. In addition to clarification, this step was required as no consensus was reached by the stakeholders.

6.2 Objective

The second objective of phase 2 is relevant to this chapter. The objective is: To review the literature to determine evidence based practices that provide validation for, and the expansion of the concourse statements identified.

6.3 Data Collection

The literature pertinent to each statement included in the original concourse statement was reviewed in turn and is discussed below. The researcher attempted to include literature that either supports and, or, dismisses the statements. The literature review also allowed for expansion of the statements that is included as indicators and criteria in the audit tool.

6.4 Statements for verification

6.4.1 The infection prevention control programme

The concourse statement relevant to this statement is: *There is evidence of an IPC programme per area in the OR.* Evidence was found to support this statement.

The Royal Cornwall Hospitals' 2014 Clinical Guideline for Theatre Practice Standards of the United Kingdom's National Health Service (2014) states that, due to the diversity of the tasks performed, technical complexity, and the vulnerability of patients in the operating room, it is advisable that an Infection Prevention Programme, addressing the art of surgery and anaesthesia, is used to determine unit compliance (Royal Cornwall Hospitals, 2014).

The programme has to be integrated, have a strong underlying team approach, diverse interventions, administrators' approval and financial support, allocated

mentors and have systems in place to manage healthcare worker non-compliance to the programme (Andersson, 2013).

Anuja Vaidya (2013) suggests that leadership, communication, teamwork are included into a patient infection prevention safety programme. This relates to the multi-disciplinary team's approach to Infection Prevention Control Programmes.

Organisational, technical guidelines, human resources, surveillance and assessment of compliance, microbiology laboratory, environmental, monitoring programmes and public health engagement are components of an infection prevention and control programme according to the World Health Organisation (WHO, 2008).

Although this statement scored negatively (-0.24) by the participants of this study, the researcher found evidence to support this statement and is therefore included in the audit tool. The IPC Programme is included in *Standard 1: There is an IPC Programme that is appropriate for the goals of the service and that supports quality care of patients in the operating room. Criteria 1.2* includes the following: *1.2.1: Organisation and Planning, 1.2.2 Human Resource Management, 1.2.3 Surveillance and Assessment, 1.2.4 Microbiology Laboratory Involvement, 1.2.5 Environment* and *Standard 29: The surgical site infection rate and practices reflect international acceptable care.*

Standard 2 requires the inclusion of the IPC Committee that develops and maintains the IPC Programme. *Standard 2: There is an OR IPC Committee that is appropriate for the goals of the service and that supports quality care of patients in the operating room*, Criteria 2.1 requires Hospital Administrators approval and a team approach. Criteria 2.1 and indicators list the Committee members as the Hospital Manager, IPC Coordinator, Technical Manager, Cleaning Manager, Microbiologist, Clinical Pharmacist, OP Unit Manager, Physicians, Surgeons, Anaesthetists, CSD Manager and the OR Clinical Facilitator. Criteria 2.2 requires the availability of interdepartmental service level agreements between stakeholders, communication strategies and monitoring of compliance to the programme.

6.4.2 There is a Hospital Committee that focuses on IPC in the Operating Room

The concourse statement relevant to this statement is: *There is evidence of a Hospital Theatre Committee that consists of members of the multi-disciplinary team.* Evidence was found to support this statement.

A specialised group of professionals, whose main focus is to manage IPC practices in the OR, should be established with official committee status.

Peter Achterstraat (2013) supports the inclusion of Operating Room Committees in the management structure of the operating room and concluded that the committees are more effective when medical officers are involved. The role and composition of the committee, report structures and extent of influence over policies and procedures should be clear. Clear lines of authority to change practices are essential to support good leadership practices of the unit manager. Risk identification rounds by the multi-disciplinary team and the management thereof should be discussed (Achterstraat, 2013).

Although the participants scored the statement negatively (-0.95) it is included in the audit tool in: *Standard 2: There is an OR IPC Committee that is appropriate for the goals of the service and that supports quality care of patients in the operating room.* A list of the members that are required to serve on the committee, as well as the communication structures within the committee, is listed as criteria 2.1 and 2.2. Risk assessment rounds are included in the audit tool in *Standard 28: A preventative maintenance programme is evident.*

6.4.3 The disclosure of the IPC status of the Operating Room Theatre

The concourse statement relevant to this statement is: *Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list.* Evidence was found to support statement.

The concept *status of the Operating Room* implies that a level of compliance to an Infection Prevention Control Programme is awarded to a unit. This information is valuable to assist patients and the multi-disciplinary team to decide on the utilisation of the healthcare service.

Due to the unlimited digital access via the internet, patients with no formal training, education or exposure to the medical field are more informed than ever. Hold (2011) urges patients to ask for information prior to surgery for example hand washing practices, shaving techniques and antibiotic usage (Hold, 2011).

Coulter *et al* (2005) encourage patients to ask more questions regarding their treatment regime (Coulter *et al*, 2005). Due to the isolation of the operating room and anaesthesia most patients are not able to do just that. It is therefore important that

the patient is informed pre-operatively as part of the informed consent discussion between the patient and the treating physician. Kelly Pyrek (2013) indicates that publication of information relevant to healthcare will allow patients and stakeholders to make informed decisions regarding their choice of the provider (Pyrek, 2013). The South African National Health Act (no. 61 of 2003) states that the user (patient) must have full knowledge of the risks and benefits and potential consequences of his treatment regime and that the healthcare provider has to provide the patient with the information (Depart of Health 2003). It is therefore reasonable to expect healthcare providers to explain the quality and success of infection control programmes to the patient and the treating doctors. This will enable the patient to make an informed decision reflecting as informed consent. Most research studies regarding disclosure of information and informed consent, focus on surgical procedural information (what procedure is being consented to) and not on the quality of systems (how the procedure is performed) in the peri-operative environment. As the patient is usually sedated during his or her stay in the peri-operative area, the patient cannot make decisions based on what he experiences, or is even aware of what is happening around him. The patient's role as the leading partner in his treating plan is therefore compromised.

The only information available to the patient, regarding the quality of systems inside the operating room theatre pre-operatively, is the operating room's compliance to an Infection Prevention Control Programme. This information can be communicated in the hospital admission documentation. Coulter *et al* (2005) states that younger patients are keener to participate in their treatment plan and that ethnicity and gender plays a role in patient involvement.

Appleby *et al* (2010) concluded that 75% of the patients included in their study regard the choice to be able to choose the healthcare provider as important, and that educational level, age, employment status and ethnicity has no bearing on the responses (Appleby *et al*, 2010). The study focussed on the healthcare provider (hospital) and not specific the operating room theatre. No studies specific to the operating room as the preferred environment was found. Patients interpret quality as "cleanliness, quality of care and standard of facilities" (Appleby *et al,* 2010) and general practitioners suggest providers based on personal experience and not information from the healthcare providers (Appleby *et al,* 2010).

Although the participants scored the statement negatively (-0.48), the impact of disclosure of IPC ratings of healthcare providers and its impact on quality service delivery in South Africa is worth further investigation and included in the audit tool in *Standard 1*, *Criteria 1.2.3 Surveillance and Assessment, Indicator 15: The compliance rate of the unit to the IPC programme is communicated to stakeholders with every shift hand-over event.*

6.4.4 Incident Reporting System

The concourse statement relevant to this statement is: *There is evidence of a formal incident reporting system in the OR.* Evidence is found to support this statement.

Incident reporting is every staff member's responsibility according to the Royal Cornwall Hospitals (2014) and regards every non-adherence to policies and procedures as an incident.

Van den Akker *et al* (2010) acknowledge that the actual extent of non-reporting of incidents is unknown. They estimate that only four to fifty percent of all incidents are actually reported, and concludes that voluntary reporting statistics must therefore be seen as unreliable. Incidents related to equipment mismanagement are responsible for procedures being extended as well as longer anaesthesia time which can indirectly contribute to the patient's risk in developing a surgical site infection (van den Akker *et al*, 2010).

Although reported incident rates are unreliable and cannot be regarded as the only indicator for quality work, it is included in the Core Standard Audit tools as there is no alternative, more reliable indicator. As long as comparisons are made of the same indicator over time, this will, at least, indicate trends.

Although the participants scored the statement negatively (-0.38), proof of reporting of incidents relating to the standard is included in the audit tool in *Standard 3: There is evidence of an incident report system.*

6.4.5 The physical building, interior structures and work flow systems in the OR impact on the IPC status of the unit.

The concourse statement relevant to this statement is: *The structure of the OR design adheres to legislation.* Evidence was found to support the statement. The design of the operating room area has an impact on flow systems and directional

work cycles, for example the decontamination cycle that directs staff and instrumentation movement. Clean, sterile, and contaminated areas are segregated in all operating rooms to ensure adherence to basic sterile principles and minimise contamination of sterile or clean items.

Byron Burlingame (2014) defines the operating room as "… a room in the surgical suite that meets the requirements of a restricted area and is designated and equipped for performing surgical operations or other invasive procedures that require a sterile field. Any form of anaesthesia may be administered in the OR as long as appropriate anaesthetic gas administration devices and exhaust systems are provided" (Burlingame, 2014). A restricted area is "… a designated space that can only be accessed through a semi-restricted area in order to achieve a high level of asepsis control. Traffic in the area is restricted to authorized personnel and patients and personnel are required to wear surgical attire and cover head and facial hair. Masks are required where open sterile supplies or scrubbed persons may be located" (Burlingame, 2014). A semi-restricted area "… comprises the peripheral support areas surrounding the restricted area of a surgical suite. This support area includes facilities such as storage areas for clean and sterile supplies, sterile processing rooms, work areas for storage and processing of instruments, scrub sink areas, corridors leading to the restricted area, and pump rooms" (Burlingame, 2014). Differentiation between these areas are listed in *Standard 4: The physical building, design and fixtures in the OR adhere to legislation* as: *Criteria 4.1: The pre-operative area adheres to legislation* and the indicators, *Criteria 4.2: The Recovery Room area adheres to legislation* and the indicators, *Criteria 4.3: Every scrubbing-up area adheres to legislation* and the indicators, *Criteria 4.4: The cleaning and disposal area adheres to legislation* and the indicators, *Criteria 4.5: Rest and Change Rooms adheres to legislation* and the indicators, *Criteria 4.6: Kitchen facilities in the OR adhere to legislation* and the indicators, *Criteria 4.7: Storage facilities adhere to legislation* and the indicators, *Criteria 4.8: Setting-up space allows for adherence to basic sterile principles* and the indicators, *Criteria 4.10: CSD area adheres to legislation* and the indicators, *Criteria 4.11: Linen storage rooms adhere to legislation* and the indicators.

The maintenance of basic sterile principles during a procedure are dependent on the size of the physical environment in which the operating team is functioning. Minimum sterile field space is discussed by Burlingame and equipment for a basic non-

complicated case is listed. The operating room table measures 1.75 meter with added 2 meter to accommodate arm rests and the scrub team. A safe traffic pathway is defined as a distance of 4 feet that will allow two people to pass each other inside the sterile field without contaminating themselves and the sterile field, including walls and equipment. An open traffic pathway is defined as an area around the operating table that allows certain activities prior to the procedure e.g. set up, cleaning and draping of the patient and preparation of trolleys. This includes the area at the patient's head where the anaesthetist needs free access to the patient throughout the procedure (Burlingame, 2014). The minimum amount of people needed during a surgical procedure that should be allocated in the operating room is an anaesthetist, anaesthetic nurse, floor nurse, surgeon, scrub nurse and assistant. As they all have to adhere to basic sterile principles changes in structure and additional fittings in the intra-operative area for example shelving must be done with caution.

The researcher was unable to locate the Gauteng Department of Health's regulation pertaining to the control of private hospitals in South-Africa. The KwaZulu-Natal's Department of Health Regulation 158, pertaining to control of Private Hospitals in South Africa, is a three part document that directs the minimum requirements for physical facilities. Chapter 7 describes an operating room as "… a restricted area where interventions invasive of nature and surgical procedures are performed". It also states that once an operating room area is accredited as a specific class it may not be utilised for any other types of procedures. The following areas have to be included in the Operating Room facility: patient waiting area (pre-operative), recovery room area, scrub, setting-up (ante-room, area where surgical procedures are performed in a sterile environment (intra-operative area), duty station, storage facilities, cleaning areas, change and rest rooms (Department of Health, 1996).

Although the participants scored the statement negatively (-1.10) it is included in the audit tool in *Standard 4: The physical building, design and fixtures in the OR adhere to legislation.* The different areas are listed as criteria and the physical dimensions of the areas as indicators.

6.4.6 Air quality in the OR determines micro-organism load during procedures

The concourse statement relevant to this statement is: *Air quality is monitored and managed according to evidence based practices.* Evidence was found to support the statement.

The physical isolation of an Operating Room Complex in a hospital is partially to allow for control of the specialised air-flow system in the area. Andersson *et al* (2012) established that theatre staff may shed 10□ skin particles per person per minute and that 10% of these skin particles may be infected with unwanted bacteria. It takes skin particles three (3) minutes to be extracted from a specific area through a laminar flow system. They also indicated that bacteria, for example *Staphylococcus epidermis* on human skin particles, are their main interest as it can potentially land on the patient or sterilised instruments and areas. Although it is impossible to measure skin particles alone in the operating room, the measurement of all particles as a *particle count* is common practice. Air quality is determined by people movement in the operating room, the amount of people in the room, clothing, the quality of the air conditioning system and the maintenance thereof, physical activities and door movement. Laminar Air-flow, Turbulent Ventilation and De-placed Ventilation systems are described (Andersson *et* al, 2012). Andersson (2012) further adds that the ventilation system should not only prevent micro-organisms from entering the surgical wound but must also create acceptable working conditions for operating room staff and all four phases: filtration of air, distribution of air, pressurization of the room and air dilution must be effective.

Association for Professionals in Infection Control and Epidemiology's *Guide to the Elimination of Orthopedic Surgical Site Infections* (2010) questions the effectiveness of laminar flow systems and the cost-effectiveness thereof. They recommend a specific ceiling design, two filters cleaning the air rated at 30% and 70% efficacy, positive air pressure, air exchanges at 20 per hour of which 4 as outside air, two returning at least 203mm above the floor on opposite corners and the unilateral flow of air via diffusers (Association for Professionals in Infection Control and Epidemiology, 2010). Caveney (2011) demands consistent levels of humidity and operating room temperature that ranges between 30%-60% and 18-21^{o}C respectively, and states that separate standing fans and humidifiers are not acceptable.

Netcare's Clinical Service Infection Prevention and Control Environmental Policy No. IPC03 of 2013 defines air sampling as "… a measurement of all suspended material in the air i.e. bacteria in dust particles and the purpose is to ensure that the risk of infection to the patient is not coming from the ventilation system" (Netcare, 2013). This is confirmed by Rothrock (2015).

Air sampling is required after commissioning of theatres, major renovation, after working on air conditioning systems, as part of surveillance (investigation due to a disease outbreak) and every six (6) months (Netcare, 2013). Standard ISO 1466-1:2004 classifies clean rooms according to the level of dust / particle contamination detected in the room.

It is clear that the management of air quality demands understanding of some technical skill, and the involvement of the technical department is non-negotiable.

The participants scored the statement neutral (0.00). The statement is included in the audit tool in *Standard 5: Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms, Criteria 5.1: Air-flow systems are maintained* and the indicators*, Criteria 5.2: Staff movement is monitored* and the indicators*, Criteria 5.3: Additional measures* and the indicators *and Criteria 5.4: Communication structures relevant to air quality* and the indicators*.*

6.4.7 Building alterations and renovation practices in the hospital

The concourse statement relevant to this statement is*: Additional IPC guidelines during building renovations and construction are evident.* Evidence was found to support the statement.

Surgery and surgical techniques are constantly revised and adapted, due to the strong scientific character of the operating and surgical field, for example the recent developments in bariatric surgery and robotic surgery. This places pressure on the physical peri-operative environment as well as other treatment areas to accommodate demands. Building and renovations should therefore be expected. Building renovations and construction in the hospital building is included in this review as patients are transported passing areas under construction. The hospital supply of water, vacuum and pressure influences the operating room area.

Bartley's report on the Role of Infection Control during Construction in Health Care Facilities, states that the Infection Control Department participation during the planning, design and pre-construction phase is critical and lists the aspects to be discussed (Bartley, 2000). Additionally water pipe management is discussed in Phil Ashcroft's Health Building Note (2013). According to Anaissie *et al* (2002) the following nosocomial infections are related to hospital water supply systems: *Pseudomonas aeruginosa, Stenotrophimas maltophilia, Serratia marcescens,*

Acinetobacter baumannii, Aeromas hydrophila, Chryseobacterium species, Mycobacterium avium, Mycobacterium fortuitum, Mybobacterium xenopi, Mycrobacteria kansasii, Mycrobacterium chelonae, Mycrobacterium fortuitum, Fusarium solani, Exophiala jeanselmei and Aspergillus funigatus (Anaissie *et al*, 2002)

Communication of daily planned activities to hospital management and the IPC manager is essential. Time schedules regarding water, air, pressure interferences must be coordinated. The main focus of operating room management is the protection and maintenance of environmental aspects and therefore should have insight into planned projects and the effect it may have on service delivery.

Although the participants scored this statement negatively (-0.24) it is included in the audit tool as *Standard 6: Water quality contributes to the prevention of infection and distribution of micro-organisms,* and *Standard 7: Additional building and construction practices support the quality of the IPC practices in the OR Criteria 7.1: Planned building and construction events are communicated* and the indicators*, Criteria 7.2: A pre-construction plan is evident indicating the risk it will pose on the OR and patient pathways* and the indicators*, Criteria 7.3: The intra-construction phase is managed according to evidence based practices* and the indicators and *Criteria 7.4: The post-construction phase is managed according to evidence-based practices* and the indicators.

6.4.8 OR Staffing and Work Delegation

The concourse statements relevant to this statement is: *The work delegation per shift is according to the Scope of Practice of each staff member*. *There are enough qualified staff allocated per shift to maintain IPC practices. The OR manager is trained and skilled in managing the IPC programme.* Evidence was found to support the statement.

Patient's Rights within the Patient's Charter, based on the Bill of Rights, states that patients are entitled to continuity of care. This entails that the patient will receive the same quality care irrespective whether the patient is in a ward or operating room (South African Constitution, 1996a). Due to the lack of published research articles addressing staffing models in the operating room, the following position statements and policies are included:

In the 2015 publication on position statements the Association of perioperative Registered Nurses (2014) proposed a staffing plan that will allow the staff to manage any case load at any day (AORN, 2014). The staff ratio in the operating room is determined by factors that include: case load for the day and night, average time per procedure, complexity of procedure e.g. technical skills required, patient risks factors e.g. malignant hyperthermia, obesity, pre-procedure planning and preparation, turn-over time between procedures, staff competency and experience (AORN, 2014).

AORN also recommends that Registered Nurses should not work in a direct patient contact environment for longer than 12 hours in a 24 hour period, and no more than 60 hours in a 7 day period. AORN defines direct care as "time spent providing hands-on care to patients …" (AORN, 2014). Whereas indirect care is defined as "time spent on activities that support patient care and direct care providers but does not involve hands-on care activities …" (AORN, 2014).

The Association of perioperative Registered Nurses published a statement demanding that one Registered nurse is allocated per operating room case as a circular nurse. Circular nurse is defined as "….a role performed by the perioperative registered nurse, without sterile attire, during the preoperative, intraoperative, and postoperative phases of surgical patient care. In collaboration with the entire perioperative team, the circulating nurse uses the nursing process to provide and coordinate the nursing care of the patient undergoing operative and other invasive procedures" (AORN, 2014). In a South African context the circular nurse is mostly referred to as a floor nurse and is a lower category nurse as the scrub nurse.

Netcare's Clinical Services Surgical Services and Responsibilities Policy (No.2, 2012) indicates that a registered nurse with or without a qualification with operating room experience is charge of the theatre at all times and that an anaesthetic nurse assist the anaesthetist.

Klopper and Uys (2013) admit that there is no workforce plan in the health policy of South Africa but acknowledges studies done by Aiken *et al* (2008), Needleman *et al* (2001), Lake *et al* (2010) and, Cho *et al* (2003), whose results indicate that the more registered nurses on duty per shift, the lower the risk of incidents per shift (Klopper *et al*, 2013). It is therefore reasonable to expect the operating room theatre to function on a majority registered nurse staffing model. Klopper and Uys (2013) also states that the infection prevention control nurse and management is 100% responsible for

infection control practices and the registered nurse and specialist OR nurse is 50% responsible for infection control practices on regional and tertiary hospital level (Klopper *et al*, 2013).

Netcare's Sterile Services Management and Decontamination Process Policy (No. 3, 2013) states that the CSD manager must have experience or a qualification in CSD management. Netcare's Internal Quality Review document states that "there is a qualified or experienced healthcare professional with designated responsibilities for infection control in the health establishment" (Netcare, 2014).

The participants scored: *The work delegation per shift is according to the Scope of Practice of each staff member* negatively (-0.19) and, *There are enough qualified staff allocated per shift to maintain IPC practices* positively (0.14). These statements are included in the audit tool as criteria and indicators in the following standard: *Standard 9: Human resources are managed to maintain IPC structures in the OR.*

No evidence was found to suggest that the unit manager should be managing the IPC programme. Due to the positive score of 0.90 by the participants the statement is included in Standard 9.

6.4.9 Training and development

The concourse statement relevant to this statement is: *The clinical skills of the multi-disciplinary team are assessed annually*, *Targeted OR IPC training and monitoring of the multi-disciplinary team is evident* and *There is evidence of standard precaution compliance by all members of the multi-disciplinary team.* Evidence was found to support the statements.

Infection prevention and monitoring of infection prevention practices is everyone's main focus in the operating room. Due to the complexity of the multi-disciplinary team and numerous clinical activities the implementation of this can be challenging. The World Health Organization's Report on the Burden of Endemic Health care-Associated Infections Worldwide states that accountability and staff education has to be improved on a continuous basis (World Health Organization, 2011).

The National Infection Prevention and Control Manual published by Health Protection Scotland (Health Protection Scotland, 2014) recommends that monitoring of compliancy of all staff including agency staff and contractors should be arranged in all areas of the operating room, after members have attended formal training

sessions. The use of various communication mediums to disseminate the information to ensure sustainable improvements are encouraged (Health Protection Scotland, 2014). Arteche *et al* (2012) concluded that compliancy to basic sterile principles by scrub nurses are directly related to their attendance to in-service training sessions (Arteche *et* al, 2012).

Continuous Professional Development is introduced in the South African Nursing Act (No. 33 of 2005). The importance of continuous training of nurses by nurses is supported by the following statement: "Nurses have a vital role in the development, reviewing and approving of patient care policies regarding infection control. Nurses are not only responsible for themselves, but also responsible for monitoring other staff for their adherence to policies. They are responsible for developing training programmes for members of staff" (UK Essays, 2010).

The participant scored *The clinical skills of the multi-disciplinary team are assessed annually* negatively (-1.19), and *Targeted OR IPC training and monitoring of the multi-disciplinary team is evident* negatively (-0.62). It is included in the audit tool as: *Standard 1: There is an IPC Programme that is appropriate for the goals of the service and that supports quality care of patients in the operating room, Criteria: 1.2.2 ,* and *Standard 10: The clinical skills of the multi-disciplinary team are assessed.* The statement *There is evidence of standard precautions compliance by all members of the multi-disciplinary team* scored 0.10. The statement is included in the audit tool as: *Standard 8: Policies and procedures regarding IPC practices in the OR are evident, Standard 10: Clinical skills of the multi-disciplinary team are assessed, Standard 11: Every person entering the semi-restricted and restricted area of the OR adheres to PPE* and *Standard 12: Hand hygiene practices are evident.*

6.4.10 Communication structures

The concourse statement relevant to this statement is: *Communication strategies in the OR are evident.* Evidence was found to support the statement.

Communication patterns in the operating room is diverse in format and type. Communication is defined as "… a process of acting on information" (Stevens, 1950), "… transmission of information, ideas, emotions, skills, etc., by the user of symbols-words, pictures, figures, graphs, etc." (Berelson and Steiner, 1964). Du Plessis *et al* (2010) defines communication as "a core component of sound relationships,

collaboration and cooperation, which in turn are essential aspects of professional practice" (Du Plessis *et al*, 2010).

According to R2598(s) the registered nurse acts as the patient's advocate. This entails that the health care provider in the operating room has the responsibility to develop and maintain communication strategies that will enable them and the team to render reasonable patient care (Armstrong *et al*, 2013).

Ineffective verbal communication patterns leads to tension between members of the surgical team. This is supported by a study that suggests wasting of time, compromised team work, wastage of resources and procedural errors is directly linked to failed communication structures in the OR. Four types of communication failures were also identified (Baker *et al*, 20004). The study further suggests that formal communications structures are essential to optimise team work in the OR. Baker *et al* (2004) concluded that engagement with Surgical Pause forces the multi-disciplinary team to collaborate irrespective of individual communication preferences.

Written communication structures are patient lists, daily staff delegation lists, the peri-operative patient document and the OR register (Netcare, 2012). Written communication structures relating to sterility control in the operating theatre include sterility indicators on packs, tracking systems on sterile packs, service dates and log books of sterilisers and equipment as well as environmental hygiene audits (Netcare, 2012). The value of written relevant and updated policies and procedures must not be underestimated as it provides structure and guidelines to staff members (Muller, 2013).

Symbolic and behaviouristic communication include the identification of certain symbols signifying information (Muller, 2013). When the operating team is dressed in sterile theatre attire around the operating room table a sterile field has to be maintained. As soon as the scrub nurse pushes a trolley outside the sterile field it may imply that the floor nurse may discard the contents.

The diversity of the multi-disciplinary team contributes to challenging intercultural communication structures (Derrida, 1968). In the operating room theatre various staff members from different cultures, with unique behaviours, languages and physical barriers need to be aware of communication challenges and structure.

Although the participants scored the statement negatively (-0.57), it is included in the audit tool as: *Standard 2: There is an OR IPC Committee that is appropriate for the goals of the service and that supports quality care of patients in the operating room*, *Criteria 2.2, Standard 4: The physical building, design and fixtures in the OR adhere to legislation, Criteria 4.13, Standard 5: Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms, Criteria 5.4, Standard 6: Water quality contributes to the prevention of infection and distribution of micro-organisms, Criteria 6.4, Standard 7: Additional building and construction practices supports the quality of the IPC practices in the OR, Criteria 7.1, Standard 8: Policies and procedures regarding IPC practices in the OR are evident, Criteria 8.2, Standard 9: Human Resources are managed to maintain IPC structures in the OR, Criteria 9.3, Standard 10: The clinical skills of the multi-disciplinary team are assessed, Criteria 10.1, Standard 11: Every person entering the semi-restricted and restricted area of the OR adheres to PPE, Criteria 11.7, Standard 12: Hand hygiene practices are according to evidence based practices, Criteria 12.2, Standard 13: The application of basic sterile technique is evident, Criteria 13.10, Standard 14: The management of single-use items are evident, Criteria 14.3, Standard 15: Human tissue is managed according to evidence-based practices, Criteria 15.2, Standard 16: Waste in the OR is according to evidence-based practices, Criteria 16.7, Standard 17: Equipment is managed according to evidence based practices, Criteria 17.3. Standard 18: Endoscope equipment is managed according to evidence based practices, Criteria 18.3, Standard 19: Anaesthetic equipment is managed according to evidence based practices, Criteria 19.2, Standard 20: Medication management in the OR is according to evidence based practices, Criteria 20.10 , Standard 21: Practices to maintain patient body temperature control are evident, Criteria 21.3, Standard 22: Hair removal practices are according to evidence based practices, Criteria 22.3, Standard 23: Practices to manage blood glucose control throughout the procedure is evident, Criteria 23.2, Standard 24: Environmental control practices are evident, Criteria 24.2, Standard 25: Cleaning and disinfection programme is evident in the OR, Criteria 25.8, Standard 27: The CSD area is managed according to evidence based practices, Standard 28: A preventative maintenance programme is evident* and *Standard 29: The surgical site infection rate and practices reflect international acceptable care.* Two additional standards 30 and 31 were added in the final audit tool, which also includes communication practices.

6.4.11 Specific disease management

The concourse statements relevant to this statement is: *Guidelines for the management of specific diseases in the OR are available and implemented*. *The immunisation programme of the staff is evident.* Evidence was found to support the statement.

Guidelines and policies regarding the management of diseases in the peri-operative environment should be available to all. Collaboration with micro-biologists, product managers, cleaning and nursing staff is unavoidable in the planning phase of the procedure to ensure adherence to evidence-based practices. Goodfellow *et al* (2013) and the Operating Suite Guideline of the Children's Hospital at Westmead (Operating Suite, 2013) lists recommendations regarding patient placement, PPE and anaesthetic equipment management per known pathogen in the operating room theatre. Pathogens listed are MRSA (Methicillin Resistant Staphylococcus Aureus), TB (Tuberculosis), MDRTB (Multi-drug Resistant Tuberculosis) and CJD (Jacobs Creunzfeldt Disease) (Goodfellow *et al*, 2013). The multi-disciplinary team's compliancy to these recommendations should be monitored.

The OHS and IPC coordinator as well as the OR unit manager, and the medical microbiologist should be informed of any procedures planned, or performed as emergency procedures on patients who is compromised. Exposure to the number of staff during the peri-operative phase must be minimised, and clearly communicated to all staff members involved for example, the patient will not be recovered in the recovery room area but inside the OR and then transferred to the ward. Netcare (2014) demands all healthcare workers are on a prophylactic immunisation programme as stipulated by National Core Standards.

The participants scored *Guidelines for the management of specific diseases in the OR are available and implemented* positively (0.86). It is included in the audit tool as an indicator: *There are policies regarding specific disease management and isolation techniques in the OR* in *Standard 8: Policies and procedures regarding IPC practices in the OR are evident,* Indicator 3.

The participants scored *The immunisation programme of the staff is evident* negatively (-0.05). It is included in the audit tool as indicator 22: *An immunisation programme for all staff in the OR is evident* in *Standard 9: Human resources are managed to maintain IPC structures in the OR.*

6.4.12 Hand hygiene

The concourse statement relevant to this statement is: *Hand hygiene practices are evident*. Evidence was found to support the statement.

In the operating room environment one has to differentiate between hand hygiene practices conducted by un-scrubbed members and those practised implemented by members that is part of the surgical scrub team. The CDC classifies the following techniques as acceptable hand washing: routine hand wash with water and ordinary soap, antiseptic hand wash with water and antimicrobial soap, surgical antisepsis with water and antimicrobial soap as well as antiseptic hand rub with an alcohol-based hand rub (Centre for Disease Control and Prevention, 2014).

According to Ford *et al* (2012) a practitioner's hands can be contaminated while assisting with even basic patient activities for example assisting with movement of a patient. These transient flora can easily be removed through hand washing. The bacterial pathogens that is referred to are Klebsiella, Vancomycin Resistant Enteroci, S Aureus, C Difficile and gram negative bacteria.

Ford *et al* (2012) also states that there is a bacterial increase on hands when finger nails are longer that 2mm, artificial nails and nail polish and that a finger ring enhances the growth of gram-negative bacilli. The NHS supports this statement by recommending that all wrist watches, jewellery, nail polish and artificial nails are removed when entering an operating room environment (Davies, 2013).

Ford *et al* (2012) published guidelines relevant to hand hygiene practices and is summarised: Hands must be washed before and after patient contact, after contact with the immediate environment of the patient, before donning and after removing unsterile gloves, after rest room use and before eating, all jewellery, artificial nails and nail polish must be removed before hand washing, hands must make contact with an anti-microbial soap for at least 15 seconds before rinsing, single-use towels are preferred, alcohol-based hand rub must be allowed to dry before gloves are donned and the same pair of gloves must not be used on more than one patient (Ford *et al*, 2012).

Hold went so far as to recommend that patients should be given the opportunity to comment on the standard of hand hygiene of nurses and doctors during their stay in hospital (Hold, 2011).

The scrubbing of hands by the operating team are described in training curriculums, regulated by the Department of Health Regulation 212 of 1993 (Department of Health, 1993) and indicates a five minute wash in total of which two minutes is the scrubbing of nails only. Washing is done up to five centimetres above the elbow. Scrubbing of skin is not recommended (Phillips, 2016).

Andersson (2013) published the following as reasons for health care workers not to adhere to basic hand-hygiene practices: shortage of soap, towels and basins, lack of evidence-based knowledge, shortage of staff and overcrowding of patients, skin irritation and skin dryness caused by the available soap and the perceived negative impact of regular hand hygiene on the patient- healthcare worker relationship (Andersson, 2013). Compliance to the practice is product, event and level of training related and has to be re-enforced continuously. Compliance to hand hygiene practices has a strong moral and ethical undertone especially in an operating room where healthcare workers are isolated from patient and visitor observation.

The participants scored the statement the highest (1.81). It is included in the audit tool as *Standard 12: Hand hygiene practices are according to evidence based practices.*

6.4.13 Antibiotics

The concourse statement relevant to this statement is: *Prophylactic antibiotics are administered according to evidence based practices.* Evidence was found to support this statement.

Prophylactic antibiotic is defined as an antibiotic that prevents an initial infection, pre-existing infection or a medium that prevents colonisation of an organism that may lead to an infection (Auwaerter *et al*, 2013).

As half-life indicators of antibiotics differ and blood loss of the patient intra-operatively is unpredictable the dose and re-dosing interval per hour of each antibiotic should be adjusted per individual patient's needs. It is important that there is collaboration between anaesthetists and pharmacists to ensure dissemination of evidence-based recommendations. It is therefore reasonable to expect updated information to be available to use as reference in the intra-operative environment for example a list with the following information: Antimicrobial Agent Recommended for Specific Procedures, Adult Dose, Paediatric Dose, Half-life with Normal Renal Function and

Recommended Re-dosing Interval (Auwaerter *et al*, 2013). Prophylactic antibiotic use can only be effective when used in conjunction with an Infection Prevention Programme.

The participants scored the statement positively (1.14). It was included in the audit tool in: *Standard 20: Medication management in the OR is according to evidence-based practices, Criteria 20.10, Indicator 51: An updated guideline regarding the use of prophylactic antibiotics are available and implemented.*

6.4.14 Medication management

Concourse statements relevant to this statement is: *All medication is managed according to evidence based practices*. *Sterile store and stock rooms are managed according to evidence-based practices*. Evidence was found to support the statements.

Contamination of medication in the operative area is easily overlooked as the source of an infection. This is supported by Hold (2011). Coovadia *et al* (2014) published recommendations to ensure a patient is not contaminated with devices used on the previous patient. Needle and syringe guidelines, as well as management of multi-and single-dose vials, are discussed. As most of the medication is delivered via intra-venous (IV) access in the operating room, the maintenance of the IV-line is imperative. Coovadia *et al* (2014) also supports the integration of infection control practices as part of the curriculum of anaesthesiologists.

Ms Lisa Fleetwood-Jones, Pharmacist at Fressenius Kabi Manufacturing SA Confirmed that the temperature of fluid warmers should not exceed 37^{o}C and that IV bags should not be warmed for longer than seven days by letter on 1 February 2015.

Hold (2011) indicates that drug and IV-site contaminated areas have been reported when mixed-solutions e.g. ephedrine, phenylephrine or saline have been shared between patients and that 3.3% of all syringes used become compromised when in contact with the IV-port closest to the intravenous cannula. Good Pharmacy Practice describes the management of medication fridges, store rooms and preparation guidelines (Department of Health, 2014).

The participants scored: *All medication is managed according to evidence-based practices* as -0.29 and *Sterile store and stock rooms are managed according to evidence-based practices* as 0.24. These statements are included in the audit tool

as: *Standard 20: Medication managed in the OR is according to evidence-based practices.* Criteria included in the standard is: *20.1: Medication store rooms are managed according to evidence-based practices, 20.2: Medication trolleys are managed according to evidence based-practices, 20.3: Medication ampules, vials and tube usage are according to evidence-based practices, 20.4: Medication refrigerators are managed according to evidence-based practices, 20.5: IV-Therapy is managed according to evidence-based practices, 20.6: CVP-lines are managed according to evidence-based practices, 20.7: Arterial lines are managed according to evidence-based practices.*

6.4.15 CSD Design and Store Rooms

The concourse statement relevant to the statement is*: The structure of the OR design adheres to legislation. Sterile store and stock rooms are managed according to evidence based practices.* Evidence was found to support the statements.

The decontamination cycle provides the theatre team a safe environment to manage sterile, clean and contaminated instrumentation. It is common practice in the UK to utilise a Centralise Sterilising Department, not part of the hospital, for repossessing of instrumentation. This is not practice in South Africa and reprocessing occurs locally in the operating room theatre's own CSD department. In some of the CSDs decontamination and cleaning is also done manually as no washer-disinfectors available.

The physical design of the OR should accommodate the maintenance of the decontamination cycle, and ensure segregation of sterile and contaminated instruments and packs via clearly defined routes.

Regulation 158 specifies the minimum floor space required per theatre in the CSD area (Department of Health, 1996). Phillips describes the cleaning, maintenance and management of the sterile store room in detail (Phillips, 2016).

The participants scored: *The structure of the OR design adheres to legislation -1.10,* and: *Sterile store and stock rooms are managed according to evidence based practices* as 0.24. These statements are included in the audit tool in: *Standard 4: The physical building, design and fixtures in the OR adhere to legislation, Criteria: 4.10: CSD area adheres to legislation* and *Standard 27: The CSD area is managed*

according to evidence based practices, Criteria 27.31: Sterile store rooms are managed according to evidence based practices.

6.4.16 Disinfection and Sterilisation

The concourse statement relevant to disinfection and sterilisation practices is: *Disinfection and sterilisation procedures are implemented according to evidence-based practices. Gluteraldehyde is managed according to evidence based practices.* Evidence was found to support the statement.

The success of disinfection, decontamination and sterilisation of items depends on device design and constructions, flow patterns of sterilant, lumen diameter and length, protein and salt residue, type of pathogen, bio- burden and cleaning methods (Ford *et al*, 2012). Combined with human factors and environmental (OR, CSD, sterile store room) management and work flow systems, the successful processing of instrumentation demands a combination of technical and practical interventions.

The following concepts are defined:

"Disinfection is a process that eliminates any or all pathogenic micro-organisms except bacterial spores" (CDC, 2008).

"High Level Disinfection (HLD) is a disinfectant the same as a sterilant but with a shorter exposure period" (CDC, 2008).

"Low Level Disinfectant (LLD) is an agent that kills most vegetative bacteria, some fungi and viruses with a ten (10) minute exposure" (CDC, 2008).

"Intermediate-Level Disinfectant (ILD) is an agent that might be bacterialcidal for mycobacteria, vegetative bacteria, most viruses and fungi" (CDC, 2008).

"Chemical sterilant is a disinfectant that kills spores with prolonged exposure time (3-12 hours)" (CDC, 2008).

"Cleaning is the removal of visible soil from objects using water, detergents or enzymatic products" (CDC, 2008).

"Sterilisation is a process that destroys or eliminates all forms of microbial life by physical or chemical methods." CDC 2008

"Biofilm is microbial communities that are tightly attached to surfaces" (CDC, 2008).

The CDC (2008) published a list of micro- organisms with recommended disinfection and sterilisation methods as well as a summary of the different chemical agents that can be used as sterilisation methods indicating the advantages and disadvantages as well as a table of sterilisation technologies. It is recommended that this data is available in the CSD units.

Participants scored the statement 1.43. This statement is included in the audit tool in Standard 27: The CSD area is managed according to evidence based practices. Gluteraldehyde is “a high level disinfectant for repossessing heat sensitive semi-critical devices, for which sterilisation is not suitable” as indicated by Johnson and Johnson (2006). Gluteraldehyde is compatible with the following materials: aluminium, brass, carbon steel, chrome plated brass, copper, stainless steel, titanium, nylon, polyester, polypropylene and silicone rubber, and will have an effective on vegetative organisms, fungi, some enveloped and non-enveloped viruses if recommendations are followed.

Product instructions must strictly be adhered to. Coovadia *et al* (2013) concluded that ignorance, lack of training and intra-operative time constraints are main reasons for healthcare workers not to comply with user instructions. Netcare 2014 describes the management of gluteraldehyde in detail.

The participants scored the statement -0.48. This statement is included in the audit tool in *Standard 18: Endoscope equipment is managed according to evidence based practices, Criteria 18.2: Measures are in place to prevent cross-infection with contaminated endoscopes. Standard 27: The CSD is managed according to evidence based practices, Criteria 27.4: Manuel decontamination practices are maintained according to evidence based practices*.

6.4.17 Equipment management in CSD

The concourse statement relevant to equipment management in the CSD is: *Sterilisation and decontamination equipment are managed according to evidence-based practices*. Evidence was found to support the statement.

Decontamination and sterilisation equipment includes washer disinfectors, high pressure air hoses, steam, ethylene oxide, plasma and formaldehyde sterilisers, load trolleys, drying shelving and sealers. The Centre for Devices and Radiological Health defines process validation as “establishing by objective evidence that a

process consistently produces a result or product is meeting predetermined specifications" (Department of Health and Human Services, 2011). Reprocessing is defined as "validated processes used to render a medical device, which has been previously used or contaminated and is designed to remove soil and contaminants by cleaning and inactivation of microorganisms by disinfection and sterilisation" (Department of Health and Human Services, 2011).

Denise Sheard (2013) demands that the validation certificates, service records and maintenance schedules of all cleaning, decontamination and sterilisation equipment to be available in the CSD. Sheard (2013) published procedures regarding the cleaning, disinfection and sterilisation of medical devices. The United States of America's Department of Health and Human Services (2011) published criteria that must be available as regulated by the FDA when medical devices are purchased e.g. instructions regarding cleaning, disinfection and sterilisation processes when devices as purchased.

Policies and procedures regarding each equipment must be available as well as proof of communication to CSD staff.

The participants scored the statement 1.05. This statement is included in the audit tool in *Standard 27: The CSD is managed according to evidence based practices, Criteria 27.5: The ultrasonic washer is managed according to evidence based practices, Criteria 27.6: The automated washer is managed according to evidence based practices, and Criteria 27.8: Sterilising equipment in the CSD area are managed according to evidence based practices.*

6.4.18 Staffing in CSD

The concourse statement relevant to human resources in the CSD is: *There are enough qualified staff allocated per shift to maintain IPC practices*. Evidence was found to support the statement.

The CSD manager must have a qualification and/ or experience in the management of the service, staff development and training must be planned and evidence of accountability lines clearly defined (Netcare, 2012). Sheard (2013) suggests staffing numbers and delegation of tasks that allows for the maintenance of the decontamination cycle without contaminating instrumentation by changing work patterns.

Participants scored this statement 0.14. The statement is included in the audit tool in *Standard 27: The CSD area is managed according to evidence based practices, Criteria 27.1: Human Resources contributes to the objectives of the CSD department.*

6.4.19 Instrumentation

The concourse statement relevant to instrumentation is: *Instrumentation management is implemented according to evidence based practices.* Evidence was found to support the statement.

Dr Earle Spaulding categorised medical devices according to their use into three groups. Critical items enters sterile tissue and can only be used if it has been sterilised. Semi- critical items are regarded as items that only come in contact with mucus membranes and intact skin and that high-level disinfection is recommended. Non-critical items that only come in contact with intact skin and disinfection is the cleaning method of choice. Due to the discovery of new micro-organisms, and resistant bacteria and viruses the use of the Spaulding Classification alone has been criticised. It is therefore recommended that processing decisions of medical devices should rather be based on disease-contact rather site or area contact (Ford *et al*, 2012).

According to the United States of America's Department of Health and Human Services (2011), cleaning is regarded as an important first step in the process as the quality of disinfection and sterilisation depends on it. Difficult-to-clean devices might demand disassembly before cleaning. Directions for reassembly of devices, have to be available in the unit. The cleaning agent used must be compatible with the instrument. The method of agent preparation should be available and meticulously followed.

To minimise friction between metal sections of certain instruments, lubricants are used to manage the problem. Oil- and silicone-based lubricants are not recommended as it can favour micro-organism growth despite of the sterilisation process. All instruments are visually inspected for cleanliness under good lighting and magnification. Decontaminated instruments are send to the so called *clean area* where the instruments are re-checked, packed labelled and sterilised.

There has been a controversy regarding marking and colour code taping of instruments to assist the CSD worker with the packing process of instrument sets.

Instrument colour code marking tape is not only expensive but has to be checked and removed after each use as the tape becomes brittle after a few autoclave sessions. This by itself poses a real danger in the intra-operative area, as pieces of tape can dislodge from the instrument into an open wound in the sterile field. Engraving of instruments are common practice. This destroys the passivation layer of the instrument (chromium oxide) that protects the steel against corrosion. After cleaning, instruments must be sprayed with a lubricant oil paying special attention to screw joints (SAFMED, 2011).

The content of each set should be revised on a regular basis. The ultimate goal is to have a comprehensive set of instrumentation during the intra-operative phase without adding extra instrumentation or opening additional instrumentation sets. Unfortunately instrumentation sets can be heavy, and damage the wrapping or covers of the set. Bigger instrument baskets/ sets also make the set unmanageable and challenging to fit onto a theatre trolley. Basic sterile principles as well as quality set management have to be maintained throughout the storing, transport and set-up of instrumentation (Sheard, 2013). The average length of a theatre trolley is 91cm with a width of 45cm and height of 81cm. For a scrub nurse to adhere to basic sterile principles it is important that the set fits completely onto the sterile trolley completely without it hanging over the edges (Phillips, 2016). It is recommended that each set should not weigh more than 25 pounds or 11.4kg (AORN, 2013).

It is recommended that instruments are not clamped during sterilisation but slightly opened to allow sterilant penetration and contact on all surfaces. Some manufacturers recommend that the tips of the instruments are covered with protectors. Heavy instruments must be placed first to avoid damage to lighter instruments. If receivers, bowls and basins are added to the set they have to be placed in such a way that it allows for draining of water. Sterile indicators are placed inside every set. A chemical indicator is inserted where the set is most dense. If linen is added to the set it has to be placed on top of the instruments and bowels (Sheard, 2013). If the CSD department is separate from the operating room theatre, sterile sets are transported in sealed containers. Separate containers are utilised for sterile and contaminated sets.

The participants scored the statement 1.19**.** The statement is included in the audit tool in *Standard 27: The CSD area is managed according to evidence based practice.*

6.4.20 Loan set management

The concourse relevant to loan set management is: *Sterilisation of loan sets are managed according to evidence-based practices.* Evidence was found to support the statement.

Netcare (2014) defines a loan set as “a medical device (instrument set) brought into healthcare facility for a procedure for a specific case”. In reality loan sets are ordered from numerous medical companies as loan units to be used in procedures. These loan sets are used in numerous hospitals and are couriered by the company from hospital to hospital. Decontamination and cleaning of the specific loan set before and after use becomes challenging.

Netcare (2014) recommends that loan sets are received in the CSD area and not the main theatre to minimize the risk of contamination and that every set is decontaminated (washed) and sterilised before and after use. The responsibility of these processes lies with the user (hospital) and not the supplier (medical company). The supplier has to provide the hospital with decontamination and sterilisation recommendations as well as training opportunities for CSD workers. Sheard (2014) described the process in detail.

The participants scored the statement 0.67. The statement is included in the audit tool in *Standard 27: The CSD area is managed according to evidence based practices, Criteria 27.9: Loan instruments are managed according to evidence based practices.*

6.4.21 Personal Protective Equipment (PPE)

The concourse statement to the use of PPE (Personal Protective Equipment) is: *The multi-disciplinary team’s compliance to, and availability of PPE is evident.* Evidence was found to support the statement.

OSHA defines Personal Protective Equipment as “Specialised equipment or clothing worn by an employee for protection against a hazard” (Ford *et al,* 2012).

Scrubs suits were introduced as standard dress code in the Operating Room environment in the 1950’s. Studies done by Dankert revealed that cotton-polyester-blend scrub suits reduces the amount of CFU’s (bacterial contamination measured by colony forming unit counts) (Marc *et al*, 2014). Males tends to shed larger numbers of

CFU's compared to females but that females wearing skirted scrubs shed more CFU's than those wearing pants. The wearing of knee-high boots over scrubs pants also had a reduction in CFU count. Marc *et al* (2014) also states that there is no study published until now that links the relation between scrubs and surgical site infections.

Theatre attire is utilised as a barrier in a specialised field. The Royal Cornwall Hospitals' Clinical Guideline for Theatre Practice Standards states that theatre attire should allow for good practice and not pose any risk to patients (Royal Cornwall Hospital, 2014). It should also contribute to the professional appearance of staff. Patients have the right to have complete confidence in the cleanliness and hygiene of the environment they are treated. All staff entering the restricted and semi-restricted area in the unit should wear theatre attire intended for wear in the operating room environment. Change rooms are provided that is neat and dry and tidy. Theatre clothes are provided from the laundry and should be in good condition. Home laundering of theatre attire is not permitted. Good personal hygiene of staff is non-negotional. When leaving the operating room you have to change back in your outside clothes and don a fresh pair of theatre clothes on return to the unit. You are only allowed to wear theatre attire outside the OR in and emergency only if your theatre attire is fully covered and fastened up.

The Royal Cornwall Hospital's Clinical Guideline for Theatre Practice Standards describes scrub suit donning techniques (Royal Cornwall Hospitals, 2014).

Annette Andersson states that contamination with airborne micro-organisms relates to the particle dispersal from staff in the operating room as well as their movements. It is also suggested that lower air permeability clothes should be worn (Andersson, 2013).

Hair, ears and the scalp can harbour S.aureus and can be a potential source of contamination (Marc *et al*, 2014). The Royal Cornwall Hospital's Clinical Guideline for Theatre Practice Standards states that all hair, including beards, braids, weaves, dreadlocks, wigs and extensions, of all staff should be covered by a disposable head cap or hood in the semi-and restricted areas. Headgear should be changed every time a fresh scrub suit is donned or if it visibly soiled. Personal hair hygiene routine is encouraged. Headgear should prevent the escape of any hair. Styles of caps available are: skullcap, bouffant and hood styles (Royal Cornwall Hospitals, 2014).

According to Marc *et al* (2014) there is mixed feelings regarding the use of head covers, and that there is no study published to date that proves that the wearing of head covers impacts on surgical site infection rates.

Face masks were developed in the early 20th century. The efficiency thereof has been in questioned in numerous debates. Marc *et al* (2014) and Croger *et al* (2010) state that there is no direct correlation between the wearing or non-wearing of fact masks and surgical site infections, nor any difference in the types of bacteria isolated from surgical wounds. It is also suggested that a surgical face masks only re-directs the projectile effects of breathing and talking and that the room CFU (bacterial contamination measured by airborne or settled colony-forming unit count) is not affected with or without the wearing of surgical face masks.

The face mask, therefor has a macroscopic, rather than a microscopic function in the sense that it protects the user more from splashes than the patient from airborne bacteria. The Royal Cornwall Hospital's Clinical Guideline for Theatre Practice Standards describes the position and handling of a surgical face mask (Royal Cornwall Hospitals, 2014).

Footwear for in- and outside the operating room has to be established. Inside shoes may not have any holes or perforations. Both the toes and heel must be enclosed. Shoes must be washed and cleaned after each shift to remove contamination of blood and body fluid (Phillips, 2016). Foot covers are available to protect outside shoes from contamination. This however should only be used as an exception than the norm as the donning and removal of the covers contaminate the user's hands. Hand washing is compulsory applying and removal of shoe covers (Phillips, 2016).

The use of space suits were introduced in the 1960's and supported by Dr Charnley and Eftekar. The space suit was used as a total body exhaust system during total joint arthroplasty procedures. Marc *et al* (2014) suggest that the total CFU's in the operating room theatre is reduced when space suits are worn but only when laminar air flow is activated in the room. There is a difference in views regarding the effectiveness of spacesuits. The cost implication of the system also has to be taken in consideration.

In 1883 Gustav Neuber used surgical gowns for the first time. A gown is defined as a covering from either disposable or reusable material with a buffer membrane to make it impermeable to fluids. Marc *et al* (2014) states that two studies by Moylan and

Garibaldi, respectively, have contradicting outcomes regarding the decrease in surgical site infections when disposable and re-usable impervious are compared. What was well established is that impervious gown material is superior to permeable cotton gowns in the prevention of surgical site infections. When reusable gowns are used the inspection of the quality of the material is important every time the gown is folded and packed to be autoclaved. This is a very labour intensive exercise and may motivate some managers to utilise disposable gowns. Sterile gowns are worn by every member of the surgical team that enters the sterile field. Gowns are regarded as contaminated items after each procedure and should be removed inside the operating room theatre before the patient is pushed to the recovery room area. After scrubbing the sterile gown is donned using a specific technique.

Due to W Halsted's initiative to wear gloves during surgery, studies have shown that his surgical site infection rate dropped from 9.6% to 1.8% Marc *et al* (2014). There is no doubt in anyone's mind that gloves during surgery is essential. The question is rather whether to double-glove or not during surgical procedures. According to Ritter et al. outer glove contamination during surgery is 30% for all inside the sterile field irrespective of double gloving or not. What has been proven by the Cochrane group study is that there is less penetration in the first glove when two gloves are worn during a surgical procedure (Marc *et al*, 2014). Donning of sterile gloves after a hand scrub session is tricky and demands special technique, referred to as closed or open method. It is not uncommon to have contamination during this process of gloving. Most sterile surgical gloves are non-powered and do not have to be rinsed after donning. It is recommended that the scrub team wears double gloves especially during the cleaning and draping phase intra-operatively when complicated procedures e.g. spinal, cranial and joint replacement surgeries are prepared for. Contaminated surgical procedures e.g. colon-rectal procedures are always challenging and double gloving and/or glove changes are common practice. There should not be a limit on the amount of sterile gloves that is allowed per procedure.

The misperception is often argued that hand washing is not necessary when gloves are worn. WHO Standard Precautions guidelines states clearly that hand washing can never be replaced by wearing gloves only (Phillips, 2016).

Non-sterile gloves should be readily available in the operating room theatre in every area of care. As soon as contact with bodily fluid is expected e.g. emptying of drains

and catheters, and during intubation and suctioning, gloves should be worn. Hand washing must follow after removing of gloves (Philips, 2016).

Contaminated instruments are washed by CSD staff wearing PPE and standard precautions are maintained throughout the process (Phillips, 2016). Only staff that has received specific training on the decontamination processes are allowed to engage in the process. The cleaning and decontamination instructions of each type of instrument should be available to the CSD staff. Written procedures and resources should be available to guide practices. (Sheard, 2013) as well as Netcare (2014) describe the wearing of PPE during manual and automated cleaning, disinfection and sterilisation.

The participants scored the statement at 0.43. The statement is included in the audit tool in *Standard 11: Every person entering the semi-restricted and restricted area in the OR adheres to PPE,* and *Standard 27: The CSD area is managed according to evidence based practices, Criteria 27.2: CSD staff members adhere to PPE policies.*

6.4.22 Specialised Equipment

The concourse statement relevant to this statement is: *Equipment is managed according to evidence based practices. Endoscope management is implemented according to evidence base management*. Evidence was found to support the statements.

Anaesthetic instrumentation is regarded as semi-critical according to Spalding (Ford *et al*, 2012). The SASA Guidelines for Infection Control in Anaesthesia in South Arica (2014) listed recommended processing methods per item. It is advisable to have the information available in the operating room department. Items of concern in anaesthesia are laryngoscope blades, laryngoscope handles, Magill forceps, re-usable nasopharyngeal temperature probes, rectal probes, bougies, intubation stylets, breathing circuits and bag valve resuscitators. Anaesthetic machine units must be disinfected and sterilised as per manufacturer's instructions. Daily inspection is recommended, as well as a protocol to manage the unit between patients (Ford *et al*, 2012).

Endoscopes are classified as semi-critical devices that requires at least high-level disinfection, and only high-level disinfection with chemical agents, or sterilisation with low temperatures are adequate. Rutala and Weber (2014) indicates that there is no

low-temperature sterilisation technology approved by the FDA for the use on gastro-endo- and duodenoscopes, and that contaminated endoscopes have been the cause of more HAI- outbreaks than any other medical device. Cleaning and disinfection practices have been anonymous with non-compliancy practices, use of damaged scopes and storage problems.

Endoscope design is complicated and channel diameter may vary between 2.8mm and 6mm, and instrument working channel diameter between 3.6mm and 1.2mm. The CRE outbreak in October 2014 in The Ronald Reagan UCLA Medical Centre in Los Angeles was linked directly to contaminated endoscopes (Chang, 20 February 2015). The hospital claimed that all re-processing guidelines have been followed and that the outbreak is due to a design flaw. Whether this statement is true or not the reprocessing protocols for any endoscope has always been challenging due to the minimal safety margin when scopes are reprocessed Rutala and Weber (2014). The introduction of the automated endoscope re-processor (AER) has replaced some manual steps but the maintenance of the re-processor itself brings new challenges.

The CDC published reprocessing guidelines but indicates that adherence to all the steps is rare Rutala and Weber (2014). Inadequate surveillance of patients result in unreliable statistical information regarding contamination as the time between colonisation and infection (lag time) of a bacteria can be long.

The participants scored the statement: *Equipment is managed according to evidence based practices* as 0.62 and *Endoscope management is implemented according to evidence based management* as 0.57. Both the statements are included in the audit tool as: *Standard 17: Equipment is managed according to evidence based practices* and *Standard 18: Endoscope equipment is managed according to evidence based practices.*

6.4.23 Documentation

The concourse statement relevant to this statement is: *Patient documentation indicate IPC practices*. Evidence was found to support the statement.

It is advisable that a standardised peri-operative document is used by the healthcare provider. Not only should it allow for patient progress reports (vital data), but also information relevant to clinical practice. The documentation should include the specific OR number where the procedure was performed, time frames of anaesthesia

as well as the procedure, date of the procedure, position of the patient on the table, cleaning solutions used, names of the multi-disciplinary team present during the procedure, hair removal practice, name of the specific incision made by the surgeon, type of suture material, prosthesis, invasive devices e.g. endo- clips, devices inserted e.g. drains used. Skin integrity of the patient is indicated pre-and post-operatively as well as the classification of the surgical site wound. The anaesthetic record should reflect the time of induction, type of anaesthetic technique, list of invasive devises inserted e.g. endotracheal tube, CVP-line, IV-line, list of all the medication administered during the procedure as well as dose and time of administration especially antibiotic agents. Patient progress reports should include: patient temperature throughout the procedure, blood glucose levels as well, hydration status of the patient, suctioning methods and ventilator settings. Serial numbers of all equipment used on the patient, as well as proof of sterile pack and instrumentation checks should be evident. All single-use items should be listed (Netcare, 2014).

A system should be in place to track proof of the decontamination and sterilisation practices of re-usable items used on every patient. A sticker-tracking system is described in detail by Sheard (2013). Every pack that has been exposed to sterilisation is marked with the following information: date, load number of autoclave cycle, number of autoclave and an external chemical indicator (Sheard, 2013). Information regarding loan set management includes a checklist with the following information: decontamination event, inspection, packing and sterilisation information (Sheard, 2013).

Other documents that support patient (case) care on a specific day, based on information in the patient's perioperative document that results in tracking of the information in the OR are: proof of validation and service reports , environmental checklist of the washing, packing, autoclave and sterile storeroom management, instrumentation checklists, autoclave cycle and washer-disinfectors status reports, results from chemical and biological indicators as well as case load results (Sheard, 2013).

The re-processing of specialised equipment for example endoscopes must be documented as well as the serial number of the equipment indicated in the patient's peri-operative document (Sheard, 2013). It is advisable that logbooks are created per equipment to allow for easy access of information.

Policies, procedures and guidelines should be relevant, updated available and unit specific. Documented proof of communication to the staff should be available (Muller, 2013).

The participants scored the statement negatively -0.43. The statement is included in the audit tool in *Standard 5: Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms, Criteria 5.4: Communication structures regarding air quality in the OR is evident,* Indicator 11: *OR temperature and humidity readings are displayed in every OR and documented in the intra-operative document. Standard 13: The application of basic sterile technique is evident, Criteria13.10: Communication structures regarding the management of basic sterile technique are evident, Indicator 96: Incidents are recorded in patient peri-operative documentation and the OR register. Standard 17: Equipment is managed according to evidence based practices: Criteria 17.3: Communication structures regarding the management of equipment is evident, Indicator 11: The serial numbers of all equipment used during the procedure are listed in the patient's peri-operative document. Standard 18: Endoscope equipment is managed according to evidence based principles. Criteria 18.3: Communication structures regarding the management of endoscopes are evident* and *Indicator 17: A log book is available indicating services and repairs to every scope* and *Indicator 18: The serial number of the scope used on every patient is indicated in the log book and peri-operative document, Indicator 24: There is evidence of active surveillance of every patient after an incident regarding endoscope management and is documented in the patients' file. Standard 19: Anaesthetic equipment is managed according to evidence based practices, Criteria 19.2: Communication structures relevant to the management of anaesthetic equipment is evident, indicator 26: The serial numbers of all anaesthetic equipment are indicated in the patients' peri-operative document. Standard 20: Medication management in the OR is according to evidence based practices, Criteria 20.10: Communication structures regarding the management of medication is evident, Indicator 52: The administration time, dose and type of medication is indicated in the patients' peri-operative document. Standard 21: Practices to maintain patient body temperature control are evident, Criteria 21.3: Communication practices regarding the prevention of hypothermia is evident, Indicator 16: Every patient's temperature is recorded pre-operatively, Indicator 17: The intra-operative temperature of the patients is recorded, Indicator 18: The type of warming device as well as the serial numbers of devices and settings are recorded in the peri-operative documentation. Standard 22: Hair*

removal practices are according to evidence based practices, Criteria 22.3: Communication practices regarding the removal of hair is evident, Indicator 5: The hair removal technique as well as the time of hair removal is indicated in the patients' intra-operative document. Standard 23: Practices to manage blood glucose control throughout the procedure is evident, Criteria: 23.1: Base line data is obtained pre-operatively and Criteria 23.2: Communication practices regarding the maintenance of the patient' blood glucose level is evident.

6.4.24 Single-use items

Concourse statement relevant to this statement is*: Single-use items are managed according to evidence based practices.* Evidence was found to support the statement.

A single-use product is an item that is manufactured with the intent to be used/ opened only once. The manufacturer should clearly indicate this on the packaging of the item. The Australian and New Zealand College of Anesthetics (ANZCA) states that single-use items should not be easy to clean as it is not designed to be cleaned after use, and that it should be discarded immediately after use or opening (ANZCA, 2013).

Ford *et al* (2012) states that the debate over single-use items will always be controversial due to the regulatory, ethical and legal as well as financial aspects involved. It also states that if a hospital decides to re-sterilise a specific single-use item the hospital then are then regarded as the manufacturer and is then subject to the same standards and rules as the primary manufacturer. It is therefore recommended that all single use used items are disposed of after single patient use or opening.

Netcare (2012) differentiates between three categories single-use items firstly as *Critical devices* - when skin penetration is evident for example intra venous cannulas, needles, blades, swabs and suture devices. Secondly, *Semi-critical devices* - items that touch mucous membranes for example endotracheal tubes and suction cannulas. Lastly, *Non-critical* - Items that is usually only in contact with the patient's skin, gauze and dressings. It is recommended that a specific policy regarding the use of single-use items are available in the operating room.

The participants scored this statement positively as 0.57.

The statement is included in the audit tool as: *Standard 13: The application of basic sterile technique is evident, Criteria13.2: The integrity of the sterile fields are clearly identified, Indicator 12: Only sterile items are used within the sterile field. Standard 14: The management of single-use items are evident. Standard 18: Endoscope equipment is managed according to evidence based practices, Criteria18.2: Measures are in place to prevent cross-infection with contaminated endoscopes, Indicator 6: A single-use brush is used per cleaning session, Indicator 15: Only single-use endoscopy instrumentation is used e.g. bite blocks, biopsy needles and forceps.*

6.4.25 Linen Management (OR scrub suits, sterile gowns and towelling)

The concourse statement relevant to this statement is: *Towelling, draping and linen management is according to evidence-based practices*. Evidence was found to support the statement.

Oullet *et al* (2014) differentiated between the different types of materials that is currently used in operating rooms as cotton, cotton/ polyester, micro-filament yarns, laminates and single-use products. The benefits and limitations of each type are clearly described and must be taken in consideration when products are chosen.

Denise Sheard (2013) describes the procedure for decontamination and handling of textiles and linen. Policies and procedures for the handling of linen should be relevant, available in the unit with proof of communication to staff.

Nancymarie Phillips (2016) defines draping as the procedure of covering the patient and area surrounding the operative site with sterile towels to create and maintain an adequate sterile field during the procedure. An effective barrier eliminates or minimises the passage of micro-organisms between non-sterile and sterile areas. Draping as a technique taught to Operating Room Theatre students has been revised over years to accommodate procedural demands and evidence-based practices for example the use of an ioban film to secure drapes and procedural specific disposable drapes (caesarean section drape). Adherence to basic sterile principles during the draping process is imperative. Proof of revised policies and procedures as well as communication to staff is important (Phillips, 2016). Specially designed linen e.g. mayo cover (pillowcase cover) is used to drape a mayo table or the patient's legs when the patient is in lithotomy position in the sterile field. Care needs to be taken as

thread counts are altered due to stitch lines at seam areas. This implies that a mayo cover should be used in conjunction with other drapes.

Ford *et al* (2012) states the OHSA definition of contaminated laundry as “laundry which has been soiled with blood or other potentially infectious materials or may contain sharps” (Ford *et al*, 2012). It also states that colour coded plastic bags should be used to transport linen by employees that complies with Standard Precautions. The laundering of scrubs at home versus at a centralised laundry of the hospital is controversial. Ford *et al* (2012) suggests that home laundering of scrub suits are permissible as long as the clothes have not been contaminated with blood or other infectious material. It does recommend that a large number of viruses are reduced when bleach is added to the detergent. It further suggests that if scrub suits are changed on a daily basis it will harbour less resistant bacteria.

The participants scored the statement positively as 0.29.

The statement is included in the audit tool as: *Standard11: Every person entering the semi-restricted and restricted area of the OR adheres to PPE, Criteria 1: Theatre attire is available to everyone entering the OR and all the indicators, Standard 13:*

The application of basic sterile technique is evident, Criteria 13.6: Scrubbing, gowning and gloving procedures contribute to basic sterile technique, Indicator 46: Gowns are donned without contamination, Indicator 48: All ties of the gown is tied at the back, Indicator 49: The sterile gown is long enough to cover up to under-knee level, Indicator 50: The front tie is tied with the assistance of another scrubbed person, Indicator 51: Sterile gowns are regarded as sterile from front waist level to front shoulders and from the sleeve-cuff to the elbow, Criteria 13.7: Cleaning and draping of the patient contributes to basic sterile technique, Indicator 58: Drapes are placed with smooth movements without fiddling, Indicator 61: Drape style allows for re-positioning of the patient e.g. envelope drape for extremities as procedural requirement, Indicator 62: Miss-placed drapes are not repositioned but discarded, Indicator 63:The area closest to the scrub nurse is draped first to avoid possible contamination, Indicator 64: A sterile water and alcohol repellent drape surrounds in incision area, Indicator 71: Extra drapes and barriers are available to re-drape if needed during the procedure, Indicator 73: Sterile drapes are only removed once the incision site is closed and a dressing applied.

6.4.26 Medical Waste

The concourse statement relevant to this statement: *There is evidence of medical waste and sharps management practice.* The researcher found evidence to support the statement.

Medical waste does not only have a direct impact on the operating room environment, but on the whole hospital and public due transportation routes and storage areas of medical waste that has to be maintained. Infections associated with medical waste mal- management are: Aviation Influenza, Viral Hepatitis A, B and C, Bacteraemia, Haemorrhagic Fevers, Meningitis, AIDS, gastroenteric-, respiratory-, ocular- and skin Infections (Wold Health Organization Module 1, 2012).

Every person in the peri-operative environment is compromised if the medical waste programme is not adhered to. The World Health Organization (2012) supports this statement by listing all nurses, doctors, patients and cleaners as people at risk of being contaminated in the operating room (World Health Organization Module 2, 2012).They also indicate that abrasions, cuts, punctures with sharp objects as well as mucous membrane exposure, ingestion and inhalation are the most common routes of contamination with infected objects.

The management of sharp objects are challenging. Hutin *et al* (2005) indicates the frequency of percutaneous injury in South-Africa according to: Recapping of Needles- 17.4%, Stuck by Colleague- 7.2%, During Disposal- 9.6%, and Unattended Needle- 4.8% (Hutin *et al*, 2005).

The management of sharp objects as well as container management and design should be documented in policies and procedures and communicated (Ford *et al*, 2012). Netcare (2015) requires that the unit manager is appointed as the Assistant Healthcare Waste Officer, a service waste management plan is relevant and updated. The operating room theatre is the main producer of medical and anatomical waste.

The healthcare provider has a contract with a medical waste company that specialises in the collection, transport and disposal of all types of medical waste. The company supplies the service with containers according to the service's needs. Health Protection Scotland recommends that waste bags should not be more than ¾ full, and that waste in liquid form for example blood should first be changed to a gel

form before disposal (Health Protection Scotland, 2014). Anatomical waste should be removed from the operating room theatre as soon as possible. The waste is kept in a specific area in the theatre until it is removed. A specific register is kept indicating date, time and person that removed the waste (Rothrock, 2015). Cleaners handling medical waste should adhere to PPE and standard precautions (Rothrock, 2015).

The participants scored this statement positively as 0.76. This statement is included in the audit tool as: *Standard 16: Waste in the OR is managed according to evidence based practices.*

6.4.27 People movement in the OR

The concourse statement relevant to this statement is: *A policy minimising people movement in the OR is available and implemented.* Evidence was found to support the statement.

The degree of contamination of the intra-operative area is not only dependant on working systems, but also behaviour control of the people working in the unit. It has been established that there is a direct correlation between the number of people in the intra-operative area and the bacterial load in the same area. Amicizia *et al* (2013) supports this statement by stating that too many people in the intra operative area can be due to procedural errors, stress, ineffective operative technique, communication and equipment errors and organisational problems. Marc *et al* (2014) states further that there is a correlation between bacterial colony-forming contamination and the amount of door openings in the intra-operative area. Annette Andersson (2013) confirms that contamination with airborne micro-organisms relates to the particle dispersal from staff in the operating room as well as their movements (Andersson, 2013).

The participants scored this statement negatively as -0.19. This statement is included in the audit tool as: *Standard 5: Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms, Criteria 5.2: Staff movement is monitored, Indicator 3: One scrub nurse, one floor nurse and one anaesthetic nurse is allocated per procedure in the OR, Indicator 4: Theatre double doors are only utilised when patients are transported to and from the OR.*

6.4.28 *Turn-over-time* management.

The concourse statement relevant to this statement is: *Policies regarding turn-over time management is evident and implemented.* Evidence was found to support the statement.

The operating theatre staff is under constant pressure to work at a pace that will ensure the maximum amount of procedures are completed in the least amount of time. This practice demands a team approach to manage the period between the removing one patient from the intra-operative area, and placing the next patient on the operating table called *Turn-over- time.* Kelly Pyrek (2014) states that a clean intra-operative area should be established as soon as the patient is removed from the area (Pyrek, 2014). This does not only include the contaminated furniture and floors but also specialised equipment for example anaesthetic circuits and intubation equipment. There should be clear policies indicating the responsibilities of each team member including the scrub, anaesthetic and floor nurse as well as the cleaning staff during this time period.

A study done by Coovadia *et al* (2013) indicated that 68% of nurses that participated in the study indicated that they do not have enough time between cases to adequately clean anaesthetic equipment (Coovadia *et al*, 2013).

The participants scored the statement negatively as -1. The statement is included in the audit tool as: *Standard 26: Practices during turn-over time is according to evidence based practises.*

6.4.29 Targeted cleaning

The concourse statements relevant to the statements are: *Targeted environmental cleaning is evident. The SMART UVC for decontamination of the OR is evident. Guidelines for the management of specific diseases in the OR are available and implemented* and *Environmental control practices are evident.* Evidence was found to support the statements.

Kelly Pyrek states that most patients still have "… shiny floor syndrome" (Pyrek, 2013) but it does not mean that cleaning is up to standard. Pyrek also published Carling's studies on environmental cleaning, indicating that only 48% of surfaces are cleaned in a hospital environment (Pyrek, 2013). She states that the following

pathogens are transferable from contaminated surface areas: noroviris, C difficile, MDR-Acinetobacter, S. aueus, MRSA and VRE (Pyrek, 2013).

Declaro and Gebremariam (2015) reports on a study done in Ethiopia, where *bacillus* was identified as the most common microorganism sampled on 77% of all the surfaces sampled in the operating room. General surgery presented with 53.7% *staphylococcus* as well as the highest *aspergillus* count of 13%. Davies (2013) recommends that all horizontal surfaces, lights and equipment is cleaned daily by damp dusting before the start of the first list. Damp dusting is described as the wiping of surfaces with a lint-free cloth or detergent wipe. The wiping technique is also described (Davies, 2013).

Ford *et al* (2012) categorise surfaces as critical and non-critical surfaces including recommended cleaning methods. Terminal cleaning of un-used theatres on a daily basis is also recommended to reduce contamination. Protective coverings e.g. plastic wrap, foil or paper to protect surfaces and equipment when not in use is recommended (Ford *et al*, 2012).

Goodfellow *et al* (2013) suggests that theatre staff mop the floor with disposable equipment before cleaning staff does the actual cleaning. If chlorine is used as detergent the surfaces has to be rinsed again with water.

Sheard (2013) demands specific environmental cleaning of the CSD area before work starts and rotating of cleaning schedules to accommodate work schedules. She states that the cleaning of the CSD area should be done by CSD staff that is trained in the process and schedules. She also recommends that a monthly cleaning audit is performed at random times by senior management.

Pyrek (2014) stresses that one of the functions of the multi-disciplinary team is to determine specific cleaning schedules for all areas in the Operating Room, and that the designated staff are allocated to these duties. The importance of relevant policies and procedures are also emphasized. Phillips (2016) requires evidence of additional specialists training of staff in cleaning processes and also demands a pest control programme to be implemented.

Cleaning recommendations for specific diseases are published by Operating Suite Guideline: Infection Control Standard and Additional Precautions for the Operating Suite (2013) and should be available in the unit as reference.

Netcare (2012) describes the control and prevention from infestation of pests and rodents as a preventative measure to be an essential element in a clean environment.

The participants scored the statements as: *Targeted environmental cleaning is evident* negatively as -0.05, *The SMART UVC for decontamination of the OR is evident* positively as 0.52, *Guidelines for the management of specific diseases in the OR are available and implemented positively* as 0.86 and There is evidence of a pest control programme in the OR negatively as -0.62. The statements are included in the audit tool in *Standard 24: Environmental control practices are evident* and *Standard 25: A cleaning and disinfection programme is evident in the OR.*

6.4.30 Human tissue management

The concourse statement relevant to this statement is*: Human tissue management adheres to evidence based practices.* Evidence was found to support the statement.

After human tissue is harvested, it is handled by numerous people before it reaches the laboratory. The concern is not only the contamination of the specimen itself, but also the contamination of the healthcare workers handling the specimen as well as the environment. AST (2008) published standards on the management of specimens and refers to specimen management before laboratory involvement as the *pre-analytic phase,* and concluded that miss-labelling of specimens are common. AST (2008) further recommends functional multi-disciplinary teamwork as a requirement for specimen management. The use of PPE by all surgical team members is encouraged as it is common practice for the scrub nurse to pass the specimen to the floor nurse after harvesting. Care should be taken to immerse the specimen in the preferred preservative to prevent splashing and spilling of the preservative. Netcare (2012) also demands specimen handlers to comply with PPE policies as well as a focus on labelling and intra-operative documentation.

The participants scored the statement positively as 0.62. The statement is included in the audit tool in *Standard 15: Human tissue is managed according to evidence based practices.*

6.4.31 Body temperature control

The concourse statement relevant to this statement is: *There is evidence of regular body temperature control of patients peri-operatively.* Evidence was found to support the statement.

Hypothermia is regarded as a body temperature of 36^{o}C and lower. Vasoconstriction, sweating and the ability of shiver are inhibited by most anaesthetic agents e.g. propofol, alfentanil, desflurane and isoflurane, which results in impaired thermoregulation (Sessler, 1997). Hypothermia occurs in three stages in the operating room. According to (Christenesen *et al*, 1995) the patient loses 1-1.5^{o}C after receiving the first anaesthetic agent Due to altered vasoconstriction, body heat gets redistributed to the periphery. The second phase lasts 2-3 hours where heat is loss due to the absence of metabolic heat production. The third phase occurs when the patient's body heat is lower than 34^{o}C and the core is further deprived from heat. The result of hypothermia is altered myocardial outcomes, coagulopathy, thermal discomfort and an increase in surgical site infections of between 1-3% and a 10% increase after colon-surgery (Fulesdi *et al*, 2001).

The maintenance of the intra-operative room temperature between 22-25^{o}C, the use of warming devices and administration of warm IV –fluids and monitoring of the patient intra-operatively are methods to manage hypothermia.

The participants scored the statement as 0.00. The statement is included in the audit tool in *Standard 21: Practices to maintain body temperature control are evident*.

6.4.32 Blood glucose monitoring

Concourse statement relevant to this statement is: *There is evidence of regular blood glucose control of patients peri-operatively.* Evidence was found to support the statement.

The result of hypoglycaemia in non-diabetic patients during surgery has only recently been acknowledged as a contributing factor to surgical site infections. Pear (2007) suggests that due to the decrease in vascular circulation leading to reduced tissue perfusion and impaired cellular functions during surgery, all patients should be monitored intra-operatively. Blood glucose monitoring should therefore not only be done on known diabetic patients but on every patient that enters the operating room.

Hold (2011) further states that blood glucose control should be maintained between 7-10mmol/l.

The participants scored the statement negatively as -0.57. The statement is included in the audit tool in *Standard 23: Practices to manage blood glucose levels of patients in the peri-operative phase are evident.*

6.4.33 Hair removal practices

The concourse statement relevant to this statement: *Hair removal practices are according to evidence based practices.* The researcher found evidence to support the statement.

The use of clippers to razors are recommended as folliculitis are common within one hour after shaving with a razor. This increases the risk of surgical site infections. Allan Hold (2011) also suggest that only the incision area and 5cm around the incision area should be shaved. Sieczkowski (2014) indicates that clipping of hair should be done within two hours before surgery to minimize bacterial infection, that hair should be removed only when really necessary and that patients should be advised not to shave the incision area themselves before hospitalisation (Sieczkowski, 2014).

The participants scored this statement negatively as -0.24. This statement was included in the audit tool in *Standard 22: Hair removal practices are according to evidence based practices.*

6.4.34 Equipment management

The concourse statement relevant to this statement is*: Equipment is managed according to evidence based practices.* Evidence was found to support the statement.

Lesley Shepherd (2015) lists medical devices as equipment use for diagnosis or treatment, monitoring, critical care and emergency devices. Equipment should be cleaned in a designated area and not in hand washing basins and that manufacturer's instructions should be followed when procedures are compiled for the cleaning of equipment. Goodfellow *et al* (2013) concluded that *S. aureus, P. aeruginosa. E. faecalis and E.coli* were cultured from stethoscopes in the health care

environment and urges for diligent decontamination of medical equipment (Goodfellow *et al*, 2013).

The participants scored this statement negatively as -0.62. This statement is included in the audit tool in *Standard 17: Equipment is managed according to evidence based practices.*

6.4.35 Basic Sterile Principles

The concourse statements relevant to this statement are: *Instrumentation management is implemented according to evidence based practices, The clinical skills of the multi-disciplinary team are assessed annually, Towelling, draping and linen management is according to evidence based practices. Single-use items are managed according to evidence based practices. Disinfection and sterilisation procedures are implemented according to evidence based practices.* Evidence was found to support the statement.

Basic sterile principles are a set of procedures that is adhered to during the intra-operative phase by the surgical team to maintain sterility of instruments, drapes, equipment and devices used during the procedure. Nancymarie Phillips (2016) lists 13 statements that directs behaviour and work routines to maintain the sterile field. The patient is at his most vulnerable as soon as the first incision is made and compliancy to these principles is non-negotiable. Non-scrubbed staff members, the anaesthetist, floor and anaesthetic nurse must respect these principles and boundaries as they play a role in the maintenance of the sterile field. All persons entering the intra-operative area have to be competent in maintaining basic sterile principles (Phillips, 2016). Arteche *et al* (2012) concluded that ages, gender and years of clinical experience has no impact on the compliancy to sterile technique but that knowledge have a positive effect on compliancy. Continuous monitoring and re-enforcement is recommended (Arteche *et al*, 2012). Hopper and Moss (2010) categorise breaks in basic sterile principles in four types: immediate recognition of break, recognition after occurrence within short period of time, late recognition of break and break in sterile principle adherence not being recognised at all. They list a good surgical conscience, knowledge, focus on SSI's and basic sterile principles, reporting and implantation of corrective actions as measures to manage the technique (Hopper and Moss, 2010).

The participants scored the statements as:

Instrumentation management is implemented according to evidence based practices positively as 1.19, *The clinical skills of the multi-disciplinary team are assessed annually* positively as 1.19, *Towelling, draping and linen management is according to evidence based practices* positively as 0.29, *Single-use items are managed according to evidence based practices* positively as 0.57, *Disinfection and sterilisation procedures are implemented according to evidence based practices* positively as1.43.

These statements have been included in the audit tool as *Standard 13: The application of basic sterile technique is evident.*

6.4.36 Risk management

Concourse statements relevant to this statement are: *An OR preventative maintenance programme is evident* and *There is evidence of risk assessment rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager.* The researcher found evidence to support this statement. Evidence was found to support the statement.

Netcare (2014) describes preventative maintenance programmes in six steps, and relate good maintenance to clean environmental conditions in the nursing units. A list of equipment, with planned service intervals are published. The categories relevant to infection prevention control are: Air Conditioning and Ventilation, Auxiliary Medical Equipment, Catering, Housekeeping and Laundry, Cleaning, Disinfection and Sterilisation, Medical Furniture e.g. warming cabinets, Medical Life Support e.g. anaesthetic equipment, Monitoring Equipment, Specialised surgical Equipment, Water Tests and Buildings. Due to the complexity of some medical equipment, the Technical manager, OHS Manager, IPC Manager and OR Unit Manager need to work collaboratively to ensure sustainability of such a preventative maintenance programme with effective communication structures.

The participants scored the statement: *An OR preventative maintenance programme is evident* negatively as -0.71 and *There is evidence of risk assessment rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager* negatively as -1.14. The statements are included in the audit tool in *Standard 28: A preventative maintenance programme is evident.*

6.5 Conclusion

This verification of the statements allows for expansion of the statements and the application thereof in the operating room. The literature review contributes to the triangulation of the data as required in a multi-method research design. All the statements included in the concourse list were included in the audit tool.

CHAPTER 7

PHASE THREE: THE DEVELOPMENT AND TESTING OF A COMPREHENSIVE INFECTION PREVENTION QUALITY AUDIT TOOL

7.1 Introduction

The data collected in phase 2 of this study was used to compile a Comprehensive Infection Prevention Quality Audit Tool. The literature review, included in chapter 6, provides developmental characteristics, as well as information regarding the application of the concepts included in the audit tool. The tool is composed of standards, criteria and indicators and is based on Donabedian's (1987) model of structure-process- and-outcome standards. Six subject experts tested the audit tool for face and content validity as well as feasibility. In addition the researcher tested the audit tool in one OR. Findings, discussion and recommendations are included.

7.2 Objectives of phase three

The first objective for this phase was to incorporate the elements as determined by stakeholders in an infection prevention control quality audit tool for an operating room theatre in a private health care environment. The second objective for this phase was to test the audit tool in one operating room theatre in a private health care environment to determine the validity of the tool.

7.3 The Development of the Audit Tool

For the first objective, the audit tool was developed based on the data collected in phase one and two of the study as described in chapters 4, 5 and 6. The initial audit tool consisted of 29 standards. After the researcher tested the audit tool in an OR, 2 standards were added, which brings the total amount of standards included in the audit tool to 31. All the standards were identified as either a structure, process or outcomes standard.

7.4 Standards, Criteria and Indicators defined

A standard is described as "an ideal or exemplar that carries some authoritative weight and is used for the purposes of comparison" (Armstrong, 2013).

Criteria are items or variables which enable the achievement of a standard and the evaluation of whether it has been achieved or not.

An indicator measures changes in relation to defined criteria, in order to guide the decisions aiming at obtaining or maintaining changes (Dal Canton *et al*, 2014).

Due to the numerous areas and the large numbers of multi-disciplinary team members involved in an operating room, as well as the complexity of procedures and technical advances in the area, the design of standards for the purpose of this research had to be specific and comprehensive.

The following standards were included in the audit tool.

Table 7.1 Standards included in the final audit tool

Standard
Standard 1: There is an IPC Programme that is appropriate for the goals of the service and that supports quality care of patients in the operating room
Standard 2: There is an OR IPC Committee that is appropriate for the goals of the service and that supports quality care of patients in the operating room
Standard 3: There is evidence of an incident report system
Standard 4: The physical building, design and fixtures in the OR adhere to legislation
Standard 5: Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms
Standard 6: Water quality contributes to the prevention of infection and distribution of micro-organisms
Standard 7: Additional building and construction practices supports the quality of the IPC practices in the OR
Standard 8: Policies and procedures regarding IPC practices in the OR are evident
Standard 9: Human Resources are managed to maintain IPC practices in the OR
Standard 10: The clinical skills of the multi-disciplinary team (nursing staff, doctors and cleaners) are assessed
Standard 11: Every person entering the semi-restricted and restricted area of the OR adheres to PPE (Personal Protective Equipment) policies
Standard 12: Hand hygiene practices are according to evidence based practices
Standard 13: The application of basic sterile technique is evident
Standard 14: The management of single-use items are evident
Standard 15: Human tissue is managed according to evidence-based practices
Standard 16: Waste in the OR is managed according to evidence-based practices
Standard 17: Equipment is managed according to evidence-based practices
Standard 18: Endoscope equipment is managed according to evidence-based principles.
Standard 19: Anaesthetic equipment is managed according to evidence-based practices
Standard 20: Medication management in the OR is according to evidence based practices
Standard 21: Practices to maintain patient body temperature control are evident
Standard 22: Hair removal practices are according to evidence-based practices
Standard 23: Practices to manage blood glucose control during the peri-operative phase are evident
Standard 24: Environmental control practices are evident

Standard
Standard 25: A cleaning and disinfection programme is evident in the OR
Standard 26: Practices during turn-over time is according to evidence based practices
Standard 27: The CSD is managed according to evidence based practices
Standard 28: A preventative maintenance programme is evident
Standard 29: The surgical site infection rate and practices reflect international acceptable care
Standard 30: Peri-operative oxygenation of the patient is adequate
Standard 31: “Goal-directed fluid therapy” is maintained peri-operatively

7.5 Content Validity

The second objective of phase three is to determine the degree of validity of the audit tool. Eight subject experts, including members of the multi-disciplinary team were requested to assess the degree of validity of the tool, however only six responded.

Dixon *et al* (2011) suggests the following definition and criteria to determine the degree of content validity of an audit tool.

Dixon *et al* (2011) describe content validity as “…a process whereby the standards in the audit tool is inclusive of all the specific aspects related to the objective of the audit”. Dixon *et al* (2011) further stated that standards should be relevant to the objectives of the audit, terminology included in the audit tool should be consistent with evidence based content, the standards should be representative of the comprehensive details as described in the evidence based content, all terminology should be clearly defined, clear descriptors of required evidence required and recording guidelines should be evident.

The audit tool designed for this study was comprehensive, consisting of 31 standards. The standards in the audit tool were classified as a structure, process or outcomes standard. All 46 statements were integrated in the audit tool. (See Appendix G). Every standard consists of criteria and indicators and supplies clear direction of how to assess compliance. The standards are written in clear, user-friendly language. The researcher attempted to include standards that are realistic to achieve within the private health care environment. The researcher is of opinion that the standards represent the minimum level of standard compliance to evidence-based practices. All the standards are measureable due to the specific criteria and indicators that is included in each standard. The indicators in this study are both quantitative and qualitative of nature whereas the criteria are qualitative descriptors.

The eight experts were asked to rate each standard, criteria and indicator for face and content validity as well as feasibility in addition to decide whether they were in the context of the private operating theatre room. This was explained during the individual information sessions.

7.6 Data Collection

7. 6.1 Sample

Eight subject experts were identified to partake in this part of the study. The expert list comprised of a Microbiologist, two Infection Prevention Clinical Nurse Specialists (IPCNS), an Operating Room Science Clinical Facilitator, a Technical Manager, an Occupational Health and Safety (OHS) Coordinator, an Operating Room Unit Manager and a Clinical Nurse Specialist (CNS): Anaesthetics (n=8). One expert verbally agreed to partake in the study, received the documentation but did not supply any feedback at the time of data collection. One expert did not sign the consent documentation but commented on the tool. The information from this respondent therefore could not be included in this study. The total number of experts that participated in the study was six therefore the realised sample was six (n=6).

7.6.2 Preparation of the participants

All participants consented to be included in the study except one expert who did not sign the consent document and the data provided could therefore not be included in this study. All participants received copies of the audit tool and an information document (See Appendix H and I). The researcher had a discussion with every expert individually, explaining what was required. All experts indicated that they understood what was expected of them. The researcher had permission to utilise one specific operating room to test the audit tool. All the experts had access to the operating room for the purposes of this study. The specific hospital where the audit was conducted was not included in the q-sort (phase 2) event as documented in chapter 5. None of the above mentioned experts had been included in the q-sort (phase 2) event described in chapter 5.

7.7 Data analysis and findings

It took the experts between three (3) days and eight (8) weeks to return their findings. Three of the experts did not indicate if they tested the tool in the operating room theatre (clinical environment) or not. Two experts did indicate that the tool was tested

in the clinical environment and one expert indicated that she conducted an academic review of the audit tool. Four experts did not indicate the time it took to complete the audit tool. One expert who conducted the assessment in the clinical environment indicated that it took 48 hours to complete the audit and the other indicated that the assessment took 8 hours.

The overall comments of the participants related to the feasibility of the audit tool. Few comments were related to face and content validity. Participants commented on the resources they did not have in the private healthcare group at the time of the assessment, rather than the validity of the standards. Some comments contradicted our current general understanding of the function and position of *the nurse* and *nursing* in the OR.

Comments made by experts, unrelated to the measurement of validity of the audit tool included:

Doctors will always find a reason to complain

There is no budget for IPC in any hospital

IPC is not theatre based

This is not an IPC function to audit: this comment was made on Standard 13 addressing the assessment of the clinical skills of the multi-disciplinary team.

We do not have proof as this is done at service provider not at hospital level: this comment was made on Standard16 addressing medical waste management.

No EO available in our group: this comment was made on Standard 27 addressing CSD management.

This is in ICU not theatre: this comment was made on Standard 19 addressing management of anaesthetic equipment, specific to the changing of intra-venous lines.

Not for an IPC to audit: this comment was made on Standard 29 addressing the compliance of the OR to National Core Standards.

Not sure what is meant by this question: this comment was made on the index list of standards next to Standard 7 addressing building and construction practices.

I am scared of theatre

Four experts did comment that they experience the tool as overwhelming and that it is time consuming to complete. Two experts described the audit tool as *intimidating*. Five of the six experts verbally commented that it is a *good* tool.

7.8 Discussion of findings

The experts' contribution to determine the validity of the audit were poor. Reasons for not adhering to some standards were provided, rather than commenting on the degree of validity (clarity, realistic and relevance) of standards.

Failure to take responsibility for certain standards included in the audit tool is evident. Due to the inappropriate comments, that reflect the experts' understanding of the multi-disciplinary team approach in the OR, as well as the interpretation of the evidence-based practices (criteria and indicators) to infection prevention in the OR, the researcher could not regard the information provided as an indication of the degree of validity of the audit tool.

Possible reasons for the lack of adherence to the instructions could have related to *resistance to change*, or the experts' *un-readiness to change*. The audit tool included standards that have seldom been addressed by the specific health care provider. The resistance or un-readiness possibly stems from "…lack of information, lack of knowledge or skill, or an immediate need to attend to other matters" (Hultman, 2005).

Organisational culture, approach to, and implementation of quality assurance and the facilitation thereof could have played a role. This is supported by the work of Hofstede (1980) who describes cultural differences in a multinational company as: "…individualism versus collectivism, power distance, uncertainty avoidance and masculinity and femininity", as well as "…long-term orientation" (Hofstede, 1980 in Abdullah *et al*, 2008). Although all the experts had senior positions within their specialised field, their potential lack of opportunities to develop audit tools and to challenge existing audit tools, rather than only being audited themselves, are noted.

The experts' potential misunderstanding of what were expected of them, or their loss of interest in the detail of each standard is acknowledged, as the audit document is comprehensive.

Due to the inconclusive results provided by the experts, the researcher tested the audit tool herself, using the same criteria for validity as she gave to the experts and in

the same OR that was available to the experts to use. This method of testing the validity of a quality audit tool was used and verified by Armstrong (2001).

The unit manager of the specific unit, as well as the nursing service manager was informed of the planned audit event. The audit was conducted over a period of three days.

7.9 Changes made by the researcher

The final audit tool is included as Appendix J in the study.

Changes were made to the format of the audit tool to make it more user-friendly. In addition in some cases it made the criteria and indicators more specific.

An additional column was added to every standard to indicate the source of evidence to be included in the audit tool. Each standard is discussed:

Standard 1: *There is an IPC Programme that is appropriate for the goals of the service and that supports quality care of patients in the operating room.*

Criteria 1.2.2, indicator 11, initially read "There is adequate staff trained in the IPC programme in the operating room". The indicator was changed to "There is one staff trained in the IPC programme in the operating theatre during every shift". Criteria 1.2.3, indicator 15, initially read "The compliance rate of the unit to the IPC programme is communicated to all stakeholders before the start of each list". It was found to be unrealistic. A more realistic approach would be to communicate deviations from the previous audit outcome e.g. if an autoclave is dysfunctional or if there is a leak in the roof, as well as other IPC incidents that could have an effect on the specific performance of the multi-disciplinary team per shift. This information should be communicated during hand over from one shift to another, and should be evident on the hand over document. The indicator was changed to "The compliance rate of the unit to the IPC programme is communicated to stakeholders with every shift hand-over event".

Criteria 1.2.5, indicator 17, initially read "Resources to maintain the implementation of the IPC programme are evident". This criterion was found to be non- specific as the indicator does identify the resources required to maintain the IPC programme. The indicator was changed to "Planned Training Programmes, Journal Club meetings and internet resources are evident to maintain the implementation of the IPC programme

Standard 2: *There is an OR IPC Committee that is appropriate for the goals of the service and that supports quality care of patients in the operating room.*

Criteria 2.2, indicator 16, initially read "Interdepartmental service level agreements between stakeholders are evident". The stakeholders in the service-level agreements were not defined. The indicator was changed to "Interdepartmental service level agreements between OR, IPC, OHS, Cleaners, Kitchen are evident". Indicator 19, initially read "The IPC status of the OR is communicated to all stakeholders and patients." The stakeholders were not specified. The indicator was changed to "The IPC status of the OR is communicated to all stakeholders listed in 2.1 and patients". The researcher is aware of the sensitivity of the information and the impact it may have on the private health care provider. The patients are informed via an OR information leaflet on admission and is included as a source of evidence. Due to the comprehensiveness of the audit, the researcher is of opinion that the audit should be conducted three times a year. This is included in Standard 28, criteria 28.3, indicator 4.

Standard 3: *There is evidence of an incident report system.*

Criteria 3.2, indicator 8 initially read "Definitions regarding IPC aspects are available". It was changed to "A list of IPC Terminology Definitions is available to assist staff members to write incident reports".

Standard 4: *The physical building, design and fixtures in the OR adhere to legislation*.

The measurement of the areas as required in the indicators seemed to be un-realistic at first, as neither the theatre management nor the technical staff could provide a detailed floor plan with measurements of the specific areas. For this standard and indicators to be realistic the areas must therefore be measured by the auditor via a measuring tape or laser measuring device, if not evident on the floor plan. Additional space was therefore provided to document the findings in indicator 2, 9, 14, 22, 26, 27, 36, 40, 44, 46, 51, 55, 56, 62, 63, 69. To confirm the temperature of the sterile store room the auditor must use a thermometer if it is not available in the area. Indicator 5 "Toys are disinfected after every use and are not shared between patients", was added to criteria 4.1. Criteria 4.12, indicator 74 "An emergency back-up system is in place when the electrical power supply to the OR fails", was added.

Standard 5: *Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms.*

Additional space to indicate measurements were inserted in indicator 3, 6 and 7. Indicator 8 initially read “There is documented proof of annual HEPA filter replacement. The indicator was changed to “There is proof of primary, secondary filter servicing as well as HEPA filter replacement as per manufacturer’s instructions”.

Standard 6: *Water quality contributes to the prevention of infection and distribution of micro-organisms.*

Criteria 6.1, indicator 3 “Alternative water supplies are available in the absence of municipal water”, was added.

Standard 7: *Additional building and construction practices supports the quality of the IPC practices in the OR.*

Criteria 7.1, indicator 3 initially read “There is proof of multi-disciplinary team communication regarding the planned construction”. The indicator was changed to

“There is proof of multi-disciplinary team (nursing staff, cleaners, patients, doctors, technical manager, IPC and OHS Coordinators) communication regarding the planned construction.”

Standard 8: *Policies and procedures regarding IPC practices in the OR are evident*.

No changes were found to be necessary.

Standard 9: *Human Resources are managed to maintain IPC practices in the OR.*

Criteria 9.1, indicator 12 initially read “There is adequate staff allocated to manage emergency procedures without compromising booked lists”. The indicator was changed to “There is at least one scrub nurse, one anaesthetic nurse and one floor nurse allocated to manage emergency procedures without compromising booked lists”.

Standard 10: *The clinical skills of the multi-disciplinary team are assessed.*

The title of the standard was changed to “The clinical skills of the multi-disciplinary team (nurses, doctors and cleaners) are assessed”.

The standard is clear and relevant. To assess this standard the auditor must get consent from patients to be present during the procedure. As the specific health care

provider did not consent to this, the auditor could not involve patients and therefore focussed on the clinical skills performance of the multi-disciplinary team during the preparation phase. The performance assessment of the multi-disciplinary team was challenging though, as team members performed tasks simultaneously in different areas in the intra-operative phase e.g. the surgeon will scrub while the scrub nurse prepares sterile trolleys. This was time consuming as the auditor had to witness more than one procedure to assess one team. The auditor experienced resistance and miss-trust from the staff during the process and not from the doctors.

Standard 11: *Every person entering the semi-restricted and restricted area of the OR adheres to PPE (Personal Protective Equipment) policies*.

The WHO (World Health Organization, 2016) published Global Guidelines for the Prevention of Surgical Site Infection whilst the researcher was conducting the audit in the clinical environment. Criteria not included in the audit tool was added.

Criteria 11.5, indicator 29, “Double/re-gloving is evident when prosthesis is handled, and outer glove is routinely changed”, was added to comply with WHO recommendations.

Criteria 11.5, indicator 30, “Double/re-gloving is evident when colon-rectal surgery is performed and outer glove is routinely changed”, was added to comply with WHO recommendations.

Standard 12: *Hand hygiene practices are according to evidence-based practices.*

Criteria 12.6, indicator 18, initially read “Surgical scrub technique is performed by every member that enters the sterile field”. The indicator was changed to “Surgical scrub technique or an alcohol hand-rub is performed by every member that enters the sterile field”. Indicator 20, “A surgical scrub technique or an alcohol hand rub is performed before every case for every patient on the list”, was added to comply with WHO recommendations.

Standard 13: *The application of basic sterile technique is evident.*

The auditor had to position herself in the OR to enable him/her to have a good view off the operating site without compromising sterility. It was also necessary to understand the specific surgical procedure being performed to be able to understand the clinical interventions. Alternatively, the use of the video-camera function could provide valuable information, but this function is not available in all the theatres and

patients will have to consent to the use of the function. These indicators are therefore realistic on condition that the auditor has patient consent to be present and is a skilful OR practitioner.

Criteria 13.7, indicator 53, “A 70% alcohol based solution is used for cleaning intact skin”, was added to comply with WHO recommendations.

Criteria 13.7, indicator 57, “No anti-microbial skin sealants are used”, was added to comply with WHO recommendations.

Criteria 13.7, indicator 69, “Disposable incisional barriers are not used”, was added to comply with WHO recommendations.

Criteria 13.9, indicator 88, “An anti-biotic free, povidene-iodine or clear wound irrigation is done before wound closure”, was added to comply with WHO recommendations.

Criteria 13.9, indicator 91, “Triclosan-coated sutures are used if available”, was added to comply with WHO recommendations.

Standard 14: *The management of single-use items are evident.*

No changes were found to be necessary.

Standard 15: *Human tissue is managed according to evidence-based practices.*

Criteria 15.1, indicator 5, initially stated “Anatomical structures harvested for the purpose of re-implantation e.g. bone flaps are sent to SA Bone for disinfection and sterilisation and kept in a designated freezer”. The statement was changed to “Anatomical structures harvested for the purpose of re-implantation e.g. bone flaps are sterilised by a service provider, and kept in a designated freezer”.

Standard 16: *Waste in the OR is managed according to evidence-based practices*.

No changes were found to be necessary.

Standard 17: *Equipment is managed according to evidence-based practices.*

No changes were found to be necessary.

Standard 18: *Endoscope equipment is managed according to evidence-based practices*

Criteria 18.2, indicator 4, initially stated “There is adequate amount of endoscopes available to minimise inter-patient cleaning and adhehyde use per list”. Spaces were added for the auditor to indicate the number of G-and C- Scopes.

Standard 19: *Anaesthetic equipment is managed according to evidence-based practices.*

Additional space was included to allow the auditor to indicate the number of relevant items in indicator 11, 15, 21, 22 and 26.

Standard 20: *Medication management in the OR is according to evidence-based practices.*

Additional space was included to allow the auditor to indicate the temperature readings in indicator 4 and 18.

Criteria 20.9, “Chronic medication is administered during the peri-operative phase” and indicator 46, “Immunosuppressive medication is continued in the intra-operative area, when prescribed”, was added to comply with WHO recommendations.

Standard 21: *Practices to maintain patient body temperature control are evident.*

Additional space was added to allow the auditor to indicate the temperature readings in indicator 1, 4, 7, 8, 10, 12 and 13.

Standard 22: *Hair removal practices are according to evidence-based practices.*

No changes were found to be necessary.

Standard 23*:* *Practices to manage blood glucose control during the peri-operative phase are evident.*

Criteria 23.1, “Baseline data is obtained pre-operatively”, indicator 1, initially stated, ”Blood glucose levels of diabetic patients are measured and documented before commencement of anaesthesia”. This statement was changed to “Blood glucose levels of diabetic and non-diabetic patients are measured and documented before commencement of anaesthesia”, as recommended by the WHO.

Criteria 23.2, “Communication practices regarding the maintenance of the patient’s blood glucose level is evident”, indicator 3, “Blood glucose levels are maintained between 6.1-8.3mmol/L during the peri-operative phase”, was added to comply with WHO recommended values.

Standard 24: *Environmental control practices are evident*

No changes were found to be necessary.

Standard 25: *A cleaning and disinfection programme is evident*

Criteria 25.2, indicator 7 initially read “There is adequate amount of cleaning staff available in the OR to manage maximum occupancy of the OR” and was expanded to indicate the specific areas where cleaners should be allocated to “There is one cleaner per working theatre, one cleaner allocated to store rooms, one cleaner for the passages, recovery and pre-operative area, one cleaner for change rooms, one cleaner for rest rooms and the kitchen and one cleaner for CSD.

Standard 26: *Practices during turn-over time is according to evidence-based practices*

Additional space was allocated to criteria 26.1, indicator 1 to allow the auditor to indicate the time of the turn-over time period.

Standard 27: *The CSD area is managed according to evidence-based practices*

Additional space was provided in indicator 36, 37, 48 and 71 to allow the auditor to indicate measurements.

Standard 28: *A preventative maintenance programme is evident*

No changes were recommended.

Standard 29: *The surgical site infection rate and practices reflect international acceptable care*

No changes were recommended.

Standard 30: *Peri-operative oxygenation of the patient is evident*

This standard was added to comply with WHO recommendations.

Standard 31: *‘Goal-directed fluid therapy” is maintained peri-operatively*

This standard was added to comply with WHO recommendations.

7.10 Management of the audit event

The researcher experienced challenges during the audit event whilst testing the audit tool in the clinical environment. The following requirements should be part of any future processes:

- The auditor must have an OR qualification and a skilled practitioner.
- More than one auditor should be included in the same audit event.
- The auditor needs the following tools to be able to manage the audit: measuring tape or device, thermometer, humidity meter and a scale.

The auditor should have the following documentation prepared by the OR unit manager in advance as it will minimize time spent searching for evidence during the audit:

- A detailed floor plan of all the operating rooms, also those separated from the main theatre complex e.g. caesarean section theatre in the maternity ward.
- A list of equipment in the OR as well a cleaning and storage instructions from the manufacturers.
- Agenda's and minutes of staff meetings and IPC meetings.
- Service level agreements between the different departments.
- List of all the liquids used in the OR as well as the material safety data sheets and letter of approval from the IPC coordinator.
- List of the latest antibiotic recommendation usage as well as a letter of approval from the pharmacy manager.
- Copy of the booked procedures for the specific day to enable the auditor to plan.
- Copy of an Informed Consent document and patient lists for the specific day.
- Staff lists indicating qualifications and job descriptions.
- Delegation documentation of staff for the specific day.
- Proof of in-service training planner for the specific year.
- Proof of in-service training and CPD records per staff member.
- List of incident reports.
- Documented evidence of risk assessment rounds.
- All policies and procedures in the OR.

The auditor acknowledges that the content of the audit tool is detailed and that the size of the audit tool is challenging.

7.11 Conclusion

Due to lack of data provided by the participants, the validity of the audit tool could not be determined by a panel of experts as was envisaged for the objectives of phase three. The researcher did however, check content and face validity, which assisted in determining validity. Further checks for validity will, however, be required before using the tool on a national basis. This will be done in a follow up study. The operating room is a multi-dimensional area that is dynamic and demands multi-skilled professionals. The multi-method methodology allowed for triangulation of data and identified possible research opportunities in this complex environment. Conclusions, limitations and recommendations are discussed in chapter 8.

CHAPTER 8

8. CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

8.1 Overview of the Study

The complex intra-operative environment, stakeholder involvement and the specialised procedures performed in the operating room increase the mismanagement of risks within the operating room. Hospital Acquired Infections (HAI's) and specifically Surgical Site Infections (SSI's) are preventable if pro-and reactive measures are in place to manage the risks, of which an audit tool to determine the OR's compliance to evidence based practices is one. The existing infection prevention audit tools, currently used by the specific private healthcare providers, are fragmented and there is a duplication of standards. Improving quality in the OR's should assist in reducing SSI's. For this reason the introduction of this audit tool is important. SSI's are devastating, not only to the patient personally, but it is also a financial burden which could be prevented. Every health care provider, private or public supported, therefore has no reason not to invest in an infection prevention audit tool for operating room theatres. In this study an audit tool, based on evidence based practices was developed to address the need.

The problem identified was that there has been numerous attempts to design an infection prevention control program for operating room theatres based on evidence based practices which resulted in fragmentation, duplication of individual roles and responsibilities. Existing audit documentation consists of general statements and allowed for numerous interpretations of requirements in the specialised area. This resulted in poor quality auditing, misleading results and impacts on reliability of the existing audit tool.

The purpose of this study is to develop and test a comprehensive infection prevention control quality audit tool for operating room theatres in a private health care environment. The following objectives were used to guide the study:

8.1.1 Objective 1: To identify the content of the infection prevention quality audit tools and policies currently used in the operating room theatres in a private healthcare environment.

In phase 1, Chapter 4 of the study the researcher did a content analysis of sources and categorised the content of the sources. The sources included National Core

Standards, Internal Audit Documentation, Internal Policies and Procedures of the healthcare provider as well as external sources which included published articles, guidelines, position statements, training modules, policies from other healthcare providers, published manual, text books, editorials and reports. (See Appendix A). Forty-three (43) categories were identified that was used as concourse statements. The list of concourse statements is listed in Table 4.2. The objective of phase one was achieved as the content analysis was conducted and statements were included as concourse statements.

8.1.2 Objective 2: To determine what internal stakeholders (nurses, Infection Control and OHS Coordinators) and external stakeholders (surgeons) regard as important elements in the infection prevention quality tool of operating theatres in a private health care environment. To review the literature to determine evidence based practices that provide validation for, and the expansion of the concourse statements identified.

In phase 2, stakeholders (21) from three hospitals sorted the concourse statements during a q-sort event according to what they regard as important to be included in an infection prevention quality audit tool. Q-sort as data collection method is described in chapter 5 of this study. The results from the q-sort event was contradictory. The results are discussed in detail in chapter 5 of this study. The objectives of phase two were initially partially met as the stakeholders alone could not determine the content of the audit tool, due to their exclusion of evidence-based statements, therefore a literature review was conducted to verify and expand the statements and is included in chapter 6 of the study.

8.1.3 Objective 3: To incorporate the elements as determined by stakeholders in an infection prevention quality audit tool for an operating room theatres in a private health care environment. To test the audit tool in one operating room theatre in a private health care provider to determine the degree of validity of the tool.

The audit tool was developed and includes standards, criteria and indicators which are specific to infection prevention control in the operating room. Experts in the field of operating room science and infection prevention were required to determine the degree of validity of the audit tool. Their participation was poor. However, they did identify the anticipating challenges for using the audit tool. The researcher tested the audit tool in the clinical environment and recommendations and changes are

described in detail in chapter 7. During the testing period, the WHO published the *Global Guidelines for The Prevention of Surgical Site Infections* (WHO, 2016) relevant to the prevention of surgical site infections. The audit tool was revised to comply with these recommendations. The objectives of phase three was met. The validity of the tool was partially determined by the subject experts. An additional audit was done by the researcher to complete this process.

8.2 Limitations

The study was conducted in only three hospitals of one private health care provider in Gauteng. The 21 participants in phase 2 represented a small sample which made factor analysis difficult. This latter statistical analysis may have provided a better indication of what which statements (factors) were more important than others, than the descriptive statistical analysis which was used.

Stakeholders in this study included surgeons, anaesthetic and scrub nurses, IPC- and OHS coordinators and CSD managers. Other stakeholders for example anaesthetists, recovery room nurses and unit managers were not included which may be seen to be a limitation.

The stakeholders' frustration with the q-sort data collection method may have influenced their responses.

The data supplied by the experts during the validation phase was insufficient and necessitated further audit by the researcher to remedy this deficiency.

8.3 Recommendations

The following recommendations are made:

8.3.1 Research: The audit tool should be piloted in a collaborative effort in private and public hospitals to ascertain feasibility of the audit tool.

Once the audit is implemented, research should be conducted to determine the impact of the audit tool on quality care in the operating room and the prevention of surgical site infections.

Patient's knowledge of IPC in the OR that enables them to give informed consent should be investigated.

Stakeholders' understanding of what a comprehensive infection prevention quality audit tool should entail, should be investigated further.

8.3.2 Nursing Education: Infection prevention in the operating room should be emphasized in the curricula of Operating Room Science and Infection Prevention and Control nurse programmes. Short courses should be offered to qualified nurse practitioners.

Focus on multi-disciplinary team management in the OR and the integration of team dynamics in the OR should be included in an educational programmes.

The value of q-sort as teaching method should be explored.

8.3.3 Clinical Practice:

- The audit tool should be available electronically.
- Role players in the hospitals should be identified to implement the auditing of the operating rooms after they have received training.
- The audit tool should be revised on a regular basis.
- Consultation with quality managers within the private healthcare provider should occur to discuss the inclusion of the audit tool into the current internal audit processes.

8.3.4 Quality Improvement: The teaching of audit tool design, development and the validation thereof should be included in quality improvement programmes. The audit tool should be used as an OR internal audit document. A dedicated quality improvement programme, relevant to each standard in the audit tool, should be facilitated throughout the year to address the stigma of an audit event and improvement of stakeholders' competency levels.

8.4 Conclusion

This study proved that the development of a validated, defragmented comprehensive infection prevention quality audit tool for operating room theatres in a private health care environment is challenging. The utilisation of such an audit tool demands skilled practitioners and extensive preparation. A comprehensive infection prevention quality audit tool for an OR contains valuable information that could be utilised as a teaching medium, assessment tool or guide. The contribution of the multi-disciplinary team in the development and maintenance of such a tool is invaluable.

LIST OF DATA SOURCES

APPENDIX A

Data Source Number	Source	Key Words Relevant to Research Question: (Raw Data)	Categories Identified in the Sources	Date of publication
1	Amicizia, D. Cristina, M. Ottria, Perdelli, F. Spagnolo, A. (2013). Operating theatre quality and prevention of surgical site infections. Department of Health Sciences. University of Genoa, Italy.	Operating theatre, Quality, Prevention of Surgical Site Infections	Structural Features and Design of the OR, Workflow Systems, Ventilation Systems, Water, Procedural and Behavioural Factors, Surgeon's Skill, Skin Preparation, Timing of Antimicrobial Prophylaxis, Sterilisation of Instrumentation,	2013 Article
2	Annerson, D. Berrios-Torres, S. Bratzler, D. Delliger, E. Greene, L. Kaye, K. Maragakis, L. Nyquist, A. Podgorny, K. Saiman, L. Yokoe, D. (2014). Strategies to Prevent Surgical Site Infections in Acute Care Hospitals*. Infection Control and Hospital Epidemiology*, vol. 35, no. 6, pp. 605-627	Prevent, Surgical Site Infections	Glucose Control of the Patient, Hair Removal, Hand Hygiene, Skin Preparation, Antimicrobial Prophylaxis, Surgeon Skill, Gloving, Asepsis, Ventilation, Traffic in the OR, Environmental Surfaces, Sterilisation of Surgical Equipment, Direct Auditing, Internal Reporting of Incidents, Multi-disciplinary Team Approach, Education of Staff	2014 Strategy
3	Andersson, A. (2013). Patient Safety in the Operating Room: Focus on Infection Control and Prevention, PhD Thesis, University of Gothenburg, Sweden.	Patient Safety, Operating Room, Infection Control and Prevention	Risk Identification in the OR, Surgical Technique, Ventilation Systems, Theatre Clothing, Normothermia of the Patient, Prophylactic Antibiotics, Hand Disinfection, Nursing Records, Protective Measures	2013 Thesis
4	Andersson, A. Apell, S. Hjalmarsson, S. Karlsteen, M. Lindberg, T. Tarakonov, Y. Wernstrom, I. (2012). Particle Tracing: Analysis of Airborne Infection Risks in Operating Theatres. COMSOL Conference:	Airborne Infection, Risks, Operating Theatres	Particle Count, HEPA –filter Management, People Movement in the OR, Laminar Air-flow Maintenance	2012 Guideline

	Milan.			
5	ANZCA. (2013). Guidelines on Infection Control in Anaesthesia. Australian and New Zealand College on Anaesthesia. PS28. Australia	Infection Control, Anaesthesia	Standard Precautions, Hand Hygiene Practices, Gloves, Mask, Theatre Caps, Theatre Attire, Traffic in Theatre, Sharps Management, Prophylactic Antibiotics, Vaccination of Workers, Equipment Disinfections, Invasive Procedures, Medication Management	2013 Guideline
6	AORN. (2013). Sterilization. *AORN Journal.* Association of peri-Operative Registered Nurses. Pp. 513-540. Denver: United States of America.	Sterilisation AORN	Sterilisation Department Management, Decontamination Practices, Work-flow Systems, Autoclave Management, Sterile Store Room, Movement of Sterile Packs	2013 Journal Article
7	AORN. (2014). Position Statement on Perioperative Safe Staffing and On-Call Practices*. Association of Perioperative Registered Nurses Journal*. United States of America.	Peri-Operative, Safe Staffing, AORN	Registered Nurse Ratio per Shift, Competency of Staff, Multi-disciplinary Team Approach	2014 Position Statement
8	Appleby, J. Burge, P. Devlin, N. Dixon, A. Magee, H. Robertson, R. (2010). Patient Choice: How Patients Choose and How Providers Respond. The Kings Fund. Hobbs the Printers Limited. United Kingdom.	Patient Choice, Providers Respond	Informing Consumers, Patient's Right to Information	2010 Research Abstract
9	Arteche, D. Labrague, L. Pacolor, N. Yboa, B. (2012). Operating Room Nurses' Knowledge and Practice of Sterile Technique. Nursing Care. OMICS Publishing Group, vol.1, no. 4. ISSN: 2167-1168 JNC.	Operating Room, Nurses' Knowledge, Sterile Technique	Theatre Attire Practices, Sterilisation Practices, Basic Sterile Practices, Skin Preparation, Surgical Scrub Techniques, Surgical Gowning and Gloving Techniques, Patient Draping Techniques, Minimising of Talking in the OR, Theatre Temperature Maintenance, Waste Segregation	2012 Research Abstract

			Practices, Knowledge of Staff, Quality Programme Management	
10	Ashcroft, P. (2013). Health Building Note 00-09: Infection control in the built environment. Department of Health. Quarry House. United Kingdom.	Health Building, Infection Control, Built Environment	Construction Planning Phase, Infection Control Coordinator Consultation, Communication of Information, Routine Inspection of Construction Site	2013 Guideline
11	Association for Professionals in infection Control and Epidemiology. (2010). Guide to the Elimination of Orthopaedic Surgical Site Infections. APIC Guide. Washington: United States of America.	APIC, Elimination, Orthopaedic, Surgical Site Infections	OR Specific Infection Prevention Program, Hair Removal Practices, Normothermia of the Patient, Skin Preparation Practices, Air Quality Maintenance, Gloving Techniques, Traffic Patterns in the OR, Gowns and Drapes Management, Sterility, Instrument Management, Teamwork, Communication Structures in the OR	2010 Guideline
12	Auwarter, P. Bolon, M. Bratzler, D. Dellinger, E. Fish, D. Napolitano, L. Olsen, K. Peri, T. Sawyer, R. Slain, D. Steinberg, J. Weinstein, R. (2013). Clinical practice guidelines for antimicrobial prophylaxis in surgery. *American Society of Health-System Pharmacists*, Inc, vol. 70, pp. 195-283.	Clinical Practice, Antimicrobial Prophylaxis, Surgery	Availability of Antibiotic Guidelines, Type of Surgery Performed, Clinical Skills of the Surgical Team	2012 Guideline
13	Bak, A. Browne, J. Golsorkhi, M. Loveday, H. Pratt, R. Prieto, J. Tingle, A. Wilcox, M. Wilson, J. (2013). National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England. *Journal of Hospital Infection*. The Healthcare Infection Society. London: Elsevier.	Evidence-Based, Preventing, Healthcare-Associated Infections, Hospitals	Hospital Environment Maintenance, Cleaning Programmes, Equipment Management, Education of Workers, Hand Hygiene Practices, Protective Equipment Availability, Gloving and Gowning Techniques, Mask Management, Sharps Management, Aseptic Principle Management, Documentation, Quality Improvement Programmes, Risk Identification, Sterile Principle	2013 Guideline

			Management	
14	Baker, G. Bohnen, J. Doran, D. Espin, S. Grober, e. Lingard, L. Orser, B. Regehr, G. Reznick, R. (2004). Communication Failures in the Operating Room: an observational classification of recurrent types and effects. *Quality Safety Health Care,* vol. 13, pp. 330-334.	Communication, Failures, Operating Room, Classification, Types, Effects	Team Member Involvement, Information Management, Communication Breakdown, Assessment of Communication	2004 Research Article
15	Bartley, J. (2000). APIC State-of-the-Art Report: The role of infection control during construction in health care facilities. *Association for Professionals in Infection Control and Epidemiology*, Inc*.* Washington: United States of America.	APIC, Infection Control, Construction, Health Care Facilities	Consultation with Hospital Management, Infection Control Personnel Involvement, Planning of Phases, Inspection of Areas	2000 Report
16	Burlingame, B. (2014). Operating Room Requirements for 2014 and Beyond. The faculty Guidelines Institute. United States of America	Operating Room, Requirements	Physical Design of the Operating Room, Basic Sterile Principles	2014 Guideline
17	Caveney, C. (2011). Infection Control: The Surgical Environment and Ancillary Areas. Veterinary Infection Prevention and Control. John Wiley and Sons Inc.	Infection Control, Surgical Environment, Infection	Physical Environment and Design of the OR, Cleaning Schedules, Normothermia of Patients, Sharps Management, Waste Management, Air Quality Maintenance, HEPA-filter Maintenance, Sterile Principle Management	2011 Book
18	Centre for Disease Control. (2014). Chapter 17: *Surveillance Definitions*. Specific Types of Infections. Georgia, United States of America.	CDC, Surgical Site Infection	Surveillance of SSI's, Reporting of SSI's, Training of Healthcare Workers	2015 Training Module
19	Centre for Disease Control. (2014).	CDC, Surveillance	Surveillance of SSI's, Training of	2014

	Procedure-associated Module: Surgical Site Infections. Georgia, United States of America.		Healthcare Workers	Training Module
20	Cowen, A. Everts, R. Jones, D. Taylor, A. Wardle, E. (2010). Infection Control in Endoscopy. 3rd Edition. *Gastroenterological Society of Australia.* Australia.	GESA, Infection Control	Disinfection Practices, Sterilisation Practices, Decontamination Practices, Documentation	2010 Clinical Update Guideline
21	Charkowska, A. (2008). Ensuring Cleanliness in Operating Theatres. *International Journal of Occupational Safety and Ergonomics*, vol. 14, no. 4, pp. 447-453.	Cleanliness, Operating Theatres	Clean Air Maintenance, HEPA-filter Management	2008 Article
22	Coovadia, Y. Gopalan, P. Samuel, R. Samual, R. (2013). Infection control in anaesthesia in regional, tertiary and central hospitals in KwaZulu-Natal. Part 1: Unsafe Injection Practices Among Anaesthetists. *South African Journal of Anaesthesia Analogue*, vol. 19, no. 1, pp. 68-70.	Infection Control, Unsafe, Injection Practices, Anaesthetists	Single-use syringe Management, Single-use-vial Management, and Multiple Patient Management, Medication Management	2013 Article
23	Coovadia, Y. Gopalan, P. Samuel, R. Samual, R. (2013). Infection control in anaesthesia in regional, tertiary and central hospitals in KwaZulu-Natal. Part 2: Equipment Contamination. *South African Journal of Anaesthesia Analogue*, vol. 19, no. 3, pp. 146-151.	Infection Control, Anaesthesia, Equipment, Contamination	Decontamination of Anaesthetic Equipment, Special Disease Management, Policies and Procedure Manitenance	2013 Article
24	Coovadia, Y. Gopalan, P. Samuel, R. Samual, R. (2013). Infection control in anaesthesia in regional, tertiary and central hospitals in KwaZulu-Natal. Part3: Decontamination practices. *South African Journal of Anaesthesia Analogue*, vol. 19, no. 4, pp. 204-211.	Infection Control, Anaesthesia, Decontamination Practices	Decontamination of Anaesthetic Equipment, Turn-over Time Management, Cidex Management, Monitoring of Clinical Practices, Single-use Item Promotion and Management	2013 Article

25	Davies, E. (2013). Prevention and Control of Infection in Theatre. *North Tees and Hartlepool*. Version 2. NHS Foundation Trust. National Health System. United Kingdom.	Prevention and Control, Infection , Theatre	Hand Hygiene Practices, Standard Precautions Adherence, Disinfection Practices, Sterilisation Practices, Clinical Specimen Management, Uniform Policy Application, Special Disease Management Guidelines and Application, Surgical Instrumentation Management, Waste Management, Air System Maintenance, Skin Preparation Practices, Antibiotic Prophylaxis Management, Theatre Attire Policies, Sharps Management, Cleaning of the OR Environment	2013 Policy
26	Declaro, M. Gebremariam, T. (2013). Operating theatres as a source of nosocomial infection: A systematic review. *Saudi Journal for Health Sciences,* vol. 3, no. 3, pp. 5-8.	Operating Theatres, Source of Nosocomial Infection	Air and Ventilation System Maintenance, Surgical Team Practices, Indoor Traffic Maintenance, Theatre Attire Management, Glove Management and Hand Hygiene Practices, Decontamination of the OR Environmental Control , IPC Programme Management	2015 Article
27	Department of Health. (2014). Government Notice No. 512. Publications of Health Infrastructure Norms and Standards. 30 June 2014.	Department of Health, Infrastructure, Norms and Standards	Design of the OR, Risk Assessment Strategies, Consultation with Stakeholders	2014 Government Notice
28	Department of Health. (2014). National Health Act No. 61 of 2003. Publication of Health Infrastructure Norms and Standards Guidelines. Government Notice, no. 116. 17 February 2014.	Department of Health, Infrastructure, Norms and Standards, Guidelines	Design for Purpose, Risk Assessment Strategies, Consultation with Stakeholders	2014 Government Notice
29	Department of Health and Human Services.	Reprocessing,	Single-use Item Management,	2011

	(2011). Reprocessing Medical Devices in Health Care Settings: Validation Methods in labelling. Centre for Devices and Radiological Health. Centre for Biologics Evaluation and Research. United States of America.	Medical Devices, Validation, Labelling	Sterilisation Methods, Patient Information	Policy Statement
30	Department of Health. (1996). Regulation 158. Government Printers. KwaZulu-Natal: South Africa.	Department of Health, Control, Private Hospitals	OR Design Requirements, Air Conditioning Maintenance, Operating Suite Area Specifications, Sterilisation and Disinfection Requirements, Pharmacy and Storeroom Design and Specifications	1996 Regulation
31	Department of Health. (2014). *Good Pharmacy Practice in South Africa*. 4th Edition. The South African Pharmacy Council. Arcadia: South.	Department of Health, Pharmacy Practice	Medication Management, Medication Store Room Management, Single-use Item Management, Sterile Technique Maintenance, Refrigerator Management	2014 Guideline
32	Du Plessis, E. Jordaan, E. Jali, M. (2010). Chapter 20: Communication in a health care unit*. The Principles and Practice of Nursing and Health Care*. Van Schaik. South Africa.	Communication, Heath Care Unit, Practice of Nursing	Maintenance of Teamwork, Quality of Communication, Communication Structures	2010 Book
33	Ford, G. Gold, M. Karlet, M. Mani, M. (2012). Infection Control Guide for Certified Registered Nurse Anesthesia. *American Association of Nurse Anesthesia.* Park Ridge: United States of America.	AANA, Infection Control Guide, Nurse, Anesthesia	Preventative Measures, Hand Hygiene Practices, Recommendations for Fingernails and Jewellery, Injection Practices, Antibiotic Therapy Management, Disinfection and Sterilisation Practices, Anaesthetic Equipment Decontamination Practices, Single-use Item Management, Housekeeping Practices, Cleaning Programmes, Laundry Management,	2012 Guide

			Personal Protective Device Management, Waste Management	
34	Goodfellow, B. Lishman, G. Matron, J. Robb, A. Winter, C. (2013). Infection Prevention and Control Practice in the Operating Department. The Newcastle upon Tyne NHS Hospitals Foundation Trust. United Kingdom.	Infection Prevention and Control, Operating Department, Practice	Staff Immunisation Programme, Theatre Attire Management, Personal Protection Equipment Management, Hand Hygiene Practices, Glove Management, Sharp Management, Waste Management, Linen Management, Cleaning Schedules, Instrumentation Management, Endoscope Management, Staff Movement, Sterile Field Maintenance, Precautions for Specific Diseases, Training of Staff, Auditing of Practices, Standards and Policies Maintenance	2013 Policy
35	Health Protection Scotland. (2014). National Infection Prevention and Control Manual. *Infection Control Team*. Version 2.3. National Services Scotland.	Infection Prevention, Health Protection Scotland	Standard Precautions Maintenance, Hand Hygiene Practices, Personal Protective Equipment Use, Care of Medical Equipment, Management of Linen, Safe Disposal of Waste, Transmission Based Precautions Application	2014 Manual
36	Hold, A. (2011). Infection Control in Theatre. *South African Journal of Anaesthesia*, vol. 17, no. 1, pp. 56-64. Durban: South Africa.	Infection Control, Theatre	Patient Information Strategies, Glucose Control Practices, Temperature Control Practices, Hair Removal Practices, Antibiotic Use Guidelines, Skin Preparation Practices, Air Quality Maintenance, People Traffic Practices ,Scrubbing Practices, Gowning and Gloving Practices, Standard Precaution Application, Anaesthetic Equipment Decontamination, Scheduling of	2011 Journal Article

			Procedures, Linen Management, Personal Protective Equipment Management, Theatre Attire Management, Medication Practices, Surgical Technique Management, Hand Hygiene Practices	
37	Hopper, W. Moss, R. (2010). Common Breaks in Sterile Technique: Clinical Perspectives and Perioperative Implications. *AORN Journal*, vol. 91, no. 3, pp. 350-367.	Sterile Technique, Clinical Perspectives, Perioperative, Implications	Basic Sterile Principles Maintenance, Sterilisation Practices, Setting-up Standards, Hand Antisepsis Maintenance, Gowning and Draping Practices, Gloving Practices, Skin Preparation Practices, Airflow During Surgery, Environmental Control, Surgical Technique Application, Specimen Management, Sharps Management, Incident Reporting Systems	2010 Abstract
38	Smart UVC. (2015). Smart UVC Disinfection. Available at http://tru-d.com/why-uvc-disinfection/how-uvc-works/ Accessed on: 2 February 2015	Ultra-Violet Light-C (UVC) Disinfection	Decontamination of Contaminated Area, Specialised Equipment Usage, Policies and Procedure Guideline Management	2015 ARTICLE
39	Johnson and Johnson. (2006). Cidex OPA. *Advanced Sterilization Products*. Division of Ethicon. California: United States of America.	Cidex, Sterilisation	Cleaning of Equipment, Decontamination of Equipment, Personal Protective Equipment Availability, Documentation Systems, Application of Special Disease Guidelines	2006 Product Insert Guide
40	Klopper, H. Uys, L. (2013). What is the ideal ratio of categories of nurses for the South African public health system? *South African Journal of Science*, vol. 109, no. 5/6, pp. 1-4.	Ratio, Nurses, South African, Health System	Number of Incidents Compared to Number of Registered Nurses, Management's Responsibility, IPC Responsibilities	2013 Published Article
41	Marc, F. Salassa, T. Swiontkowski, M.	Surgical Attire,	Surgical Attire Management, Mask	2014

	(2014). Surgical Attire and the Operating Room: role in infection prevention. *The Journal of Bone and Joint Surgery*, vol. 96, no. 17, pp. 1485-1492.	Operating Room, Infection Prevention	Management, Head Covering Management, Gowns, Gloves, Room Ventilation Maintenance, Room Traffic Maintenance	Article
42	National Department of Health. (2011). National Core Standards for Health Establishments in South Africa. Department of Health: South Africa.	Core Standards, Health Establishments, South Africa	Infrastructure and Design: Water supply Quality Checks, Waste Management: Sharps, Linen and Laundry, Food Management, Clinical Services, Human Resources: Skills Development, Patient-Staff Ratio's Health Technology: Equipment Management, Documentation, Incident Report System Medicine Supply and Management: Sterility and Store Room Management, Antibiotic Management, Monitor of Infection Rates Protective Clothing Cleaning Schedules Pest Control Hand Hygiene Clinical Auditing Quality Improvement Plans Risk Assessment Programmes, Laboratory Results Management Sterilising Department: Decontamination and Sterilisation IPC Policies Standard Precautions Refrigerator Management	2011 National Standards
43	Netcare (2013). Quality Alert 10-2013:	Theatre, Particle	Multi-disciplinary Team Involvement	2013 QUALITY

	Theatre Particle Count. Netcare: South Africa.	Count	Strategies, Communication of Results	ALERT
44	Netcare Internal Quality Reviews. (2014). Infection Prevention Control. Netcare: South Africa.	Quality, Infection Prevention	Hand Washing Practices, IPC Training, IPC Reporting and Statistical Data Analysis, Environmental Surveillance Practices, Standard Precaution Implementation, Waste Management, Special Disease Management, Terminal Cleaning: CRE, Protective Clothing, Specimen Management, Risk Assessment	2014 Audit Document Information relevant to the management of patients in wards were excluded.
45	Netcare. (2014). CSSD Internal Quality Review Document. Netcare: South Africa.	Quality, CSSD	Policies and Procedure Management, Design of CSSD, Equipment Management, Instrumentation Management, Incident Reporting Methods, Sterilisation Methods, Tracking Systems, Sterile Store Room Management, Endoscope Management, Standard Precaution Application, Personal Protective Equipment Management, Auditing in CSSD, Cidex Management, Sharps Management	2014 Audit Document
46	Netcare. (2014). Specialist Units. Internal Quality Review Document. Netcare: South Africa.	Quality, Specialist Units	Communication Methods, Documentation Management, Particle Count Maintenance, Sharps Management, Equipment Management, Cleaning Equipment Management, Medication Procedures, Incident Management, Quality Alert Management, Aseptic Technique and Medication Management	2014 Audit Document The following categories were excluded from this study: Psychiatric Ward, Medication Prescription

				Management, Schedule Drug Management, ICU Department, Threatened Limb Management
47	Netcare. (2007). Basic Principles of Sterile Technique. *Netcare Education*. Nursing Faculty. South Africa.	Sterile Technique	Surgical Team's Adherence, Sterile Field Maintenance, Gowning and Gloving Techniques, Microbial Barrier Maintenance, Hand Hygiene Practices, Protective Clothing Management, Sterile Pack Management, Standard Precaution Management	2007 Standard
48	Netcare. (2010). Skin Preparation and Draping. Netcare Education. Nursing Faculty. Netcare: South Africa.	Skin Preparation, Draping	Standard Precaution Implementation, Sterile Technique Maintenance, Shaving of Patient, Sterile Pack Management, Drape Management, Cleaning Solution Management, Incident Reporting Systems	2007 Standard
49	Netcare. (2012). Clinical Services Surgical Services: Responsibilities Policy No. TH Section TH.2. Version, 8. Netcare Clinical Services. South Africa	Surgical Services, Responsibilities, Policy	Staffing of the OR, Patient Record Management, Peri-Operative Care, Specimen Management, People Movement in the OR, Theatre Attire Management	2012 Policy The following categories were excluded from this study: Intra-operative Positioning, Theatre Reception, Electro-surgical Equipment,

				Checking of swabs, instruments and needles, Conscious Sedation
50	Netcare. (2013). Sterile Services Management and Decontamination Process Policy No. TH Section TH. 3. Netcare Sterile Services. South Africa.	Sterile Services, Decontamination Process	Staffing in CSD, Training and Education Programmes, Cleaning and Drying of Instrumentation Practices, Single-use Item Management, Cidex Management, Loan Set Management, Autoclaves Management, Sterile Store Room Management, Decontamination Cycle Maintenance	2013 Policy
51	Netcare. (2013). Clinical Services Infection Prevention and Control Environment Policy no. IPC03 of 2013. South Africa.	Infection Prevention and Control, Environment	Cleaning of the OR, Audit Management, Air Sampling Practices, Anaesthetic Equipment Maintenance, Endoscope Management, Laundry and Linen Management, Refrigerator Management, Waste and Sharps Management, Cleaning of Anaesthetic Equipment	2013 Policy
52	Netcare. (2013) Clinical Services Infection Prevention and Control Nursing Techniques. IPC02. Netcare. South Africa.	Infection Prevention and Control, Nursing Techniques	Hand Hygiene Practices, Specimen Collection Practices, Aseptic Technique Management, Standard Precaution Implementation, Isolation Techniques, Special Disease Management, Multi-vial Use Practices	2013 Policy
53	Netcare. (2014). Clinical Services Nursing Standard Operating Procedures. Theatre Attire NUR05.S02. Netcare: South Africa.	Infection Prevention and Control, Theatre Attire	Personal Protective Equipment Usage, Availability of Attire, Changing Methods, Masks, Hats and Boots Management	2014 Policy

54	Netcare. (2014). Clinical Services Theatre and SSD Managing of Loan Equipment. NUR05.S01. *Health Technology Division*. Netcare: South Africa.	Theatre and CSSD, Loan Equipment	Decontamination Processes, Documentation of Processes, Sterilisation Practices	2014 Policy
55	Netcare. (2014). Internal quality Review. *Occupational Health and Safety*. Netcare South Africa.	Quality, Occupation Health and Safety	Personal Protective Equipment Management, Environmental Management, Equipment Management, Incident Report Systems, Risk Assessment Practices	2014 Audit
56	Operating Suite. (2013). Infection Control: Standard and Additional Precautions of the Operating Suite. *The Children's Hospital at Westmead*. United Kingdom.	Infection Control, Precautions, Operating Suite	Personal Protective Device Management, Hand Washing Practices, Gloving, Mask and Eye Protection Practices, Gowning Practices, Laundry Management, Cleaning Practices, Additional Cleaning Practice Guideline Management	2013 Standard
57	Phillips, N. (2016). *Barry and Kohn Operating Room Technique.* 13th Edition. Elsevier: United States.	Operating Room	Environmental Control Practices, Basic Sterile Principle Maintenance, Instrumentation Management, Sterilisation Practices, Specialised Equipment Management, Standard Precaution Implementation, Waste and Linen Management, Cleaning Schedule Maintenance	2013 Book
58	Pyrek, K. (2013). HAI Prevention and Environmental Hygiene: Changing The Landscape of Healthcare Delivery. *Infection Control Today*. Virgo Medical.	HAI (Hospital Acquired Infection), Environmental Hygiene, Healthcare	Environmental Control Practices, Patient Information Practices, Special Disease Management Guidelines, Communication Practices, IPC Programme Management	2013 Report
59	Pyrek, K. (2014). Updated Environmental Cleaning RP Addresses OR Imperatives.	Environmental Cleaning, OR	Environmental Control Practices, Cleaning Programme Management,	2014 Report

	Infection Control Today. Available from http://www.infectioncontroltoday.com/Articles/2014/04/Updates-Environmental-Cleaning-RP-Addresses-OR-Imperatives/ . Accessed on 04 March 2015.		Anaesthetic Equipment Management, Turn-over Time Management, Education and Training Programmes	
60	Rothrock, J. (2015). *Alexander's Care of the Patient in Surgery.* 15th Edition. Elsevier: United States.	Care, Patient, Surgery	Environmental Control Programmes, Basic Sterile Principle Maintenance, Sterilisation and Decontamination Practices, Endoscope Management, Hand Hygiene Practices, Personal Protective Equipment Management, Standard Precaution Maintenance, Cleaning Schedule Management, Laundry and Waste Management, Specimen Management, Incident Reporting Systems, Communication Practices, Anaesthetic Equipment and Surgical Equipment Management	2015 Book
61	Royal Cornwall Hospitals. (2014). Clinical Guideline for Theatre Practice Standards. National Health System. United Kingdom.	Clinical Guide, Theatre, Practice Standards	Staff Preparation, Environmental Preparation, Record Keeping and Documentation Practices, Aseptic Technique Application, Disease Management in the OR, Decontamination, Clinical Waste, Incident Reporting, People Movement in the OR	2014 Guideline
62	Rutala, W. Weber, D. (2014). Gastrointestinal Endoscopes: a need to shift from disinfection to sterilization. *Journal of the American Medical Association*, vol. 312, no. 14, pp. 1405-1406.	Endoscopes, Disinfection, Sterilisation	Endoscopic Instrumentation Management, Endoscope Processor Maintenance, Cleaning Programmes, Endoscope Policies and Procedures, Training of Staff	2014 Editorial
63	SAFMED. (2011). Protecting Surgical Instruments from Corrosion: the importance	Surgical Instrumentation,	Cleaning and Decontamination of Instrumentation, Incident Reporting	2011 Article

	of passivation. The Surgical Post. Available from http://www.plattsnisbett.com/wordp/?p=190 . Accessed on 8 July 2015	Corrosion, Passivation	Systems , Documentation Practices	
64	Sheard, D. (2013). CSSD Forum Standard Operating Procedure. Sterile Service Department. CSFA. South Africa.	CSSD, Standard Operating Procedure	Department Cleaning Procedure, Departmental Dress Code, Collection of Contaminated Equipment Practices, Manual and Automated Decontamination Equipment Management, Loan Set Management, Control of Packing Area Practices, Steriliser Management, Sterile Store R, Doom Management, Quality Control Practices, Validation of Equipment, Maintenance Schedule of Equipment, Decontamination of Linen, Instrumentation Management, Anaesthetic Equipment Management	2013 Procedures
65	Shepherd, L. (2015). Part 1: Decontamination of Medical Devices. Part2: Environment Including Management of Spills of Blood/Body Fluids. *National Health Services Forth Valley.* United Kingdom.	Decontamination, Medical Devices	Education of Staff, Incident Reporting Systems, Documentation Practices, Sterilisation Practices, Singe-use Item Management, Risk Assessment Practices	2012 Guide
66	Sieczkowski, C. (2014). Clipping not Shaving Intervention Guidelines. *Surgical Site Infection Improvement Programme*. 3rd Version. Health Quality and Safety Commission New Zealand. New Zealand.	Clipping, Shaving, Guidelines	Hair Removal Practices, Clipping versus Shaving Practices, Skin Preparation Practices	2014 Guideline
67	*SASA Guidelines for Infection Control in Anaesthesia in South Africa 2014* South African Society for Anaesthesiologists. (2014) SASA	Infection Control, Anaesthesia	Multi-dose Vial Management, Medication Management, Hand Hygiene Practices, Anaesthetic Equipment Management, Antibiotic	2014 Guideline

	Guidelines for Infection Control in Anaesthesia in South Africa. *South African Journal for Anaesthesia Analogue*, vol. 20, no, 3, pp. 1-39. South Africa.		Use Practices, Clinical Techniques, IPC Programme Management, Incident Reporting Systems	
68	UK Essays. (2010). Role of Laminar Airflow in Controlling Operating Room Infections. Available from http://www.ukessays.com/essays/nursing/role-of-leminar-air-flow-in-controlling-oprating-room-infection-nursing-essays.php . Accessed on 14 May 2014.	Laminar Air-Flow, Operating Room, Infection	Ventilation System Maintenance, Particle Count Management, Traffic in the OR Control, Staff Allocation per Case, Policies and Procedure Management, Staff Training Programmes, Risk Assessment Practices	2014 Article
69	Vaidya, A. (2013). 10 Best Strategies for Infection Prevention and Control. Available from http://www.beckershorspitalreview.com/quality/10-best-strategies-for-infection-prevention-and-control/ . Accessed on 10 March 2015.	Infection Prevention and Control	Hand Hygiene Practices, Environmental Hygiene Management, Staff Vaccination Programmes, Surveillance Practices, Antibiotic Management, IPC Programme Management, Risk Assessment Practices	2013 Article
70	World Health Organization. (2008). Core Components for Infection Prevention and Control Programmes: Report of the Second Meeting Informal Network on Infection Prevention and Control in Health Care. Geneva: Switzerland.	WHO, Infection Prevention and Control, Programmes	IPC Programme Implementation, Human Resource Management, Audits and Surveillance Practices, Environmental Control Practices, Microbiology Laboratory Involvement	2008 Report

APPENDIX B

THE DEVELOPMENT OF A COMPREHENSIVE INFECTION PREVENTION CONTROL QUALITY AUDIT TOOL FOR OPERATING ROOM THEATRES WITHIN A PRIVATE HEALTHCARE ENVIRONMENT

PARTICIPANT GUIDELINE SHEET

Good day, my name is Linette Engelbrecht. I am a MSC Nursing student in the Department of Nursing Education at the University of the Witwatersrand. I would like to invite you to participate in a research study entitled: “The development of a comprehensive infection prevention control quality audit tool for operating room theatres within a private healthcare environment.” Before agreeing to participate, it is important that you read and understand the following explanation of the purpose of the study, the study procedures and your right to withdraw from the study at any time. This information sheet is to help you decide if you would like to participate. You need to understand what is involved before you agree to take part in this study.

You should not agree to participate unless you are satisfied with the procedures involved. Do not hesitate to ask me any questions.

The purpose of this study is to develop and pilot test a comprehensive infection prevention control quality audit tool for operating room theatres in a private healthcare environment. You are experienced and knowledgeable in your specific field and are therefore invited to partake in this study as you meet the requirements of the sample group for this study.

If you agree to partake in this study, the data will be collected at your workplace facility. You will be given a set of numbered statements individually printed on cards, you will be asked to rank order the statements from agree to disagree in order of importance for inclusion in a comprehensive infection prevention control quality audit tool within a private healthcare environment by writing the number of the card on a spreadsheet (deck) provided. It will take approximately 30 to 40 minutes to sort all the statements. After you have sorted the statements I will conduct an interview with you to clarify any uncertainties.

The information from all the participants will be analysed and used to compile a comprehensive infection prevention quality audit tool that then will be pilot tested in one operating room within a private healthcare environment. A summary of the research will be available to you on request.

The results of the research will be confidential. No names will be used. Participation will not be of any direct benefit to you personally but may benefit the development of infection prevention control quality audit tools for operating rooms within the private healthcare environment.

You may withdraw your participation from the study at any time without any prejudice to yourself or negative consequences.

Should you have any questions about your rights as a study participant, or questions or concerns about any aspects of this study, please call the Ethics Department of the

University of the Witwatersrand on +27 11 717 1234 or my supervisor, Dr Sue Armstrong at 011 488 3094.

Thank you for your consideration.

.....

L Engelbrecht

072 120 7692

Johannesburg, 2017

APPENDIX C

THE DEVELOPMENT OF A COMPREHENSIVE INFECTION PREVENTION QUALITY AUDIT TOOL FOR OPERAWTING ROOM THEATRES IN A PRIVATE HEALTHCARE ENVIRONEMNT

INFORMED CONSENT

I hereby confirm that I have been informed by the researcher, Linette Engelbrecht, about the nature of her study entitled “The development of a comprehensive infection prevention quality audit tool for operating room theatres in a private healthcare environment”.

I have received, read and understood the written information sheet regarding the study.

I further understand that although I have commenced with the audit tool, I am not obliged to submit the data sheets should I choose not to.

I may, at any stage, without prejudice, withdraw consent and participation in the study.

I have had sufficient opportunity to ask questions and, of my own free will, declare myself prepared to partake in the study.

…….. ……..

Signature Date

Johannesburg, 2017

APPENDIX D

Participant Guideline during the Data Collection Phase (Q-sort)

You are provided with a set of cards each containing a single statement and allocated number. You are requested to rank order these statements under the following condition of instruction: *Rank the following concepts in order of importance for inclusion in an Infection Prevention Quality Audit Tool for the operating room theatre in a private health care environment.*

First familiarise yourself with the statements by placing the cards in three roughly equal piles, e.g. ‘agree’, ‘disagree’, and ‘neutral’.

You are also provided with a numbered Q sort response sheet. Each space on the sheet indicates the positioning of an item on the continuum from -3 (most disagree) to +3 (most agree).

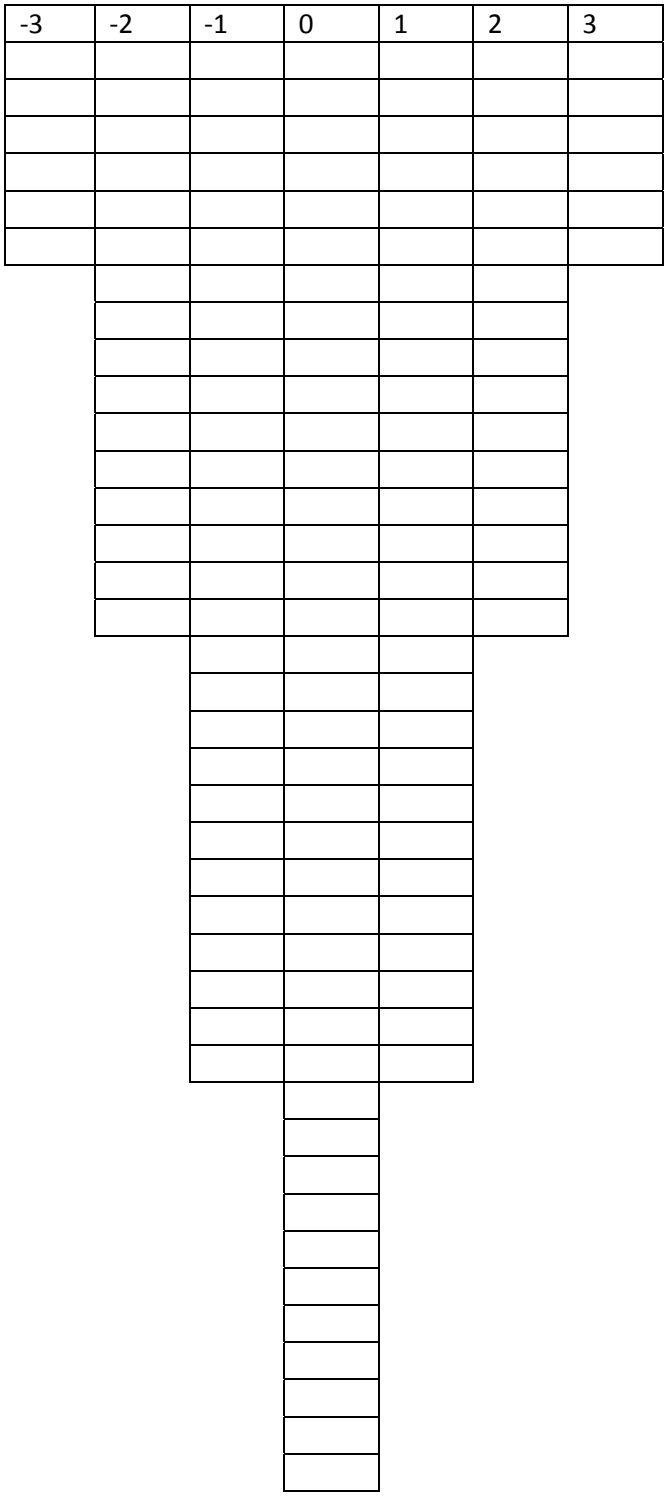
Write the number of the card in the desired position on the sheet with the pen provided. You can only allocate one card number per block.

The researcher will be present during the data collection phase and will conduct a qualitative interview with you afterwards to clarify uncertainties regarding extreme scores. This information will be added to you score sheet.

APPENDIX E

Q-sort diagram/ score sheet

MOST DISAGREE NEUTRAL MOST AGREE



APPENDIX F

Interview guide during data collection phase (Q Sort)

The person is thanked for her participation in this study.

The participant is assured again of the confidentiality of the information provided.

The participant is requested to ask any questions regarding this data collection phase.

The participant is asked to motivate extreme score allocation of statements.

The information is verbally repeated to the participant by the researcher.

The researcher verifies the information provided.

Score Sheet Number	

'Please motivate your placement of card number ☐ on the score sheet.'

_____
_____
_____

Score Sheet Number	

'Please motivate your placement of card number ☐ on the score sheet.'

_____
_____
_____
_____
_____
_____
_____
_____

Researcher

APPENDIX G

Summary of statement Mean Scores and Final Audit Tool Integration

Statement	Statement Mean Score	Final Audit Tool
There is evidence of an IPC Programme per area in the OR	-0.24	Standard 1: There is an IPC Programme that is appropriate for the goals of the service and that supports quality care of patients in the operating room. Standard 2: There is an OR IPC Committee that is appropriate for the goals of the service and that supports quality care of patients in the operating room Standard 29: The surgical site infection rate and practices reflect international acceptable care.
There is evidence of a Hospital Committee that consists of members of the multi-disciplinary team	-0.95	Standard 2: There is an OR IPC Committee that is appropriate for the goals of the service and that supports quality care of patients in the operating room
Patients and the multi-disciplinary team are informed of the IPC status of the OR before the start of each list	-0.48	Standard 1: There is an IPC Programme that is appropriate for the goals of the service and that supports quality care of patients in the operating room. Criteria 1.2.3: Surveillance and Assessment Indicator 15
There is evidence of a formal incident reporting system	-0.38	Standard 3: There is evidence of an incident report system
The structure of the OR design adheres to legislation	-1.10	Standard 4: The physical building, design and fixtures in the OR adhere to legislation Standard 6: Water quality contributes to the prevention of infection and distribution of micro-organisms
Air quality is monitored and managed according to evidence based practices	0.00	Standard 5: Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms
Additional IPC guidelines during building renovations and construction are evident	-0.24	Standard 7: Building and construction practices support the quality of the IPC practices in the OR Standard 6: Water quality contributes to the prevention of infection and distribution of micro-organisms
The work delegation per shift is according to the Scope of Practice of each staff member	-0.19	Standard 9: Human resources are managed to maintain IPC structures in the OR Criteria 9.1, Indicator 11

There is enough qualified staff allocated per shift to maintain IPC practices	0.14	Standard 9: Human resources are managed to maintain IPC structures in the OR Criteria 9.1
The clinical skills of the multi-disciplinary team are assessed annually	-1.19	Standard 10; The clinical skills of the multi-disciplinary team are assessed Standard 27, Criteria 27.1, Indicator 4
Communication strategies in the OR are evident	-0.57	Standard 2: There is an OR IPC Committee that is appropriate for the goals of the service and that supports quality care of patients in the operating room, Criteria 2.2 Standard 4: The physical building, design and fixtures in the OR adhere to legislation, Criteria 4.13 Standard 5: Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms, Criteria 5.4 Standard 6: Water quality contributes to the prevention of infection and distribution of micro-organisms, Criteria 6.4 Standard 7: Additional building and construction practices supports the quality of the IPC practices in the OR, Criteria 7.1 Standard 8: Policies and procedures regarding IPC practices in the OR are evident, Criteria 8.2 Standard 9: Human Resources are managed to maintain IPC structures in the OR, Criteria 9.3 Standard 10: The clinical skills of the multi-disciplinary team (nurses, doctors and cleaners) are assessed, Criteria 10.1 Standard 11: Every person entering the semi-restricted and restricted area of the OR adheres to PPE, Criteria 11.7 Standard 12: Hand hygiene practices are according to evidence based practices, Criteria 12.2 Standard 13: The application of basic sterile technique is evident, Criteria 13.10 Standard 14: The management of single-use items are evident, Criteria 14.3 Standard 15: Human tissue is managed according to evidence-based practices, Criteria 15.2 Standard 16: Waste in the OR is managed according to evidence based

		practices, Criteria 16.7 Standard 17: Equipment is managed according to evidence based practices, Criteria 17.3 Standard 18: Endoscope equipment is managed according to evidence based practices, Criteria 18.3 Standard 19: Anaesthetic equipment is managed according to evidence based practices, Criteria 19.2 Standard 20: Medication management is according to evidence based practices, Criteria 20.10 Standard 21: Practices to maintain body temperature control are evident, Criteria 21.3 Standard 22: Hair removal practices are according to evidence based practices, Criteria 22.3 Standard 23: Practices to manage blood glucose control throughout the procedures are evident, Criteria 23.2 Standard 24: Environmental control practices are evident, Criteria 24.2 Standard 25: Cleaning and disinfection programme is evident in the OR, Criteria 25.8 Standard 27: The CSD area is managed according to evidence based practices, Indicator 3, 10, 11, 12, 21, 22, 34, 39, 40, 45, 47, 48, 51, 54, 56, 57, 58, 59, 60, 61, 62, 63, 66, 67 Standard 28: A preventative maintenance programme is evident
Guidelines for the management of specific diseases in the OR are available and implemented	0.86	Standard 9: Human Resources are managed to maintain IPC structures in the OR, Criteria 9.3, Indicator 22 Standard 25: Cleaning and disinfection programme is evident in the OR, Criteria 25.7 Standard 27: The CSD area is managed according to evidence based practices, Criteria 27.10
Hand hygiene practices are evident	1.81	Standard 12: Hand hygiene practices are according to evidence based practices
Prophylactic antibiotics are administered according to evidence based practices	1.14	Standard 20: Medication management in the OR is according to evidence-based practices
Medication is managed according to evidence based practices	-0.29	Standard 20: Medication management in the OR is according to evidence-based practices
Sterile store and stock rooms are managed	0.24	Standard 4: The physical building, design and fixtures in the OR adhere to

according to evidence based practices		legislation, Criteria 4.10 Standard 27: The CSD area is managed according to evidence based practices, Criteria 27.11
Disinfection and sterilisation procedures are implemented according to evidence based practices	1.43	Standard 27: The CSD is managed according to evidence based practices
Instrumentation management is according to evidence based practices	1.19	Standard 27: The CSD is managed according to evidence based practices
Sterilisation and decontamination equipment are managed according to evidence based practices	1.05	Standard 27: The CSD is managed according to evidence based practices,
The multi-disciplinary team's compliance to, and availability of PPE is evident	0.43	Standard 27: The CSD is managed according to evidence based practices, Criteria 27.2 Standard 11: Every person entering the semi-restricted and restricted area adheres to PPE
Sterilisation of loan seats are managed according to evidence-based principles	0.67	Standard 27: The CSD is managed according to evidence based practices, Criteria 27.9
Gluteraldehyde is managed according to evidence based practices	-0.48	Standard 27: The CSD is managed according to evidence based practices, Criteria 27.4 Standard 18 :Endoscope equipment is managed according to evidence based practices, Criteria 18.2
Equipment is managed according to evidence based practices	-0.62	Standard 17: Equipment is managed according to evidence based practices Standard 19: Anaesthetic equipment is managed according to evidence based practices
Endoscope management is implemented according to evidence based practices	0.57	Standard 18: Endoscope equipment is managed according to evidence based practices
Patient documentation indicate IPC practices	-0.43	Standard 5: Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms, Criteria 5.4 and indicator 11 Standard 13: The application of basic sterile technique is evident, Criteria 13.10 and indicator 94,96 Standard 17: Equipment is managed according to evidence based practices, Criteria 17.3 and indicator 11 Standard 18: Endoscope equipment is managed according to evidence based practices, Criteria 18.3 and indicator 20,24 Standard 19: Anaesthetic equipment is managed according to evidence

		based practices, Criteria 19.2 and indicator 29.30 Standard 20: Medication management is according to evidence based practices, Criteria 20.9 and indicator 52 Standard 21: Practices to maintain patient body temperature control are evident, Criteria 21.3 and indicator 16, 17, 18, Standard 22: Hair removal practices are according to evidence based practices , Criteria 22.3 and indicator 5, 7 Standard 23: Practices to manage blood glucose control throughout the procedure is evident, Criteria 23.2 and indicator 1, 2 Standard 24: Environmental control practices are evident, Criteria 24.2, Indicator 12
Single–use items are managed according to evidence based practices	0.57	Standard 13: The application of basic sterile technique is evident, Criteria 13.2 and indicator 12 Standard 14: The management of single-use items are evident Standard 18: Endoscope equipment is managed according to evidence based practices, Criteria 18.2 and indicator 15
Towelling, draping and linen management is according to evidence based practices	0.29	Standard 4: The physical building, design and fixtures in the OR adhere to legislation, Criteria 4.11: Linen storage rooms adhere to legislation, indicator 58, 59, 60, 61 Standard 11: Every person entering the semi-restricted and restricted area in the OR adheres to PPE policies, Criteria 11.1 and indicator 1, 2, 3, 4, 5, 6 Standard 13: The application of basic sterile technique is evident, Criteria 13.6, indicators 45, 45, 48, 49, 50, 51, 52, 58, 59, 61, 62, 63, 65, 66, 67, 68, 71, 72, 73
There is evidence of medical waste and sharps management	0.76	Standard 16: Waste in the OR is managed according to evidence based practices
A policy minimising people movement in the OR is available and implemented	-0.19	Standard 5: Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms, Criteria 5.2 and indicator 3 Standard 9: Human Resources are managed to maintain IPC structures in the OR, Criteria 9.2: People movement in the OR are monitored
Policies regarding turn-over time management is evident and implemented	-1	Standard 26: Practices during turn-over time is according to evidence based practices
Targeted environmental cleaning is evident	-0.05	Standard 25: Cleaning and disinfection programme is evident in the OR

The SMART UVC for decontamination of the OR is evident	-0.52	Standard 25: Cleaning and disinfection programme is evident in the OR
Hair removal practices are according to evidence based practices	-0.24	Standard 22: Hair removal practices are according to evidence based practices
The OR manager is trained and skilled in managing the IPC programme	0.90	Standard 9: Human Resources are managed to maintain IPC structures in the OR, Criteria 9.1, Indicator 1
Human tissue management adheres to evidence based practices	0.62	Standard 15: Human tissue is managed according to evidence based practices
There is evidence of standard precautions compliance by all members of the multi-disciplinary team	0.10	Standard 8: Policies and procedures regarding IPC practices in the OR are evident Standard 10: The clinical skills of the multi-disciplinary team are assessed Standard 11: Every person entering the semi-restricted and restricted area of the OR adheres to PPE Standard 12: Hand hygiene practices are according to evidence based practices
There is evidence of regular body temperature control of patients peri-operatively	0.00	Standard 21: Practices to maintain body temperature control are evident
The immunisation programme of the staff is evident	-0.05	Standard 9: Human Resources are managed to maintain IPC structures in the OR, Criteria 9.4, Indicator 22
There is evidence of regular blood glucose control of patients peri-operatively	-0.57	Standard 23: Practices to manage blood glucose control throughout the procedure is evident
Targeted OR IPC training and monitoring of the multi-disciplinary team is evident	-0.62	Standard 10: The clinical skills of the multi-disciplinary team are assessed
There is evidence of a pest control programme in the OR	-0.62	Standard 24: Environmental control practices are evident
An OR preventative maintenance programme is evident	-0.71	Standard 28: A preventative maintenance programme is evident
There is evidence of a risk assessment during OR rounds by the IPC Manager, OHS Manager, Technical Manager and Unit Manager	-1.14	Standard 28: A preventative maintenance programme is evident

APPENDIX H

THE DEVELOPMENT OF A COMPREHENSIVE INFECTION PREVENTION QUALITY AUDIT TOOL FOR OPERATING ROOM THEATRES WITHIN A PRIVATE HEALTHCARE ENVIRONEMNT

SUBJECT EXPERT INFORMATION SHEET

Good day, my name is Linette Engelbrecht. I am a MSC Nursing student in the Department of Nursing Education at the University of the Witwatersrand. I would like to invite you to partake as an IPC / OR expert in the third part of the study entitled: "The development of a comprehensive infection prevention quality audit tool for operating room theatres within a private healthcare environment".

Before agreeing to partake, it is important that you read the following explanation of the purpose of the study, the study and your right to withdraw from the study at any time. You should not agree to participate unless you are satisfied with the procedure.

The purpose of this study is to develop and pilot test a comprehensive infection prevention control quality audit tool for operating room theatres in a private healthcare environment. The data collection has been completed in phase one of the study based on a literature review of aspects that is included in other audit tools, policies, procedures and published articles and guidelines internationally. The data was presented to internal and external stakeholders from three hospitals in a concourse format. Three IPC Coordinators, three CSD Managers, three OHS Coordinators, three Anaesthetic Nurses, six Scrub Nurses and three Surgeons did partake in the study. The participants had to select statements they feel should be included in a IPC quality audit tool for operating room theatres by sorted the data using q-sort in phase two. In phase three the audit tool was designed. You are requested to test the audit tool for validity should you agree to partake in this study.

The audit tool consist of twenty-nine standards with criteria and indicators. It will take you approximately 6 hours to complete the document in the clinical environment.

If you agree to partake in this study a hard copy of the tool will be supplied to you with documentation to make recommendations. Permission has been obtained to pilot the audit tool in one operating room theatre in the group should you wish to. Alternatively you may make recommendations about the audit tool without being in the clinical environment. Once you have completed your data, I will collect the information from you or you can mail the results to me.

A summary of the research will be available to you on request. Participation will not be of any direct benefit to you personally but will benefit the development of infection control quality tools of operating room theatres within a private healthcare environment.

You may withdraw your participation from the study at any time without any prejudice to yourself or negative consequences.

Should you have any questions about your rights a study participant, or questions or concerns about any aspect of this study, please call the Ethics Department of the University of the Witwatersrand on +27 11 717 1234 or my supervisor. Dr Sue Armstrong at 011 488 2094.

Johannesburg, 2017

I thank you for your consideration.

……

L Engelbrecht

072 120 7692

Johannesburg, 2017

APPENDIX I

VALIDATION DOCUMENT

Recommendations of IPC/OR experts on the Comprehensive Infection Prevention Quality Audit Tool for Operating Room Theatres within a Private Healthcare Environment as Required in Phase Three of the Study.

Instructions on completion of the document

1. Familiarise yourself with the audit tool provided
2. Please use the document provided for your comments and recommendations.

Should you have any questions please feel free to contact me on 072 120 7692.

Linette Engelbrecht

Name of participant:

Date:

The tool was piloted in the clinical environment? YES NO

Please indicate the time you spent on completion of the audit _____

STANDARD NO:

CRITERIA NO:	INDICATOR	COMMENTS

INFECTION PREVENTION QUALITY AUDIT TOOL FOR OPERATING ROOM THEATRES **APPENDIX J**

STANDARD 1: STRUCTURE: There is an IPC Programme that is appropriate for the goals of the service and that supports quality care of patients in the operating room. (C = Compliant; PC = Partially Compliant; NA = Non-Compliant; N/A = Not Applicable).

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
1.1	There is an Infection Prevention Programme specific to every area in the OR.					1. Pre-operative area	Documented IPC Programme
						2. Intra-operative area	
						3. CSD area	
						4. Recovery Room area	
						5. Store rooms	
						6. Change rooms	
						7. Kitchen	
1.2	The programme includes: 1.2.1 Organising and Planning					8. A budget is allocated to the programme	Minutes of IPC meetings
						9. Policies, goals and strategies of the programme are identified and communicated	Documented policies, goals and minutes of meetings and publications
						10. The OR Committee approves, guides and publishes reports of the IPC programme	Minutes of meetings
	1.2.2 Human Resource Management					11. There is one staff trained in the IPC programme in the operating room during every shift	Delegation documentation of every shift
						12. The responsibility for monitoring the IPC programme is clearly defined	Job description of members of the multi-disciplinary team
						13. There is proof of multi-disciplinary involvement in the IPC programme	Minutes of meetings
	1.2.3 Surveillance and Assessment					14. There is documented proof that the effectiveness of the programme is monitored	Minutes of meetings

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						15. The compliance rate of the unit to the IPC programme is communicated to stakeholders with every shift hand-over event	Hand-over documentation E-mail Patient information documentation
	1.2.4 Microbiology Laboratory					16. There is proof of microbiology laboratory engagement in the IPC programme	Laboratory test results
	1.2.5 Environment					17. Planned Training Programmes, Journal Club meetings and internet resources are evident to maintain the implementation of the IPC programme.	Planned Training Programmes, Attendance Lists, Internet access, Published Evidence-based Articles
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 2: STRUCTURE: There is an OR IPC Committee that is appropriate for the goals of the service and that supports quality care of patients in the operating room.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
2.1	There is an OR IPC Committee that consist of the following:					1. Hospital Manager	List of Committee Members and attendance lists
						2. IPC Coordinator	
						3. OHS Coordinator	
						4 .Technical Manager	
						5. Cleaning Manager	
						6. Microbiologist	
						7. Clinical Pharmacist	
						8. OR Unit Manager	
						9. Physicians	
						10. Surgeon per discipline represented in the OR	
						11. Anaesthetist	
						12. CSD Manager	
						13. OR Clinical Facilitator	
2.2	Communication structures are evident					14. There is documented proof of structured meetings reflected in agendas and minutes of meetings	Agenda's and minutes of meetings
						15. Lines of responsibilities are clearly defined	Minutes of meetings
						16. Interdepartmental service level agreements between OR, IPC, OHS, Cleaners, Kitchen are evident	Interdepartmental service level agreements
						17. There is proof that the objectives of the committee are met	Minutes of meetings
						18. The Committee approves, guides and publishes reports regarding the IPC programme	Minutes of meetings and published reports

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						19. The IPC status of the OR is communicated to all stakeholders listed in 2.1 and patients	Minutes of meetings Patient Information Leaflet
						20. There is proof that all reported incidents as well as risk assessments are discussed and managed	Minutes of meetings
						21. Statistics proof that IPC practices are monitored	Minutes of meetings
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 3: STRUCTURE: There is evidence of an incident report system.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
3.1	There is evidence of a formal and in-formal (anonymous) incident reporting system					1. There is a system in place that protects the staff member who reports an incident	Policies and Procedures
						2. Patients are assisted in the reporting of adverse events	Policies and Procedures Patient information regarding incident reporting Display of Patients' Rights Charter in pre-operative area.
						3. There is proof that IPC incident are converted in learning experiences	Incident Reports and Training Programmes
						4. There is proof of feedback of reported IPC incidents to the IPC committee and staff members	Minutes of meetings
						5. Reporting of- and non-reporting of IPC incidents are included in the risk assessment process	Minutes of meetings List of incidents not reported that resulted in adverse events and "Not Competent" audit ratings
						6. Disciplinary action is taken against routine IPC policy-offenders	Discussion planners and disciplinary reports
3.2	The staff in the OR is trained in the use of the incident report system					7. There is proof of in service training of staff regarding the incident report system	In-service training planners and attendance reports
						8. A list of IPC Terminology Definitions is available to assist staff members to write incident reports	List of IPC terminology and definitions
	SCORE:						
	MAXIMUM SCORE:						

	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 4: STRUCTURE: The physical building, design and fixtures in the OR adhere to legislation.

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
4.1	The pre-operative area adheres to legislation					1. The pre-operative area is managed as a semi-restricted area	Demonstration
						2. There is a minimum of 900mm between bedsides and 1500mm between the foot of any bed and the opposite bed	Measurement or floor plan of the area Indicate measurement:
						3. Each bed bay is equipped with a designated suction unit, oxygen point and monitoring equipment	Demonstration
						4. There is an area allocated to paediatric nursing only	Demonstration
						5. Toys are disinfected after every use and are not shared between patients	Demonstration Policy
						6. There are toilet facilities available in the area	Demonstration
						7. The area is equipped with a hand washing basin	Demonstration
4.2	The Recovery Room area adheres to legislation					8. The area is within the restricted area	Demonstration, floor plan of the area
						9. A minimum unobstructed floor area of 12m² and wall length of 3000mm for the first OR and 16m² for two and 24m² for three operating rooms is evident	Measurement or floor plan of the area Indicate amount of operating rooms: Indicate measurement:

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						10. Each bay is equipped with a designated oxygen outlet, suctioning point and monitoring equipment	Demonstration
						11. A deep bowl sink is available	Demonstration
4.3	Every scrubbing-up area adheres to legislation					12. The scrubbing-up area allows for direct access to the operating room	Demonstration, Floor plan
						13. The area is outside but adjacent to the OR	Demonstration
						14. The width of the area is not less than 2100mm	Demonstration Indicate measurement:
						15. At least two people can scrub simultaneously	Demonstration
						16. Hot and cold water is available	Demonstration
						17. Elbow operated taps, movement sensor, knee or foot operating taps are available	Demonstration
4.4	The cleaning and disposal area adheres to legislation					18. The area serves the operating room only	Demonstration
						19. Each theatre has access to this area via a disposal corridor	Demonstration, Floor plan
						20. Each theatre has access to this area via a disposal corridor	Demonstration, Floor plan
						21. Both the disposal corridor and the cleaning area are outside the restricted area	Demonstration, Floor plan
						22. The area has unobstructed floor area of 5m² and minimum wall length of 2m per operating room	Demonstration, Floor plan Indicate measurement:
						23. The area consist of a rust proof deep bowl sink, hand wash basin and adequate shelving and cupboards	Demonstration, Floor plan

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						24. A separate area for the storage of cleaning equipment and materials is evident	Demonstration, Floor plan
4.5	Rest and Change Rooms adhere to legislation					25. Each male and female change room can be entered from outside and has access to the semi-restricted and restricted areas	Demonstration, Floor plan
						26. Floor area is not less than 9m² for the first two OR's and then additional 2m² for every other OR	Measurement, Floor plan Amount of theatres: Indicate the size of the change rooms
						27. A hand wash basin and one partitioned toilet per 12 persons are evident	Number of staff on duty: Number of hand wash basins: Number of toilets:
						28. There are separate storage areas for clean OR theatre attire and personal items of the staff	Demonstration, Floor plan
						29. A designated area is indicated and marked for used OR attire	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						30. Rest rooms for OR staff are within the semi-restricted area	Demonstration, Floor plan
4.6	Kitchen facilities in the OR adhere to legislation					31. The design of the kitchen allows for clear flow of work from preparation to delivery area	Demonstration, Floor plan
						32. Refrigeration space is provided	Demonstration
						33. Hand wash basin is provided	Demonstration, Floor plan
						34. Designated area for the disposal of food is indicated	Demonstration
						35. Food, transported from the main kitchen is covered with cling wrap or a lid	Demonstration Policy
						36. Bain Marie's are cleaned daily, water is changed three times a day and food is kept at 85^{o}C	Demonstration Policy Measurement: Indicate the temperature of the water
4.7	Storage Facilities adhere to legislation					37. Separate mechanical ventilated store rooms are provided for stock, clean linen, medication and equipment	Demonstration, Floor plan
4.8	Setting- up space allows adherence to basic sterile principles					38. Setting-up space is either provided as a separate room or inside the OR	Demonstration, Floor plan
						39. Adequate space is provided to set-up sterile trolleys and to maintain basic sterile principles	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
4.9	The size of the OR adheres to legislation					40. The following minimum dimensions are evident: Minor Theatre = 20m² Major Theatre = 30m² Cardiac Theatre = 45m² Catheterisation Lab = 42m² Height of all theatres = 2.9m	Floor plan, Measurement: Indicate the size of the theatres: Minor Theatre: Major Theatre: Cardiac Theatre: Catheterisation Lab: Height of the theatres:
						41. Each theatre has manual or censored double door access for patient beds and single door access for staff	Demonstration, Floor plan
						42. Doors have an overlap so that it can close completely	Demonstration
4.10	CSD area adheres to legislation					43. The CSD area is adjacent to/or forms part of the OR	Demonstration, Floor plan
						44. A minimum floor space of 30m² for the first two OR's and additional 2m² per other OR is evident	Floor plan Measurement: Number of theatres: Size of CSD area:

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						45. A trolley wash area with a floor drain, hot and cold water is evident	Demonstration, Floor plan
						46. A deep stainless steel sink of at least 350mm deep with hot and cold water is available	Demonstration and measurement Indicate the size of the sink:
						47. The washing and packing area is separated	Demonstration, Floor plan
						48. Vacuum and high pressure air systems are available	Demonstration
						49. A slop-hopper is available	Demonstration, Floor plan
						50. Hand washing facilities are available	Demonstration, Floor plan
						51. Floor space of the clean tray preparation is 4m² X 1m² per additional OR	Floor plan, Observation Measurement: Total amount of theatres: Size of preparation area:
						52. The maintenance area for mounted autoclave units is outside the restricted area	Demonstration, Floor plan

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						53. The sterile store room is outside traffic flow patterns but inside the restricted area	Demonstration, Floor plan
						54. Slated shelving is evident in the sterile store room	Demonstration
						55. The lowest shelf in the sterile store room is at least 25cm above floor level and the highest 45cm from the ceiling	Measurement Lower shelf: Highest shelf:
						56. Sterile store room temperature is 21^{o}C and measured twice daily	Temperature chart Measurement:
						57. A designated pathway for the transportation of sterile and contaminated items inside the hospital building is evident	Demonstration, Floor plan
4.11	Linen storage rooms adhere to legislation					58. Contaminated/ soiled and clean linen are managed in separate areas	Demonstration
						59. A ventilated clean linen storage room is evident as well as cupboards or mobile storage units away from high volume traffic	Demonstration, Floor plan
						60. A designated ventilated room is evident for contaminated and soiled linen away from high volume traffic	Demonstration, Floor plan
						61. A designated pathway for transportation of contaminated and clean linen is indicated	Demonstration, Floor plan

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
4.12	Fittings and fixtures adhere to legislation					62. Corridors in the OR measures at least 2300mm	Floor plan Measurement: Indicate width
						63. Doors are at least 1.2m wide	Measurement:
						64. Floors are of concrete finish covered with a smooth washable material	Demonstration
						65. Joints between floor and walls are smooth and rounded	Demonstration
						66. No cracks or tears in the washable floor material are evident	Demonstration
						67. No carpets and/or wooden structures or furniture are evident	Demonstration
						68. Walls are covered with a smooth concrete finish and covered with a durable paint or washable impervious material	Demonstration
						69. Walls behind hand washing basins and sinks are covered with impervious material up to 450mm above and 150mm on each side of the fitting	Demonstration Measurement:
						70. No cracks or tears in the washable material on the walls are evident	Demonstration
						71. No cracks or peeling of paint on the walls are evident	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						72. Walls are free of fixtures that might obstruct cleaning practices	Demonstration
						73. Fixtures e.g. pendulums containing suction, air and electrical points do not hinder adherence to basic sterile principles	Demonstration
						74. An emergency back-up system is in place when the electrical power supply to the OR fails	Policies & Procedures Demonstration Emergency generators
4.13	Communication structures regarding the physical building, fixtures and designs in the OR are evident					75. A detailed floor plan indicating public, semi-restricted and restricted areas is evident in all areas is in the unit	Floor plan
						76. A detailed floor plan indicating the decontamination cycle-route is evident in all the areas	Floor plan
						77. Risk assessments regarding the physical building of the OR are evident	Minutes of risk assessment rounds and meetings
						78. There is proof of communication of deviations to the technical department	Minutes of meetings Incident Reports Electronic communication
						79. Deviations in policies and procedures are reported as incidents	Incident Reports
	SCORE:						
	MAXIMUN SCCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 5: STRUCTURE: Air quality in the OR contributes to the prevention of infection and distribution of micro-organisms.

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
5.1	Air-flow systems are maintained					1. Laminar air-flow systems or a ventilation system of at least 15 air changes per hour with additional HEPA-filters with 0.3µm, 99.97% filter capacity are evident per theatre	Service reports Floor plan
						2. Air ventilation covers are dust free	Demonstration
5.2	Staff movement is monitored					3. One scrub nurse, one floor nurse and one anaesthetic nurse is allocated per procedure in the OR	Demonstration Procedure: Number of staff: Delegation documents
						4. Theatre double doors are only utilised when patients are transported to and from the OR	Demonstration
5.3	Additional measures regarding air quality are managed					5. No fans are evident in the OR area	Demonstration
						6. Theatre temperature is maintained between 22^{o}C and 25^{o}C	Measurement Indicate temperature: Temperature charts
						7. Theatre humidity is at least 60%	Measurement Indicate humidity: Humidity charts

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
5.4	Communication structures regarding air quality in the OR is evident					8. There is proof of primary, secondary filter servicing as well as HEPA filter replacement as per manufacturer's instructions	Service reports Policies Minutes of IPC Meetings/ Reports
						9. There is documented proof of six monthly air particle counts in the OR, after construction in the hospital, part of surveillance processes and after HEPA-filter changes.	Service reports Policies Minutes of IPC Meetings/ Reports
						10. The results of air particle counts are communicated to the OR IPC Committee	Minutes of IPC Meetings
						11. OR temperature and humidity readings are displayed in every OR and documented in the intra-operative document of the patient	Demonstration Patient intra-operative documentation
						12. Deviations from policies and procedures are reported as incidents	Incident Reports Minutes of IPC Meetings
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 6: STRUCTURE: Water quality contributes to the prevention of infection and distribution of micro-organisms.

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
6.1	Water supply is adequate to contribute to evidence based practices					1. Hot and cold water is available at every tap	Demonstration
						2. Water pressure allows for adequate flow of water	Demonstration
						3. Alternative water supplies are available in the absence of municipal water	Demonstration Policies
6.2	Water equipment is maintained to prevent contamination					4. Only elbow -lever taps are evident	Demonstration
						5. Drains are clean and unobstructed in basins	Demonstration
						6. There is no corrosion evident on taps and water exits	Demonstration
						7. There is no evidence of leaking taps, basins and water pipes	Demonstration
6.3	Micro-biological monitoring of water is evident					8. Annual water sample test results for *Legionella sp.* is evident	Laboratory reports Minutes of IPC meetings Policies
6.4	Communication structures regarding water quality is evident					9. The results of water sample test are available in the unit	Demonstration
						10. There is proof of communication of the results to the OR IPC Committee	Minutes of IPC meetings
						11. There is documented proof of communication of problems regarding water management to stakeholders e.g. technical department	
						12. Deviations from policies and procedures are reported as incidents	
	SCORE:						

	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 7: STRUCTURE: Additional building and construction practices supports the quality of the IPC practices in the OR.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
7.1	Planned building and construction events are communicated					1. There is documented proof of communication between contractors and IPC Coordinators and the IPC OR Committee regarding planned building and renovations in the hospital	Minutes of meetings
						2. Notices regarding the planned events are evident	Demonstration Electronic documentation
						3. There is proof of multi-disciplinary team (nursing staff, cleaners, patients, doctors, technical manager, IPC and OHS coordinators) communication regarding the planned construction	Documentation Minutes of meetings
7.2	A pre-construction plan is evident indicating the risk it will pose on the OR and patient pathways					4. The following are included in the pre-construction plan: Floor plan with indicated phases of the planned construction	Pre-construction plan
						5. Preparation for demolition	
						6. Type construction	
						7. Dust and debris control	
						8. Ventilation control	
						9. Patient location and transport	
						10. Indicated areas for storage of equipment	
						11. Walkways for construction workers	
						12. Shower and toilet facilities for construction workers	
7.3	The intra-construction phase is managed according to evidence-based practices					13. There is proof of meetings regarding the impact of the construction and revision of plans are evident	Minutes of meetings Demonstration
						14. There is evidence of daily environmental risk rounds in the OR	Demonstration Daily reports

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						15. There is evidence of continuous communication with all stakeholders	Demonstration Electronic communication
						16. There is evidence of patient information practices regarding the construction	Demonstration Notices Patient information letters
						17. There is proof of surveillance of patients operated on during the construction phase	Demonstration
7.4	The post-construction phase is managed according to evidence-based practices					18. Particle counts as well as *Legionella sp*. tests are repeated after construction in the OR	Test results Policies Minutes of meetings
						19. There is proof of environmental cleaning is implemented after construction	Demonstration Policies Minutes of meetings
						20. Post-construction rounds and communication thereof are evident	Demonstration Minutes of meetings
						21. Deviations from policies and procedures are reported as incidents	Incident Reports Minutes of meetings
	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 8: STRUCTURE: Policies and procedures regarding IPC practices in the OR are evident.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
8.1	Policies and procedures are evident in the OR					1. Evidence-based policies and procedures of every procedure performed in the OR are available	Demonstration Policies
						2. Policies and procedures are reviewed annually	Demonstration Policies
						3. There are policies regarding specific disease management and isolation techniques in the OR	Demonstration Policies
						4. Staff is conversant with policies and procedures	In-service training records Questioning
8.2	Communication structures regarding the IPC policies in the OR is evident					5. Titles and reference numbers of IPC policies are evident of notice boards	Demonstration
						6. Policies open for review are indicated on the notice boards	Demonstration
						7. There is proof that policies and procedures are discussed in departmental meetings	Minutes of meetings
						8. There is proof that policies and procedures are discussed in the OR IPC Committee meetings	Minutes of meetings
						9. There is proof that policies and procedures are communicated to newly appointed staff and students as part of orientation	Staff Orientation Documentation
						10. There is proof that all members of the multi- disciplinary team including representatives form medical companies entering the OR are informed of IPC policies and procedures	Notices Policies Demonstration

	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 9: PROCESS: Human Resources are managed to maintain IPC structures in the OR.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
9.1	Adequate trained staff is on duty per shift to maintain IPC practices					1. The unit manager is an RN with at least a diploma in Operating Room Science as a post basic qualification	CV documentation
						2. The unit manager has proof of annual OR skills, OR management and OR IPC CPD attendance	In-service training records
						3. The unit manager is trained in managing the IPC programme	In-service training records
						4. There is an RN with Operating Room Science as a post-basic qualification allocated as shift leader per shift who is excluded from a surgical team for the shift	CV documentation Delegation documentation
						5. At least one Registered Nurse is allocated as scrub nurse per list	Delegation documentation Demonstration
						6. At least one floor (ENA) and one anaesthetic nurse (RN or EN) is allocated per list	Delegation documentation Demonstration
						7. There one RN allocated per recovery bay in the OR	Delegation documentation Demonstration
						8. One cleaner is allocated per working theatre	Delegation documentation Demonstration
						9. There are enough CSD workers on duty to separate washing and cleaning practices from checking and packing	Delegation documentation Demonstration
						10. There is one porter per working theatre allocated per shift	Delegation documentation Demonstration
						11. Work delegation is within the scope of practice of every staff member	Delegation documentation Demonstration List with qualifications of staff members

NO	INDICATORS	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						12. There is at least one scrub nurse, one anaesthetic nurse and one floor nurse allocated to manage emergency procedures without compromising booked list	Delegation documentation Demonstration Indicate the number of staff members:
9.2	People movement in the OR are monitored					13. Only healthcare providers(nurses, doctors) with adequate training regarding IPC principles in an OR are allowed inside the OR	Demonstration In-service training records Incident Reports Policies
						14. Representatives from companies or other members of the multi-disciplinary team adhere to policies and procedures of the OR	Demonstration Policies Incident Reports
						15. Representatives and/ or other members of the multi-disciplinary team have written permission from the patient to be present during the procedure	Consent documentation Policies
						16. Representatives and/ or other members of the multi-disciplinary team not part of the surgical team has permission from the unit manager to be present in the OR	Demonstration Proof of UM approval of OR list per day Policies
						17. The names of all persons present during the procedure are indicated in the OR register and the patient's peri-operative documentation	Demonstration Policies OR register Peri-operative documentation
9.3	Communication structures regarding the movement of people in the OR is evident					18. Signs indicating the restricted and semi-restricted areas are evident	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						19. Red lines on the floors indicate restricted, semi-restricted and public areas	Demonstration
						20. Posters regarding PPE management is evident in the change rooms, at exit points as well as tea and rest rooms	Demonstration
						21. Deviations in policies and procedures are reported as incidents	Incident Reports Previous audit results Minutes of meetings
9.4	OHS preventative programmes are evident					22. An immunisation programme for all staff in the OR is evident	Policies Staff profiles from OHS coordinator Demonstration
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 10: PROCESS: The clinical skills of the multi-disciplinary team (nurses, doctors and cleaners) are assessed.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCCE
10.1	There is a system in place that reflects the clinical skills of the multi-disciplinary team					1. Nursing staff are assessed annually to determine compliance to policies and procedures	Assessment documentation Policies Permanent staff training planner
						2. Each nursing staff member compiles an annual portfolio reflecting competencies and skills	Portfolio per staff member Policies Skills assessment documentation
						3. The portfolio reflects annual CPD requirements as determined by SANC	SANC Notice
						4. Portfolios include evidence of remedial sessions to address sub-standard practices	Remedial documentation Assessment reports
						5. There is a clinical nurse specialist or clinical facilitator employed in the unit that is not allocated to lists	Delegation documentation
						6. Annual registration of the multi-disciplinary members by relevant professional councils are evident. Nursing staff: SANC, Doctors: HPCSA	Demonstration Policies
						7. Deviations from policies and procedures are regarded as incidents	Incident Reports Minutes of meetings
						8. The performance of the multi-disciplinary teams (nurses, doctors) are monitored and communicated to the IPC committee	Minutes of meetings
	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 11: PROCESS: Every person entering the semi-restricted and restricted area of the OR adheres to PPE (Personal Protective Equipment) policies.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
11.1	Theatre attire is available to everyone entering the OR					1. Theatre attire is available in the change rooms for everyone to wear a fresh pair per shift and when contaminated	Demonstration
						2. Theatre attire is washed by an accredited hospital laundry at 91 ^{o}C for at least 25 minutes	Accreditation documentation and certificate
						3. Theatre attire is transported in enclosed containers to and from the OR	Demonstration
						4. Clean linen is stored in a designated area	Demonstration
						5. Contaminated and/or used theatre attire is placed in a designated bin marked for this purpose	Demonstration
						6. An 'outside gown" is worn over theatre attire when staff has to go outside the OR complex	Demonstration Policies
						7. Disposable hats are available in the change rooms to allow every staff member to wear a clean cover every day and to change when contaminated	Demonstration Policies
						8. Disposable hats cover all hair and beards	Demonstration Policies
						9. Disposable overshoes are available to allow staff members to use every time when entering the OR and to replace when contaminated	Demonstration Policies
						10. Used hats and shoes are placed in a medical waste container indicated for this purpose after use	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						11. Hand washing facilities are used after removing or donning of theatre attire	Demonstration Policies
						12. Everyone entering the semi-restricted and restricted area is require to changed into hospital supplied theatre attire	Demonstration Policies
11.2	Eye protection devices are used according to evidence-based practices					13. It is evident that all staff wear goggles in the intra-operative area and recovery area	Demonstration Policies
						14. Masks with an attached visor are available in the scrub rooms	Demonstration
11.3	Plastic aprons are used according to evidence-based practices					15. Disposable plastic aprons are available in all areas in the OR	Demonstration
						16. Every member of the scrub team dons an apron before scrubbing , gowning and gloving unless a fluid and alcohol repellent sterile gown is used	Demonstration
						17. Every other member of the multi-disciplinary team is wearing plastic aprons when attending to a patient	Demonstration
						18. Plastic aprons are removed and discarded in the medical waste	Demonstration
						19. Plastic aprons are removed before entering the tea room and/ or rest rooms	Demonstration
11.4	Surgical masks are used according to evidence-based practices					20. Disposable masks are available at the entrance of each scrub room and theatre	Demonstration
						21. Disposable masks are worn by all members of the intra-operative team as soon as the first sterile packs are opened	Demonstration Policies

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						22. Masks cover both the nose and mouth at all times	Demonstration Policies
						23. All four ties are used to secure the mask without crossing each other	Demonstration
						24. Masks are removed after each case by handling the ties only and discarded in the medical waste container	Demonstration
						25. Hands are decontaminated after the removal of a mask	Demonstration
11.5	Disposable gloves are used according to evidence-based practices					26. Multi size sterile and non-sterile disposable gloves are available throughout the OR	Demonstration
						27. Un-sterile gloves are worn by every member that might be in contact with body fluid e.g. the floor, anaesthetic and recovery room nurse	Demonstration
						28. Sterile gloves are worn by everyone in the sterile field	Demonstration
						29. Double/re- gloving is evident when prosthesis is handled, and outer glove is routinely changed	Demonstration
						30. Double/re- gloving is evident when colon-rectal surgery is performed and outer glove is routinely changed	Demonstration
						31. Gloves are removed as soon as the procedure is completed and contaminated items are managed	Demonstration
						32. Used gloves are disposed of into medical waste containers	Demonstration
						33. Hands are disinfected after removal of gloves	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
11.6	OR shoes are managed according to evidence-based practices					34. Permanent staff in the OR differentiates between inside and outside shoes	Demonstration
						35. OR shoes encloses the wearer's toes and heels	Demonstration
						36. OR shoes are anti-static	Demonstration
						37. Used/ contaminated shoes are placed into a designated bin when removed	Demonstration
						38. OR shoes are disinfected and autoclaved after each shift and/ or visibly contaminated	Demonstration
11.7	Communication structures regarding the management of PPE is evident					39. Posters regarding PPE are evident at entrance and exit areas in the OR	Demonstration Posters
						40. There is evidence that the policies and procedures regarding PPE is communicated to newly appointed staff and students as part of orientation	Orientation documentation
						41. Deviations in policies and procedures are reported as incidents	Incident Reports Audit results
11.8	Additional devices are managed according to evidence based practices					42. Lead gowns, collars and skirts are disinfected after each list according to manufacturer's instructions	Manufacturer's instructions Demonstration
						43. Laser shields are disinfected according to manufacturer's instructions	Manufacturer's instructions Demonstration
	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 12: PROCESS: Hand hygiene practices are according to evidence-based practices.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
12.1	Hand hygiene equipment, fixtures and products are available to adhere to evidence-based practices					1. There is a clinical basin available in every area where preparation for/or clinical work is performed	Demonstration Floor plan
						2. Only IPC Coordinator approved hand soaps are used	Demonstration List of IPC approved hand soaps
						3. Material Safety Data Sheets of the products are available in the OR	List of all the products Material Safety Data Sheets confirmed by pharmacy
						4. Alcohol hand rub is available next to the hand soap and in every other area in the OR	Demonstration
						5. Alcohol hand rub is available at each pre-op and recovery bay	Demonstration
						6. Alcohol hand rub is available at the entrance and exit of each OR and change rooms	Demonstration
						7. Alcohol Hand rub is available at the entrance and exits of tea- and rest rooms	Demonstration
12.2	Communication structures regarding hand hygiene practices are evident					8. There is documented proof of continuous in-service training of permanent staff regarding hand hygiene practices	In-service training planner In-service training records
						9. There is documented proof of in-service training of students and new staff regarding hand-hygiene practices during orientation	Orientation documentation

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCEOF EVIDENCE
						10. Hand hygiene information e.g. WHO posters and pamphlets are evident in the OR	Demonstration Posters Policies
						11. Policies and procedures regarding hand hygiene practices are evident	Demonstration
						12. Deviations in policies and procedures are reported a incidents	Incident Reports Results from audits
12.3	"Bare-below-elbow"-practices are evident					13. All persons entering the OR have bare clear nails without nail polish, arcrylic or artificial nails	Demonstration Polcies
						14. No rings, wrist watches, bangles or ethnic relics are evident on hands and arms	Demonstration
						15. Nails are short and clean	Demonstration
12.4	Hand washing practices are evident					16. People entering the OR wash their hands before and after donning OR attire, when entering and before leaving the OR, before and after patient contact, before and after having meals and/or tea, after using the toilet, before handling sterile packs, after removing gloves and masks	Demonstration Policies
12.5	A-septic hand wash procedure is evident					17. A-septic hand wash is performed by anaesthetist before procedures e.g. spinal, epidural catheters, arterial and CVP lines and insertion of IV catheters	Demonstration
12.6	A surgical scrub technique is evident					18. Surgical scrub technique or an alcohol hand-rub is performed by every member that enters the sterile field	Demonstration
						19. The surgical scrub technique is performed according to evidence-based practices	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATOR	SOURCE OF EVIDENCE
						20. A surgical scrub technique or an alcohol hand rub is performed before every case for every patient on the list	Demonstration
						21. Alcohol hand rub is applied before donning of gloves	Demonstration
12.7	Hand care is promoted					22. All bruises and cuts are covered with waterproof plaster	Demonstration
						23. Staff are moisturising hands after lists to prevent dry and cracked skin	Demonstration
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 13: PROCESS: The application of basic sterile technique is evident.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURSE OF EVIDENCE
13.1	There is adequate amount of, items and equipment to maintain basic sterile principles					1. There is an adequate amount of sterile packs and sets to prepare for the lists of the day	Demonstration
						2. Packs are transported from the sterile store room to the designated OR on trolleys	Demonstration
						3. There is an adequate amount of trolleys to ensure only one sterile pack per trolley during the opening process	Demonstration
						4. Sterile containers, sets bowls and items fits onto the sterile trolleys without over-lapping	Demonstration
13.2	The integrity of the sterile fields are clearly identified and maintained					5. Every member of the surgical team adheres to basic sterile principles during preparation and performance of surgical procedures	Demonstration
						6. The sterile fields are created as close as possible to the time of use	Demonstration
						7. 'Walkways' of the surgical team are planned and utilised during procedures	Demonstration
						8. Movement and talking are minimised in the intra-operative area	Demonstration
						9. Only persons that are scrubbed, wearing sterile gown and gloves as well as PPE enter the sterile fields	Demonstration
						10. Sterile areas are touched as little as possible	Demonstration
						11. Sterile fields are continuously kept in view by the scrub nurse	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						12. Only sterile items are used within the sterile field	Demonstration
						13. Sterile areas, instrumentation and items are handled as little as possible	Demonstration
						14. All un-scrubbed persons maintain a distance of 30cm from anything that is considered sterile	Demonstration
						15. Un-scrubbed persons do not lean over sterile areas	Demonstration
						16. If the sterile integrity of any item inside the sterile field is in doubt it is discarded	Demonstration
						17. Additional furniture e.g. tools inside the sterile field is draped with sterile towels	Demonstration
13.3	Sterility of trolleys are maintained during the operative phases					18. Trolleys are decontaminated before and after each procedure	Demonstration
						19. Every trolley used within a sterile field is covered with an alcohol and water resistant drape that hangs at least 30cm over all four edges of the trolley in a downward fashion	Demonstration
						20. The flat top surface and the leg of the mayo stand is covered when used	Demonstration
						21. There are no stacking of sterile packs on trolleys	Demonstration
						22. Scrub persons push sterile draped trolleys by only touching the top surface of the trolleys	Demonstration
						23. Un-scrubbed persons grab underneath the sterile drapes onto a pole to push the trolley	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						24. When a procedure is cancelled the sterile trolleys are not covered with sterile drapes for later use but discarded	Demonstration
13.4	Sterility of packs are maintained during the operative phases					25. Sterile packs are kept in a designated sterile store room	Demonstration
						26. Sterile packs are transported to the theatres on trolleys or enclosed containers	Demonstration
						27. The contents of sterile packs are not shared between procedures	Demonstration
						28. Sterile packs are kept inside the set-up room until required	Demonstration
						29. Hands are decontaminated before opening of sterile packs	Demonstration
						30. The integrity of sterile packs are checked before opening	Demonstration
						31. Packs are opened on request of the scrub nurse	Demonstration
						32. The scrub nurse opens the last sterile wrap layer of every pack	Demonstration
						33. The scrub nurse removes and interprets the sterile indicator before touching the contents of the sterile pack	Demonstration
13.5	Liquids are managed to keep micro-organisms to a minimum					34. Only sterile liquids are used within the sterile field	Demonstration
						35. The expire date and integrity of containers and caps are checked before use	Demonstration
						36. Only liquids approved by the IPC coordinator are used in the OR	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						37. The material data sheets of the liquids are available in the unit	Demonstration
						38. Bottles containing liquid are emptied per single usage or excess fluid is discarded	Demonstration
						39. Liquids are poured into sterile containers without wetting surrounding sterile items and reaching over sterile areas	Demonstration
						40. The floor nurse maintains a distance of 30cm away from all sterile trolleys when pouring liquids	Demonstration
						41. Any draped area in the sterile field that is wet is discarded or re-draped with a water and alcohol repellent sterile drape	Demonstration
13.6	Scrubbing gowning and gloving procedures contribute to basic sterile technique					42. Members entering the sterile field are scrubbed, gowned and gloved in time to adhere to basic sterile principles	Demonstration
						43. Only nails are scrubbed with a brush	Demonstration
						44. Hands, arms and elbows are dried before alcohol hand rub is applied to hands	Demonstration
						45. Sterile indicators are checked before the sterile gown pack is used	Demonstration
						46. Gowns are donned without contamination	Demonstration
						47. The open or closed method of gloving is evident	Demonstration
						48. All the ties of the gown are tied at the back	Demonstration
						49. The sterile gown is long enough to cover up to under-knee level	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						50. The front tie is tied with the assistance of another scrubbed person	Demonstration
						51. Sterile gowns are regarded as sterile from front waist level to front shoulders and from the sleeve-cuff to the elbow	Demonstration
13.7	Cleaning and draping of the patient contributes to basic sterile technique					52. A separate “cleaning” and “draping” trolley is prepared by the scrub nurse, to avoid excess movement during the cleaning and draping phase	Demonstration
						53. A 70% alcohol based solution is used for cleaning intact skin	Demonstration
						54. The scrub nurse cleans the incision site in either circular or straight movements, from “clean” to “dirty” areas, without re-contaminating cleaned areas	Demonstration
						55. The area cleaned around the incision site, is big enough to allow for maximum exposure of the underlying anatomical structures	Demonstration
						56. The cleaning solution is allowed to evaporate/ dry before draping is commenced	Demonstration
						57. No anti-microbial skin sealants are used	Demonstration
						58. Drapes are placed with smooth movements without fiddling	Demonstration
						59. Gloved hands are protected by cuffing of drapes when placed without gloved hands touching the patient’s skin	Demonstration
						60. Double gloves are worn when difficult areas are draped e.g. head where contamination rate is high	Demonstration

NO	CRITERIA	C (2)	PC (1)	PC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						61. Drape style allows for re-positioning of the patient e.g. envelope drape for extremities as a procedural requirement	Demonstration
						62. Miss-placed drapes are not repositioned but discarded	Demonstration
						63. The area closest to the scrub nurse is draped first to avoid possible contamination	Demonstration
						64. A sterile water and alcohol repellent drape surrounds the incision area	Demonstration
						65. The whole patient is covered as well as the table, arm boards and bed extensions	Demonstration
						66. Towel clips are not repositioned	Demonstration
						67. Sterile cords, tubing and devices are secured onto the sterile drapes, as only the top surface of the draped OR table is regarded as sterile	Demonstration
						68. All equipment e.g. micro-scope, stealth-frames, c-arms and cameras are sterilised or enclosed with sterile covers before used in the sterile field	Demonstration
						69. Disposable incisional barriers are not used	Demonstration
						70. Extremities are manoeuvred by a second scrubbed nurse and positioning devices to enable skin preparation	Demonstration
						71. Extra drapes and barriers are available to re-drape if needed during the procedure	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						72. The scrub nurse never turns her back on the draped patient when reaching for instrumentation	Demonstration
						73. Sterile drapes are only removed once the incision site is closed and a dressing applied	Demonstration
13.8	Instrumentation management contributes to basic sterile principles					74. Instrumentation is positioned in orderly fashion in the containers to allow for easy access when required	Demonstration
						75. Instruments are temporary arranged onto the mayo table only when required and placed back into containers after use	Demonstration
						76. The handles of instruments and suture materials are not visible over the edge of the mayo-table or trolleys	Demonstration
						77. Instruments are only handled by mid-shafts and handles when passing them from one team member to another	Demonstration
						78. Sharps are passed to each other either loaded on instruments e.g. needle holders or in receivers e.g. scalpel blade in a kidney dish	Demonstration
13.9	The surgical technique contributes to minimisation of micro-organisms in the operating field and incisional area					79. Internal contaminated anatomical structures e.g. cysts, tumours and bowel are isolated from surrounding tissue as soon as it is exposed	Demonstration
						80. Procedures are in place to minimise contamination of surrounding structures and sterile field	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						81. Contaminated swabs are removed from the sterile field as soon as possible and isolated in medical waste bags for counting purposes	Demonstration
						82. The floor nurse presents with PPE when handling contaminated items	Demonstration
						83. Re-gloving by the surgical team and re-draping of incision site is evident after removal of contaminated structures	Demonstration
						84. Prostheses and implants are only touch after re-gloving of the team, and placed onto a separate sterile trolley, with designated sterile instrumentation for cutting, measuring and sizing	Demonstration
						85. Char from the use of electro-surgical instrumentation is removed via irrigation of the operating site before closure	Demonstration
						86. Self-retaining wound retractors are released periodically during the procedure to release pressure from tissue and re-establish blood flow to the area	Demonstration
						87. Shields are used to prevent contamination of the wound with spray, bone dust and debris when power tools e.g. bone saws and burrs are used	Demonstration
						88. An anti-biotic free, povidene-iodine or clear wound irrigation is done before wound closure	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						89. Swabs depositing excessive fluff are removed from the sterile field and reported	Demonstration
						90. The surgical blade, used to make the skin incision is discarded, as soon as the incision is made	Demonstration
						91. Triclosan-coated sutures are used if available	Demonstration
13.10	Communication structures regarding the management of basic sterile technique is evident					92. There is documented proof if in-service training and CPD attendance regarding basic sterile technique by every member of the surgical team	Planned CPD training programme Attendance lists
						93. Communication regarding the draping and management of new equipment and disposable items within the sterile field is evident	In-service training records Policies and procedures Demonstration
						94. There is proof of incident reporting of non-compliance to the basic sterile principles	Incident Reports Demonstration
						95. Active patient surveillance is evident when a bridge in compliancy to basic sterile principles occurred	Incident Reports Documentation
						96. Incidents are recorded in the patient peri-operative documentation and the OR register	Incident Reports Peri-operative documentation OR register
						97. Procedure and surgeon preference cards are updated regularly	Procedure and preference cards
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						

	AUDITOR:						

STANDARD 14: PROCESS: The management of single-use items are evident.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
14.1	Single-use items are identified					1. Every item that is regarded as single-use is clearly marked by the manufacturer	Demonstration
14.2	Disposal of single-use items are according to evidence- based practices					2. Single-use items are disposed of after use, as medical waste	Demonstration
						3. There is no evidence of re-sterilised single-use items inside the OR and store rooms	Demonstration
						4. Single-use items are disposed of after accidental opening	Demonstration Incident Reports
						5. There is proof of single-use item charges onto an "OR loss account", due to accidental opening, or cancellation of procedures	Incident Reports Transfer documentation
14.3	Communication structures regarding the use of single-use items in the OR are evident					6. Policies and procedures regarding the management of single-use items are evident and communicated	Documentation In-service training records Minutes of meetings
						7. Deviations in policies and procedures are regarded as incidents	Demonstration Incident Reports
	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 15: PROCESS: Human tissue is managed according to evidence- based practices.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
15.1	Handling of human tissue minimises environmental and human contamination					1. Human tissue is handed to the floor nurse, together with a sterile forceps, to be used to place it into a specimen bottle during procedures	Demonstration
						2. All persons handling human tissue adhere to the PPE policy	Demonstration
						3. Specimens are stored in a designated area accessible to the courier of the laboratory	Demonstration
						4. Specimen containers are closed tightly to prevent leakage of preservatives	Demonstration
						5. Anatomical structures harvested for the purpose of re-implantation e.g. bone flaps, are sterilised by a service provider, and kept in a designated freezer	Demonstration Documentation of service provider
						6. All harvested anatomical structures are clearly identified with patient details	Demonstration
						7. An updated register, indicating the content of the anatomical structures for potential re-implantation, is available and checked daily	Demonstration Register
15.2	Communication structures regarding the management of human tissue is evident					8. Incidents regarding non-conformance to the policy are reported and documented	Incident Reports Demonstration
						9. There is documented proof if in-service training and CPD attendance regarding the management of human tissue, by all members of the surgical team	In-service Training Programme Attendance Register

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						10. Anatomical and laboratory registers correlate with harvesting and transportation timelines	Anatomical & Laboratory Registers OR Register
	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 16: PROCESS: Waste in the OR is managed according to evidence- based practices.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
16.1	A specific waste plan for the OR is available					1. A specific area in the OR is indicated for the handling of waste	Demonstration Waste Plan
						2. The movement of waste inside the OR and to the holding bay is clearly defined	Demonstration Waste Plan
						3. Waste is transported to the hospital holding bay as soon as possible	Demonstration Waste Plan
16.2	Procedures regarding the handling of waste are evident					4. All staff handling waste adhere to the PPE policy	Demonstration Waste Plan
						5. Waste generated per procedure is removed during every turn-over time interval	Demonstration Waste Plan
16.3	Segregation of classes of waste are evident					6. Municipal waste is bagged in clear bags	Demonstration Waste Plan
						7. Medical waste is bagged in red bags	Demonstration Waste Plan
						8. Anatomical waste is contained in red bags and specific containers	Demonstration Waste Plan
						9. Pharmaceutical waste is contained in green specific containers	Demonstration Waste Plan
16.4	Sharps management are evident					10. Containers specific for sharp item disposal are evident in all clinical areas	Demonstration Waste Plan
						11. Container size allows for the content to be completely covered	Demonstration Waste Plan
						12. The lids of the containers cannot be removed once secured	Demonstration
						13. Sharps can be disposed of into the sharp container without handling the lid	Demonstration
						14. Containers are marked with date of use and maximum levels	Demonstration
						15. Containers are visibly clean	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						16. Containers are disposed of in red plastic bags to the hospital holding bay after removal	Demonstration Waste Plan
						17. No sharp objects are visible from the containers	Demonstration
16.5	Anatomical waste is managed					18. Anatomical waste is enclosed, in red plastic bags, in designated containers, at point of harvesting	Demonstration
						19. Liquid waste (body fluid) is transported in the disposable suction liners, or as contaminated swabs in red bags and containers, to the hospital holding bay for incineration	Demonstration Waste Plan
						20. Anatomical waste is transported to the hospital anatomical holding bay (freezers) after completion of the procedure	Demonstration Waste Plan
						21. No anatomical waste is handed to the patient or parents of patients	Demonstration Waste Plan
						22. Orthopaedic fixation devices are managed as anatomical waste or sharps	Demonstration
16.6	Transport of waste from the OR					23. All waste is transported to designated hospital holding bays, in enclosed containers, marked as waste with enclosed lids	Demonstration Waste Plan
						24. Containers used for transportation are decontaminated if re-usable containers are used	Demonstration Service Contract of provider Waste Plan

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
16.7	Communication structures regarding the management of waste in the OR is evident					25. Policies regarding waste management is evident	Documentation
						26. There is proof of communication and in-service training of staff regarding waste management	Minutes of meetings In-service Training Planner Attendance Registers
						27. Deviations in policies and procedures are regarded as incidents	Demonstration Incident Reports
	SCORE:						
	MAXIMUM SCORE						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 17: PROCESS: Equipment is managed according to evidence- based practices.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
17.1	There are designated store rooms for storage of equipment only					1. Equipment is removed from the OR and stored if not required for the specific procedure	Demonstration
						2. A daily cleaning schedule per store room is evident and implemented	Demonstration Cleaning Schedule
17.2	Cleaning and storage of equipment is according to manufacturer's recommendations					3. Used equipment is cleaned and stored immediately after use	Demonstration
						4. Loan equipment is disinfected before use as per manufacturer's instruction	Demonstration Manufacturer's instruction manual
17.3	Communication structures regarding the management of equipment is evident					5. Guidelines regarding the cleaning and storage of all equipment are available in the OR	Demonstration Guidelines
						6. Routine cleaning programmes are revised to accommodate new equipment	Demonstration Cleaning Programme
						7. There is evidence of in-service training and CPD attendance of the surgical team regarding equipment	In-service Training programmes Attendance lists
						8. Guidelines regarding the management and draping of new equipment as part of the sterile field are evident	Minutes of meetings Updated policies and procedures
						9. There is proof of discussions of new equipment, guidelines and information sessions in departmental meetings	Minutes of meetings
						10. There is proof of updated service and calibration records of all equipment in the OR	Equipment log books

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						11. The serial numbers of all equipment, used during the procedure, are listed in the patient's peri-operative document	Peri-operative documentation
						12. Incidents relevant to equipment mal-functioning, breakages and miss-management are evident	Incident Reports
	SCORE:						
	MAXIMUM SCORE: 28						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 18: PROCESS: Endoscope equipment is managed according to evidence- based principles.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
18.1	Measures are in place to prevent damage to multi-lumen flexible equipment					1. All flexible endoscopy equipment is stored in brackets, hanging straight, protected from potential damage	Demonstration
						2. All scopes are transported in cases, with sterilised foam compartments, specific to the type of scope	Demonstration
						3. Only people that are trained, in managing endoscopy equipment, are handling the endoscopes	In-service training records Demonstration
18.2	Measures are in place to prevent cross-infection with contaminated endoscopes					4. There is an adequate amount of endoscopes available to minimise inter-patient cleaning and aldehyde use per list	Demonstration Number of scopes G-scope: C-scope:
						5. Cleaning and rinsing practises of all channels, valves and hoods are evident by applying suction and using cleaning brushes	Demonstration
						6. A single-use brush is used per cleaning session	Demonstration
						7. Designated soaking caps per scope is applied before immersion of the scope to be disinfected	Demonstration
						8. Water is changed after every rinsing cycle	Demonstration
						9. Leakage tests are performed before disinfection, sterilising and use of the scope	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						10. Endoscopes are cleaned in an (AER) automated endoscope re-processor	Demonstration
						11. Endoscopes are sterilised after every use where an AER is not available	Demonstration
						12. The use of aldehyde solutions as disinfectant is minimal	Demonstration
						13. Aldehyde solutions are managed according to the manufacturer's instructions	Demonstration
						14. Everyone handling endoscopes and aldehyde solutions adhere to the PPE policy	Demonstration
						15. Only single-use endoscopy instrumentation is used e.g. bite blocks, biopsy needles and forceps	Demonstration
						16. Results of monthly microscopic cultures of all scopes are evident	Laboratory results
18.3	Communication structures regarding the management of endoscopes are evident					17. A log book is available indicating services and repairs to every scope	Log book
						18. A log book indicating the disinfection and processing per scope is evident	Log book
						19. A log book indicating the status of the AED per cycle is evident	Log book
						20. The serial number of the scope, used on every patient, is indicated in the log-book and peri-operative document of the patient	Log book Peri-operative documentation

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						21. There is proof of in-service training and CPD attendance of all staff members regarding endoscope management	In-service training planner Attendance register Staff member list Delegation list
						22. There is documented proof of revision of endoscope management procedures according to manufacturer's recommendations	Minutes of meetings Policies and procedures Demonstration
						23. Incidents relevant to endoscopy management are evident	Incident Reports
						24. There is evidence of active surveillance of every patient, after an incident, regarding endoscope management and is documented in the patient's file	Surveillance documentation Peri-operative documentation Incident Reports
						25. There is evidence of planned patient allocation per OR list to ensure adequate time for cleaning and disinfection of endoscopes	Patient lists Number of scopes
						26. Endoscopes are not shared with other operating room units	Policy Demonstration
						27. There is evidence of weekly endoscopic processing audits to assess compliancy	Audit documentation
	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 19: PROCESS: Anaesthetic equipment is managed according to evidence-based practices.

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
19.1	Procedures to prevent contamination of patients are evident					1. Anaesthetic delivery units are cleaned between procedures as per manufacturer's recommendation or with 70% isopropyl alcohol	Policies & Procedures Demonstration
						2. Carbon dioxide absorbers, canisters, unidirectional valves, APL valves, water traps, ventilator bellows and re-breathing bags are protected by a HMEF-filters	Manufacturer's instructions Policies & Procedures Demonstration Equipment log books
						3. Carbon dioxide / soda lime absorber blocks are cleaned when the absorber is changed	Manufacturer's instructions Policies & Procedures Demonstration
						4. All monitor screens are cleaned with 70% alcohol impregnated wipes between procedures	Manufacturer's instructions Policies & Procedures Demonstration
						5. Adaptor valves are rinsed and disinfected	Manufacturer's instructions Policies & Procedures Demonstration
						6. Disposable circuits are single-patient use only, unless specifications are adhered to as per manufacturer's instruction	Manufacturer's instructions Policies & Procedures Demonstration
						7. Re-usable circuits are disinfected and cleaned as per manufacturer's instructions	Manufacturer's instructions Policies & Procedures Demonstration
						8. All ADU components that are visibly contaminated with secretions are replaced	Policies & Procedures Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						9. Suction catheters, oral airways, bougies, stylets, exchangers and ET-tubes are managed as disposable single-use items	Policies & Procedures Demonstration
						10. Re-usable laryngoscope blades are sterilised between procedures	Policies & Procedures Demonstration
						11. There is adequate amount of laryngoscope blades available to allow for sterilisation between procedures	Demonstration Number and size of LM Blades: Number of patients on the list:
						12. Re-usable laryngoscope handles are wiped with 70% isopropyl alcohol between procedures	Demonstration
						13. Laryngeal mask airways (LMA) are regarded as single-use items	Manufacturer's instructions Demonstration
						14. Ultrasound - and temperature probes are disinfected and sterilised as per manufacturer' instruction	Manufacturer's instructions Demonstration
						15. Ancillary instrumentation sets e.g. Magill forceps, Spencer Wells forceps are sterilised between patient use	Demonstration Number of sets: Number of patients on the list:

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCEOF EVIDENCE
						16. Non-invasive blood pressure cuffs, monitor cables and rolling boards are decontaminated between procedures	Demonstration
						17. Personal equipment e.g. stethoscopes are disinfected with 70% isopropyl alcohol between procedures	Policies Demonstration
						18. Bag valve mask resuscitators are used in conjunction with a HMEF filter	Policies & Procedures Demonstration
						19. Bag valve mask resuscitators are dissembled, washed and dried between usages	Policies & Procedures Demonstration
						20. The dissembled parts of the bag valve mask are sterilised, before use the first time, after use and when visible contaminated	Policies & Procedures Demonstration
						21. There is an adequate amount of sterile bag valve mask resuscitators to allow for disinfection and sterilisation	Number of theatres and recovery bays and emergency trolleys: Total number of bag valve mask resuscitators:

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						22. Forced-air warming devices are used when intra-operative time is ≥ 30 minutes	Policies & Procedures Indicate intra-operative time: Intra-operative documentation Number of theatres: Number of forced-air warming devices:
						23. Forced-air single-use blanket use is evident	Demonstration
						24. Patients that are intubated for longer than 48-72 hours are intubated with a subglottic secretion drainage device	Demonstration Policies & Procedures
19.2	Communication structures relevant to the management of anaesthetic equipment is evident					25. Patient information regarding respiratory diseases e.g. TB is communicated to the OR unit manager when OR list is booked	OR lists
						26. A log book for every anaesthetic delivery unit is available indicating service dates and breakages	Number of anaesthetic delivery units: Number of log books: Content of log books

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						27. A daily cleaning checklist is signed and updated	Checklist
						28. There is evidence of in-service training and CPD sessions, regarding the cleaning of anaesthetic equipment	In-service training planner Attendance lists
						29. The serial numbers of all anaesthetic equipment are indicated in the patient's peri-operative document	Peri-operative document Demonstration
						30. Non-compliance to anaesthetic equipment procedures are reported as incidents and indicated in the patient's peri-operative documentation	Incident Reports Peri-operative document
						31. There is proof of active surveillance of the patient when an incident is reported	Incident Report Intra-operative document Surveillance documentation
						32. Procedures do not commence unless the preparation list for anaesthetic equipment, cleaning and disinfection has been completed and signed	Demonstration
						33. Policies and procedures are revised as per manufacturer' recommendations	Policies & Procedures Minutes of meetings
	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 20: PROCESS: Medication management in the OR is according to evidence-based practices.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
20.1	Medication store rooms are managed according to evidence-based practices					1. Medication is stored in designated medication store rooms	Demonstration
						2. The store rooms and shelves are visibly clean and damp-dusted daily	Demonstration
						3. Store rooms are not exposed to direct sunlight	Demonstration
						4. The temperature of medication rooms are below 25^{o}C	Temperature:
						5. There are no expired items in the medication store room	Demonstration
						6. Pre-determined stock levels are indicated and maintained	Demonstration
						7. Medication store rooms are big enough to allow for stock rotation	Demonstration
						8. No cardboard boxes are visible in the store rooms	Demonstration
20.2	Medication trolleys are managed according to evidence-based practices					9. There are trolleys designated for medication only in each theatre	Demonstration
						10. Medication trolleys are visibly clean, damp-dusted daily and decontaminated between procedures	Daily check list Demonstration
						11. Pre-determined stock levels are indicated and maintained	Demonstration Stock list
						12. There are no expired items in the medication trolleys	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
20.3	Medication ampules, vials and tube usage are according to evidence-based practices					13. Hands are decontaminated before handling of medication	Demonstration
						14. Medication is drawn up as close as possible to time of use	Demonstration
						15. Syringe tips are covered with sterile capped-needles until needed	Demonstration
						16. Marked filled syringes are kept on the medication trolley until needed	Demonstration
						17. Un-used medication is discarded and not transferred to other procedures	Demonstration
20.4	Medication refrigerators are managed according to evidence-based practices					18. The temperature of medication refrigerators are maintained between 2 – 8°C	Temperature:
						19. The refrigerator temperatures are documented twice daily	Refrigerator Temperature Chart
						20. Refrigerators are defrosted and cleaned monthly	Cleaning schedule Demonstration
20.5	IV-Therapy is managed according to evidence based practices					21. The insertion of IV-Therapy is managed as an a-septic procedure	Policies & Procedures Demonstration
						22. Hands are decontaminated before handling any part of the IV-Therapy system	Demonstration
						23. All lines are marked indicating the insertion date	Demonstration IV Stickers
						24. Continue-flow lines are replaced every 72hours and add-a-lines every 36 hours	Demonstration IV Stickers

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						25. Infusion sets contaminated with blood are replaced as soon as possible	Demonstration
						26. The IV-cannula is fixated with a transparent dressing	Demonstration
						27. The IV-cannula insertion site is checked every two hours for redness and swelling and documented	Intra-operative document Demonstration
						28. All vaculitres used are marked with the following information: date of use, medication added, expiry date, batch number and name of the administrator	Vaculitre sticker Demonstration
20.6	CVP-lines are managed according to evidence based practices					29. CVP-line placement is performed as a sterile procedure	Policies & Procedures Demonstration
						30. The sub-clavian site is preferred to internal jugular and femoral sites	Policies & Procedures Demonstration
						31. An ultrasound is used when available during insertion of the line	Demonstration
						32. A line with the minimum required ports is used	Demonstration
						33. Skin is decontaminated with 0.5% chlorexidine in 70% alcohol solution	Demonstration
						34. The skin area is allowed to dry before commencement of the procedure	Demonstration
						35. Administration sets are replaced every 72 hours	Demonstration
						36. All unused ports are closed with sterile caps	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
20.7	Arterial lines are managed according to evidence-based practices					37. Arterial line placement is performed as a sterile procedure	Policies & Procedures Demonstration
						38. Injection ports are free of blood and covered with a cap when not in use	Demonstration
						39. Three-way taps are minimised if practically possible	Demonstration
						40. Arterial lines are replaced every 30 days	Demonstration
20.8	Spinal and epi- coudal/ neuraxial technique is managed according to evidence- base practices					41. Sterility is maintained throughout the insertion of the catheters	Demonstration
						42. Single-use catheters, vials and ampules are used	Demonstration
						43. Patient co-operation is assessed before commencement with the procedure	Demonstration
						44. Multiple-injection site attempts are discouraged	Demonstration
						45. Un-used ports are covered	Demonstration
20.9	Patient's receive chronic medication during the intra-operative phase, if not contra-indicated, to maintain treatment regimes					46. Immunosuppressive medication is continued in the intra-operative area, when prescribed	Demonstration Medication Charts Intra-operative Documentation
20.10	Communication structures regarding the management of medication is evident					47. Updated policies regarding the management of medication practices in the OR are evident	Policies & Procedures

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						48. There is proof that policies and procedures are communicated to staff	Minutes of meetings Demonstration
						49. There is proof of the implementation of policies and procedures	Demonstration
						50. Non-compliance to policies and procedures regarding medication management is reported as incidents	Incident Reports
						51. An updated guideline regarding the use of prophylactic antibiotics are available and implemented	Antibiotic list from pharmacy Demonstration
						52. The administration time, dose and type of medication is indicated in the patients' peri-operative document	Peri-operative documentation
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 21: PROCESS: Practices to maintain patient body temperature control are evident.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
21.1	Patient warming practices are managed according to evidence- based practices					1. A patient body temperature of 36^{o}C and above is maintained during the pre-operative phase	Demonstration Intra-operative documentation Indicate temperature:
						2. Forced-air warming devices are used on every patient when the intra-operative time is ≥ 30minutes	Demonstration Intra-operative documentation
						3. A single-use forced air blanket is used per patient	Demonstration
						4. Intra-venous fluid warming devices delivers fluid at 37^{o}C	Demonstration Indicate temperature:
						5. Intra-venous fluid warming devices are used when volume ≥ 500ml is transfused	Demonstration Intra-operative documentation
						6. Patients are exposed, cleaned and draped as close as possible to the incision time	Demonstration
						7. Intra-operative room temperature is maintained between 22^{o}C and 25^{o}C	Indicate the temperature:
						8. Patients are kept in the recovery area until their body temperatures are at least 36^{o}C	Demonstration Recovery Room documentation Indicate temperature:

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
21.2	Fluid warming cabinets are managed according to evidence- based practices					9. Fluid warming cabinets are cleaned daily	Demonstration Cleaning schedule
						10. Warmer drawer temperature does not exceed 37^{o}C	Demonstration Warmer drawer temperature charts Indicate temperature:
						11. All items in the cabinet are dated and time of insertion is visible	Demonstration
						12. IV bags are not heated for longer than 7 days	IV Stickers Demonstration Indicate the number of days:
						13. All IV bags are discarded after 7 days	IV Stickers Demonstration Indicate the number of days:
						14. IV bags are not allowed to cool down and then re-heated	Policy & Procedures Demonstration
						15. All IV bags must be covered in the cover pouch	Demonstration
21.3	Communication practices regarding the prevention of hypothermia is evident					16. Every patient's temperature is recorded pre-operatively	Pre-operative documentation
						17. The intra-operative temperature of the patient is recorded	Intra-operative documentation

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCEOF EVIDENCE
						18. The type of warming device as well as serial numbers of devices and settings are recorded in the peri-operative documentation	Peri-operative documentation
						19. Policies and procedures regarding the intra-operative temperature management is evident	Policies & Procedures
						20. Non-conformance to policies and procedures are regarded as incidents and reported	Incident Reports
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 22: PROCESS: Hair removal practices are according to evidence- based practices.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
22.1	Incision site hair is removed as close as possible to the time of incision					1. Hair is removed in the operating room	Demonstration
22.2	The hair removal method prevents the harbouring of micro-organisms					2. Hair is removed via a clipper and not a shaver	Demonstration
						3. The blade of the clipper is used as a single-used item	Demonstration
						4. Only hair in the incision area is removed	Demonstration
22.3	Communication practices regarding the removal of hair is evident					5. The hair removal technique as well as the time of hair removal is indicated in the patient' intra-operative document	Intra-operative documentation
						6. Policies and procedures regarding the removal of hair is evident	Policies & Procedures
						7. A break in incisional site skin integrity is reported and documented pre-operatively	Patient documentation
	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 23: PROCESS: Practices to manage blood glucose levels of patients in the peri-operative phase are evident.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
23.1	Base line data is obtained pre-operatively					1. Blood glucose levels of diabetic and non-diabetic patients are measured and documented before commencement of anaesthesia	Documentation
23.2	Communication practices regarding the maintenance of the patient' blood glucose level is evident					2. Blood glucose levels of diabetic patients are checked and documented every hour during the peri-opertively	Documentation Demonstration
						3. Blood glucose levels are maintained between 6.1-8.3 mmol/L during the peri-operative phase	Documentation Demonstration
						4. Policies and procedures regarding the maintenance of blood glucose levels peri-operatively is evident	Policies & Procedures
						5. Non- conformance to policies are regarded as incidents	Incident Reports
	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 24: PROCESS: Environmental control practices are evident.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
24.1	Preventative pest control practices are evident					1. There is no evidence of rodent and/or infestation of pests in the operating room theatre	Demonstration
						2. There is preventative measures in place to manage potential infestations	Contractor contracts Demonstration
						3. There is documented proof of daily damp-dusting practices throughout the unit as well as after each list	Demonstration Job descriptions OR Preparation lists
						4. Anatomical and medical waste are removed from the unit as soon as containers are sealed	Demonstration
						5. There are no open or broken windows in the operating room unit	Demonstration
						6. The consumption of food is restricted to the dining room areas	Demonstration Policies
						7. Preventative measures do not compromise the patients or staff in the operating room suite	Demonstration
						8. No aerosol products to eliminate infestations are used	Demonstration
24.2	Communication structures regarding pest control practices are evident					9. There is a procedure describing the reporting of rodent and pest sightings in the operating room	Policies & Procedures
						10. Sightings of rodents and pests are regarded as incidents	Incident Reports
						11. There is documented proof of reporting and discussions of infestations and sightings during departmental meetings and the IPC Committee meetings	Minutes of meetings

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						12. Sightings of rodents and pests in the operating room during a procedure is documented in the patients intra-operative document	Intra-operative documentation
	SCORE:						
	MAXIMUN SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 25: PROCESS: Cleaning and disinfection programme is evident in the OR.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
25.1	There is a cleaning and disinfection programme in place specific to the OR					1. A cleaning and disinfection programme specific to the OR is clearly described and communicated to all stakeholders	Documentation Electronic communication
						2. There is a service-level-agreement between the hospital and cleaning company	Service –level agreement
						3. Responsibilities and roles are clearly defined	Service-level agreement
						4. Cleaning methods of specialised equipment are updated and clearly described	Policies & Procedures Minutes of meetings
						5. There is proof of in-service training of the programme of all stakeholders	In-service training records Attendance lists
						6. The effectiveness of the programme is monitored	Audit results Minutes of meetings
25.2	Cleaning staff is allocated to every area in the OR					7. There is one cleaner per working theatre, one cleaner allocated to store rooms, and one cleaner for passages, recovery and pre-operative area, one cleaner for change rooms and one cleaner for rest rooms and the theatre kitchen and one cleaner for CSD.	Daily delegation lists Demonstration
						8. Cleaning staff adheres to the PPE policy	Demonstration
25.3	Cleaning equipment is validated					9. All cleaning equipment is approved by the IPC Coordinator	Documentation
						10. There is enough cleaning equipment available in the OR to manage the maximum occupancy of the OR	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						11. Cleaning equipment is disinfected according to manufacturer's instructions	Demonstration Policies & Procedures
25.4	There is proof that all areas are cleaned					12. All theatres are cleaned at least three hours before the start of the first procedure	Demonstration Cleaning Schedule Policies & Procedures
						13. All theatres are cleaned daily even when not used for the specific day	Demonstration Cleaning Schedule
						14. Damp dusting and maselin sweeping is done daily, using a disinfectant detergent, as approved by the IPC coordinator	Demonstration Cleaning Schedule List of approved disinfectants
						15. All other areas including storerooms in the OR are cleaned daily	Demonstration Cleaning Schedule
						16. There is no evidence of dust in the OR	Demonstration
25.5	Floors are clean					17. Floors are cleaned after each case during the "turn-over" period	Demonstration
						18. Body fluid spills are cleaned with hypochlorite granules and paper towels	Demonstration
						19. All organic matter is removed and the rest of the floor is cleaned with a hypochlorite solution	Demonstration
						20. Floors are cleaned after each list and/or everyday	Demonstration
						21. Stripping and sealing of all floors are done twice a year	Demonstration
25.6	Walls are clean					22. Walls are spot cleaned between procedures with a hypochlorite solution with a separate mop	Demonstration
						23. Walls are washed with a hypochlorite solution once a week	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
25.7	Specific diseases are managed					24. Guidelines indicating the cleaning of the OR, after specific disease contamination is evident and implemented	Policies & Procedures Demonstration Minutes of meetings
						25. UVC or fogging equipment is available	Policies & Procedures Demonstration
25.8	Communication structures regarding the implementation of the cleaning programme is evident					26. Cleaning and nursing staff in the OR is knowledgeable about the cleaning programme	Demonstration In-service training planner
						27. Daily cleaning events are documented indicating the specific time and type of cleaning done	Cleaning Check lists Demonstration
						28. Deviations from cleaning policies are reported as incidents	Incident Reports Demonstration
						29. There is documented proof that all cleaning staff has received in-service training regarding the cleaning requirements and PPE	Demonstration Attendance lists
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 26: PROCES: Practices during turn-over time is according to evidence based practices.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
26.1	Turn-over time is included in the planning and allocation of list-time to surgeons					1. Time is allowed for cleaning of the OR and preparation of each procedure per list	Demonstration Policies & Procedures Indicate time:
26.2	Policies and procedures regarding the management of turn-over time in the OR dis evident					2. Guidelines regarding the multi-disciplinary team' responsibilities during turn-over time is evident	Demonstration Policies & Procedures
26.3	Preparation for the next patient is planned and controlled					3. All contact areas in the OR are decontaminated during turn-over time	Demonstration
						4. The scrub nurse disposes of used sharp items e.g. blades during turn-over time	Demonstration
						5. The cleaners mop floors and wash walls where body fluid is visible	Demonstration
						6. Used trolleys, opened sets and packs are disposed of	Demonstration
						7. All waste is disposed of	Demonstration
						8. Anaesthetic units are re-equipped and instrumentation are decontaminated and sterilised as required	Demonstration
						9. Clean trolleys and sterile packs for the following procedure are only pushed in and opened when all cleaning activities have been completed	Demonstration
						10. All equipment not required for a procedure is removed	Demonstration

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						11. The patient for the following procedure are only pushed into the theatre after all the cleaning has been done	Demonstration
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 27: PROCESS: The CSD area is managed according to evidence-based practices.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
27.1	Human Resources contributes to the objectives of the CSD department					1. There is a registered nurse with OR or CSD experience in charge of the CSD	Demonstration Staff member lists
						2. Staff employed in the CSD has a qualification in CSD practices	Demonstration Staff member lists
						3. There is evidence of daily delegation of duties per shift	Staff member delegation lists
						4. There is evidence of CPD and in-service training planning specific to CSD practices	Planned in-service training programmes
						5. There is evidence of CPD and in-service training of CSD staff	Attendance lists
						6. Duties and responsibilities of every staff member is clearly defined	Job descriptions Delegation schedule
27.2	CSD staff members adhere to PPE policies					7. All staff in CSD wears appropriate PPE	Demonstration
						8. The bare-below elbow policy is adhered to	Demonstration
27.3	Policies relevant to CSD procedures are evident					9. Policies are available to all staff in the CSD area	Policies & Procedures Demonstration
						10. Policies are updated and relevant	Demonstration
						11. An updated list indicating the preferred choice of sterilising method per item is available	Documentation
						12. There is proof that policies are communicated to staff	Minutes of meetings
27.4	Manual decontamination practices are maintained according to evidence based practices					13. There is appropriate equipment available for the decontamination process e.g. different size brushes	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						14. The washer wears long-cuff gloves, a plastic apron and eye protection during the manual washing process	Demonstration
						15. Chemicals are diluted according to the manufacturer's instructions	Manufacturer's instruction manuals Policies & Procedures Demonstration
						16. All instruments containers and baskets are washed with an enzymatic chemical and then rinsed in a second basin with clean water	Demonstration
						17. All instruments are opened during the washing process	Demonstration
27.5	The ultrasonic washer is managed according to evidence- based practices					18. The ultrasonic washer is cleaned daily	Demonstration Cleaning Schedule
						19. The ultrasonic solution is changed daily	Policies & Procedures Cleaning Schedule Demonstration
						20. Appropriate instrument connectors are utilised	Demonstration
						21. A performance printout is available after each use	Demonstration Log book
27.6	The automated washer is managed according to evidence- based practices					22. A performance printout is available after each cycle	Demonstration Log book
						23. The cycle type is appropriate to the contents of the load	Demonstration Manufacturer's instructions
						24. Instruments are loaded with open ratchets	Demonstration
						25. Each cycle is set as a "full cycle"	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						26. A cycle challenge is inserted with every wash	Demonstration
27.7	Instrument packing is managed according to evidence- based practices					27. The packing of clean instruments is separate from the decontamination area	Demonstration
						28. Each instrument is inspected for cleanliness, residue and rust	Demonstration
						29. Burrs drill bits and saws are managed as single-use items	Demonstration
						30. Screw joints of instruments are sprayed with lubricant oil before sterilisation	Demonstration
						31. Sharp tips of instruments are covered to avoid perforation of covers	Demonstration
						32. Instruments are arranged to allow for maximum exposure of sterilant and drainage of water	Demonstration
						33. There is no engraving visible on instruments	Demonstration
						34. Instrument colour coding tape is inspected and removed when brittle or soiled	Demonstration
						35. The combination of instruments, bowls and towels in a single pack is avoided	Demonstration
						36. Sterile pack size does not exceed 91cmmx45cmm	Demonstration Indicate size:
						37. Pack weight does not exceed 11.4 kg	Demonstration Indicate weight:

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						38. A single-use absorbent tray liner is placed inside instrument baskets before placement of instruments	Demonstration
						39. A relevant class chemical indicator is placed inside every pack	Demonstration
						40. A class 1 indicator is attached on the outside of each instrument set and pack	Demonstration
						41. Sets and packs are covered with a double sterile barrier, non-woven drape if used as trolley drapes inside the sterile field	Demonstration
						42. Set and pack cover technique allows for adherence to basic sterile principles during the opening procedure	Demonstration
						43. A double peel able packing that is fibre and tear free is used to pack extra instruments	Demonstration
						44. The heat seal seams allows for adherence to basic sterile principles during the opening procedure	Demonstration
						45. The set or pack name is indicate on the outside of the item on adhesive tape	Demonstration
						46. No writing is visible on the outer wrap layer of the set or pack	Demonstration
						47. An item tracking device is attached to every pack and set	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						48. Expire dates are event related and not longer than: Peel able packing : 9 months Muslin covered sets and packs: 30 days	Demonstration Indicate dates:
						49. Sets and packs are loaded in the autoclave using designated equipment	Demonstration
						50. Sets and packs are arranged to allow for maximum sterilant exposure	Demonstration
						51. The content of each load is indicated on the daily tracking system	Demonstration Documentation
						52. Sets and packs are allowed to cool down after sterilisation on slated shelves	Demonstration
						53. Sets and packs are transported to the sterile store room in an designated enclosed sterile trolley	Demonstration
						54. There is a procedure in place describing the re-call of sterile instrumentation and packs	Demonstration Procedure
						55. It is not general practice to share instruments and sets between hospitals	Demonstration
27.8	Sterilising equipment in the CSD area are managed according to evidence-based practices					56. The validation certificates of all sterilising equipment are available	Documentation
						57. Service records of all sterilising equipment are available	Service records Log books

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						58. There is a log book indicating the performance of each steriliser during every cycle	Log book
						59. Biological indicator results per autoclave per day as well as after each breakdown is evident	Demonstration Documentation
						60. A- test chemical indicator results per autoclave per day is evident	Demonstration Documentation
						61. A relevant class chemical indicator is available in every set and pack	Demonstration
						62. A load check indicator is used for every load	Demonstration Documentation
27.9	Loan instruments are managed according to evidence- based practices					63. The company that supplies the loan set provides written decontamination and sterilisation guidelines with every set at delivery	Documented guidelines
						64. Each set is decontaminated before sterilisation	Demonstration
						65. Each set is sterilised before use	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						66. The following documented proof per loan set is available: Date and time of delivery Name of the supplier company Decontamination and sterilisation guidelines Name of the washer Name of the packer Autoclave type and number Autoclave load Names of the surgical team Name of the patient Re-de-contamination of the used loan set	Demonstration Loan set books
27.10	Management of decontamination and sterilisation processes of items contaminated with special diseases are evident					67. There are policies and guidelines in place that describe the management of instrumentation used with specific diseases	Policies & Procedures
27.11	Sterile storerooms are managed according to evidence-based practices					68. Sterile packs are not stacked	Demonstration
						69. Only CSD staff has access to the sterile store room	Demonstration
						70. Packs and sets are stored away from outside walls	Demonstration
						71. The temperature of the sterile store room is monitored and maintained at 21^{o}C	Demonstration Indicate temperature:
						72. There are no cardboard boxes and shipping containers evident in the store room	Demonstration

NO	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
						73. Stock levels are available and monitored daily	Demonstration Stock lists
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 28: PROCESS: A preventative maintenance programme is evident.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
28.1	There is evidence of monthly risk assessment rounds in the OR					1. Stakeholders do risk assessment rounds in the OR: IPC and OHS coordinator, Technical and CSD Manager as well as one surgeon.	Documentation
28.2	Results and recommendations are communicated to the IPC committee					1. Identified and unresolved risks are documented, action plans, responsible stakeholder and recommendations are available	Documentation
						2. Unresolved risks take preference in IPC committee discussions	Minutes of meetings
28.3	There is proof of IPC quality audit results in the unit					3. A comprehensive IPC quality audit of the OR is conducted three times a year	Audit results Minutes of IPC Committee meetings
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 29: OUTCOME: The surgical site infection rate and practices reflect international acceptable care.

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
29.1	The healthcare provider' focus on surgical site infection management is evident					1. Every surgical site infection is managed as an incident	IPC surveillance documents Incident Reports
						2. All stakeholders as well as community based healthcare providers are encouraged to report surgical site infections if the patient was treated in the specific OR	Reporting protocols and guidelines Minutes of stakeholder listening forum
						3. Every patient that presents with a surgical site infection in the hospital is monitored	IPC surveillance documents
						4. Surgical site infection rates are compared with CDC acceptable rates	Minutes of meetings
29.2	Adequate data regarding IPC practices on the OR is generated to be utilized in adverse event analysis					5. Patterns relevant to surgical site infections e.g. practices and/or surgical teams are identified	IPC surveillance documentation
29.3	OR IPC information reflect care acceptable to stakeholders and patients					6. Patients are comfortable with the IPC status of the OR	Patient feedback reports Patient Listening Forum minutes
						7. The OR is regarded as the preferred service provider of the community	Interview Patient Listening Forum minutes
						8. The OR complies with National Core Standards as directed by the National Department of Health	Core Standard Audit results Minutes of IPC Committee meetings
						9. The OR is accredited for student experiential learning by external academic institutions	Audit documentation Contracts Demonstration

	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 30: PROCESS: Peri-operative oxygenation of the patient is adequate

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
30.1	Base line data is obtained pre-operatively					1. The patient's pre-anaesthetic oxygenation status is documented	Documentation Demonstration
30.2	Oxygen supply to the patient is maintained					2. Fractional inspired oxygenation of 80% is maintained throughout the procedure, unless contra-indicated	Demonstration Documentation
						3. Patients receive 80% fractional inspired oxygen 2-6hours post-operatively, unless contra-indicated	Demonstration Documentation
						4. Policies regarding patient oxygenation is evident	Policies & Procedures
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

STANDARD 31: PROCESS: 'Goal-directed fluid therapy" is maintained peri-operatively

NO.	CRITERIA	C (2)	PC (1)	NC (0)	N/A	INDICATORS	SOURCE OF EVIDENCE
31.1	Base line data is obtained pre-operatively					1. Vital data is recorded pre-operatively	Documentation Demonstration
31.2	Oxygen supply to the patient is maintained					2. The patient's fluid-balance is monitored throughout the procedure	Demonstration Documentation
						3. The anaesthetist document the therapy required in the intra-operative document	Documentation
						4. Policies regarding "Goal-directed fluid therapy" is evident	Policies & Procedures
	SCORE:						
	MAXIMUM SCORE:						
	PERCENTAGE:						
	DATE:						
	AUDITOR:						

R14/49 Ms Linette Engelbrecht

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M141020

NAME: (Principal Investigator)	Ms Linette Engelbrecht
DEPARTMENT:	Nursing Education Netcare Linmed, Garden City, Union, and Clinton Hospitals
PROJECT TITLE:	The Development of a Comprehensive Infection Prevention Quality Audit Tool for Operating Room Theatres in a Private Health Care Environment
DATE CONSIDERED:	31/10/2014
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr Sue Armstrong

APPROVED BY: Professor C Feldman Co-Chairperson, HREC (Medical)

DATE OF APPROVAL: 23/12/2014

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**.

Principal Investigator Signature Date 23/12/2014

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Netcare Management (Pty) Limited

Tel: + 27 (0)11 301 0000
Fax: Corporate +27 (0)11 301 0499
76 Maude Street, Corner West Street, Sandton, South Africa
Private Bag X34, Benmore, 2010, South Africa

RESEARCH OPERATIONS COMMITTEE FINAL APPROVAL OF RESEARCH

Approval number: UNIV-2015-0011

Ms L Engelbrecht

E mail: Linette.Engelbrecht@netcare.co.za; lineng@vodamail.co.za

Dear Ms Engelbrecht

RE: THE DEVELOPMENT OF A COMPREHENSIVE INFECTION PREVENTION QUALITY AUDIT TOOL FOR OPERATING ROOM THEATRES WITHIN A PRIVATE HEALTH CARE ENVIRONMENT

The above-mentioned research was reviewed by the Netcare Research Operations Committee's delegated members and it is with pleasure that we inform you that your application to conduct this research at Netcare Union, Clinton, Linmed, Garden City Hospitals, has been approved, subject to the following:

i) Research may now commence with this FINAL APPROVAL from the Netcare Research Operations Committee.

ii) All information regarding Netcare will be treated as legally privileged and confidential.

iii) Netcare's name will not be mentioned without written consent from the Netcare Research Operations Committee.

iv) All legal requirements with regards to participants' rights and confidentiality will be complied with.

v) Netcare must be furnished with a STATUS REPORT on the progress of the study at least annually on 30th September irrespective of the date of approval from the Netcare Research Operations Committee as well as a FINAL REPORT with reference to intention to publish and probable journals for publication, on completion of the study.

vi) A copy of the research report will be provided to the Netcare Research Operations Committee once it is finally approved by the relevant primary party or tertiary institution, or once complete or if discontinued for any reason whatsoever prior to the expected completion date..

vii) Netcare has the right to implement any recommendations from the research.

viii) Netcare reserves the right to withdraw the approval for research at any time during the process, should the research prove to be detrimental to the subjects/Netcare or should the researcher not comply with the conditions of approval.

ix) APPROVAL IS VALID FOR A PERIOD OF 36 MONTHS FROM DATE OF THIS LETTER OR COMPLETION OR DISCONTINUATION OF THE STUDY, WHICHEVER IS THE FIRST.

We wish you success in your research.

Yours faithfully

3/3/2015

Prof Dion du Plessis
Full member: Netcare Research Operations Committee & Medical Practitioner evaluating research applications as per Management and Governance Policy

Shannon Nell
Chairperson: Netcare Research Operations Committee
Network Healthcare Holdings Limited (Netcare)
Date: 4/3/2015

APPENDIX M

Summary of research methodology used in this study: The Development of a Comprehensive Infection Prevention Quality Audit Tool for Operating Room Theatres in a Private Health Care Environment

	Phase 1	Phase 2	Phase 3
Chapter	**Chapter 4: The Development of a Concourse**	**Chapter 5: Q-sorting** **Chapter 6: Literature Verification**	**Chapter 7: The Development and Testing of a Comprehensive Infection Prevention Quality Audit Tool**
Research question	What is currently included in an infection prevention control quality audit tools, policies and procedures for operating room theatres in a health care environment?	What do internal and external stake holders regard as important elements in an audit tool?	What elements should be included in an infection prevention quality audit tool in order to identify risks leading to hospital acquired infections in an operating room in a private health care environment?
Objective	To identify the content of the infection prevention quality audit tools and policies currently used in the operating room theatres in a private health care environment.	To determine what internal and external stakeholders regard as important elements in the infection prevention quality audit tool of operating theatres in a private health care environment. To review the literature to determine evidence based practices that provide validation for, and the expansion of the concourse statements identified.	To incorporate the elements as determined by stakeholders in an infection prevention quality audit tool for an operating room theatre in a private health care environment (See Appendix G) To test the audit tool in one operating room theatre in a private health care environment to determine the validity of the tool.

	Phase 1	Phase 2	Phase 3
Data collection	Stage 1 : Location of Raw Data Stage 2: Consolidation of Raw Data Stage 3: Structuring of Raw Data into Categories (See Appendix A)	Collection via a q-sorting event where statements from the concourse (q-set) are rank-ordered by the specific sample population (p-set) on a score sheet An interview is conducted with each participant to clarify extreme scores Literature verification is used to expand, support or dismiss the statements.	The infection prevention control quality audit tool is tested in one operating room within a private health care facility by

BIBLIOGRAPHY

Abdullah, H. Kumar, N. Ling, G. Rose, R. (2008). Organizational Culture as a Roof of Performance Improvement: Research and Recommendations. *Contemporary Management Research*, vol. 4, no. 1: 44-56.

Achterstraat, P. (2013). Managing operating theatre efficiency for elective surgery. *New South Wales Auditor-General's Report.* NSW Health. Australia.

Al-Ali, A. (2014). Developing a Total Quality Management Framework for Healthcare Organizations. *Proceedings of the 2014 International Conference on Industrial Engineering and Operations Management Bali, January 7-9, 2014.*

Alvarado, C. Carayon, P. Flatley, P. Gurses, A. Schoofs-Hundt, A. Karsh, B. Smith, M. (2005). Work system design for patient safety: the SEIPS model. Available from http://www.ncbi.nlm.nih.gov/pubmed/17142610 . Accessed on 23 March 2015.

Amicizia, D. Cristina, M. Ottria, Perdelli, F. Spagnolo, A. (2013). Operating theatre quality and prevention of surgical site infections. Department of Health Sciences. University of Genoa, Italy.

Anaissie, E. Dignani, C. Penzak, S. (2002). The Hospital Water Supply as a Source of Nosocomial Infections. The Myeloma and Transplantation Research Centre. University of Arkansas for Medical Sciences. United States of America.

Anderson, D. Berrios-Torres, S. Bratzler, D. Delliger, E. Greene, L. Kaye, K. Maragakis, L. Nyquist, A. Podgorny, K. Saiman, L. Yokoe, D. (2014). Strategies to Prevent Surgical Site Infections in Acute Care Hospitals. *Infection Control and Hospital Epidemiology,* vol. 35, no. 6, pp. 605-627.

Andersson, A. (2013). Patient Safety in the Operating Room: Focus on Infection Control and Prevention, PhD Thesis, University of Gothenburg, Sweden.

Andersson, A. Apell, S. Hjalmarsson, S. Karlsteen, M. Lindberg, T. Tarakonov, Y. Wernstrom, I. (2012). Particle Tracing: Analysis of Airborne Infection Risks in Operating Theatres. COMSOL Conference: Milan.

ANZCA. (2013). Guidelines on Infection Control in Anaesthesia. *Australian and New Zealand College on Anaesthesia.* PS28. Australia.

AORN. (2013). Sterilization. *AORN Journal.* Association of peri-Operative Registered Nurses. Pp. 513-540. Denver: United States of America.

AORN. (2014). Position Statement on Perioperative Safe Staffing and On-Call Practices. *Association of Perioperative Registered Nurses Journal*. United states of America.

Appleby, J. Burge, P. Devlin, N. Dixon, A. Magee, H. Robertson, R. (2010). Patient Choice: How Patients Choose and How Providers Respond. *The Kings Fund*. Hobbs the Printers Limited. United Kingdom.

Armstrong, S. (2001). *A Quality Audit System for Nursing Colleges in Gauteng*. Doctoral Thesis. Johannesburg, University of Witwatersrand.

Armstrong, S. Bhengu, B. Kotze, W. Nkonzo-Mtembu, L. Ricks, E. Stellenberg, E. van Rooyen, D. Vasuthevan, S. (2013). *A new Approach to Professional Practice*. Juta and Company Lid. South Africa.

Armstrong, S. du Rand, E. Kantor, G. Kula, N. van den berg, D. Youngleson, S. (2014). *Managing Quality: Tools, Skills and Capacities for Health Leaders.* 1st Edition. Pearson: South Africa.

Arteche, D. Labrague, L. Pacolor, N. Yboa, B. (2012). Operating Room Nurses' Knowledge and Practice of Sterile Technique. Nursing Care. OMICS Publishing Group, vol.1, no. 4. ISSN: 2167-1168 JNC.

Arteche, D. Labrague, L. Pacolor, N. Yboa, B. (2012). Operating room Nurses' Knowledge and Practice of Sterile Technique. *Journal of Nursing Care,* vol. 1, no. 4.

Ashcroft, P. (2013). Health Building Note 00-09: Infection control in the built environment. Department of Health. Quarry House. United Kingdom.

Association for Professionals in infection Control and Epidemiology. (2010). Guide to the Elimination of Orthopedic Surgical Site Infections. APIC Guide. Washington: United States of America.

AST. (2008). AST Standards of Practice for Handling and Care of Surgical Specimens. *Association of Surgical Technologists.* Accessed on: 11 February 2015. Accessed on http://www.ast.org/uploadedFiles/Main_Site/Content/About_Us/Standard_Handling_Care_Surgical_Specimens.pdf

Auwarter, P. Bolon, M. Bratzler, D. Dellinger, E. Fish, D. Napolitano, L. Olsen, K. Peri, T. Sawyer, R. Slain, D. Steinberg, J. Weinstein, R. (2013). Clinical practice

guidelines for antimicrobial prophylaxis in surgery. *American Society of Health-System Pharmacists, Inc*, vol. 70, pp. 195-283.

Baker, G. Bohnen, J. Doran, D. Espin, S. Grober, e. Lingard, L. Orser, B. Regehr, G. Reznick, R. (2004). Communication Failures in the Operating Room: an observational classification of recurrent types and effects. *Quality Safety Health Care*, vol. 13, pp. 330-334.

Bartley, J. (2000). APIC State-of-the-Art Report: The role of infection control during construction in health care facilities. *Association for Professionals in Infection Control and Epidemiology, Inc.* Washington: United States of America.

Bates, P. Denham, C. Franz, C. Henderson, D. Keohane, C. Song, P. Tamir, O. Zimlichman, E. (2013). Health Care-Associated Infections: A meta-analysis of Cost and Financial Impact on the US Health Care System. *Journal of the American medical Association*, vol.173, no. 22, pp. 2039-2046.

Berelson, B. Steiner, G. (1964). *Human Behaviour*. New York: Harcourt, Brace and World, 254.

Botha, S. Kleinhans, R. Lotz, O. Markham, L. Meyer, W. O'Neil, Schlechter, A. van Aswegen, S. (2009). *Human Resource Management.* University of Johannesburg. Pearson: South Africa.

Brink, A. (2005). Antimicrobial resistance in nosocomial infections. *The Southern African journal of Epidemiology and Infection,* vol. 20, no. 2, pp. 42-45.

Bryan, C. Call, T. Elliot, K. (2007). The Ethics of infection Control: Philosophical Frameworks. Department of Medicine. *Infection Control and Hospital Epidemiology*, vol. 28, no. 3. University of South Carolina. United States of America.

Burlingame, B. (2014). Operating Room Requirements for 2014 and Beyond. The faculty Guidelines Institute. United States of America.

Burns, N. Gray, J. Grove, S. (2013). *The Practice of Nursing Research: Appraisal, Synthesis, and Generation of Evidence.*7th Edition. Elsevier. China.

Carayon, P. Kianfar, S. Xie, A. (2014). Human factors and ergonomics as a patient safety practice. *BMJ Qual Saf 2014;23: 196-205.*

Caveney, C. (2011). Infection Control: The Surgical Environment and Ancillary Areas. Veterinary Infection Prevention and Control. John Wiley and Sons Inc.

Centre for Disease Control and Prevention. (2008). Guideline for Disinfection and Sterilization in Healthcare Facilities. *HISPAC.* Available from http://www.cdc.gov/hispac/Disinfection_Sterilization/1_sumIntroMethTerms.html Accessed on 21 March 2016.

Centre for Disease Control. (2014). Chapter 17: *Surveillance Definitions*. Specific Types of Infections. Georgia, United States of America.

Centre for Disease Control. (2014). Procedure-associated Module: surgical Site Infections. Georgia, United States of America.

Chang, A. (20 February 2015). Safety of endoscope in medical spotlight. *The Star.* Johannesburg: South Africa.

Chang, A. Darzi, A. Moorthy, K. Sarker, S. Vincent, C. (2004). Systems Approach to Surgical Quality and Safety. Available from http://www.nib.nlm.gov/pmc/articles/PMC1356252/ . Accessed on 26 October 2015.

Chua, H. Kitayama, S. Tompson, S. (2013). Neuro-cultural Mechanisms of Choice-

Christensen, R. Dechert, M. Kurz, A. (1995). Heat Balance and Distribution during the Core-Temperature Plateau in Anesthetized Humans. *Anaesthesiology*, 83: 419-499.

Coovadia, Y. De Bruin, J. Dwyer, S. Fourie, A. Joubert, I. Naidu, S. Nel, D. Samuel, R. Samuel, R. (2014). Guidelines for Infection Control in Anaesthesia in South Africa. *South African Journal of Anaesthesia Analogue*, vol. 20, no. 3, pp. s1-s39.

Coovadia, Y. Gopalan, P. Samuel, R. Samuel, R. (2013). Infection control in anaesthesia in regional, tertiary and central hospitals in KwaZulu-Natal. Part 1: Unsafe Injection Practices Among Anaesthetists. *South African Journal of Anaesthesia Analogue*, vol. 19, no. 1, pp. 68-70.

Coovadia, Y. Gopalan, P. Samuel, R. Samuel, R. (2013). Infection control in anaesthesia in regional, tertiary and central hospitals in KwaZulu-Natal. Part 2: Equipment Contamination. *South African Journal of Anaesthesia Analogue*, vol. 19, no. 3, pp. 146-151.

Coovadia, Y. Gopalan, P. Samuel, R. Samuel, R. (2013). Infection control in anaesthesia in regional, tertiary and central hospitals in KwaZulu-Natal. Part3:

Decontamination practices. *South African Journal of Anaesthesia Analogue*, vol. 19, no. 4, pp. 204-211.

Coulter, A. Davis, R. Koutantji, M. Vincent, C. (2005). The Patient's Role in Patient Safety: engaging patients, their representatives, and health professionals. *Clinical Safety Research Unit.* Pp. 99-104. Department of Surgical Oncology and Technology. The Royal Society of Medicine Press Ltd. Oxford: United Kingdom.

Croger, S. Doidge, M. Jones, I. Terry, M. Webster, J. (2010). Us of face masks by non-scrubbed operating room staff. *AZN Journal of Surgery*, vol. 80, no. 3, pp. 169-173.

Dal Canton, A. Esposito, P. (2014). Clinical Audit, a Valuable Tool To Improve Quality Care: General Methodology and Applications in Nephrology. *World Journal of Nephrology,* vol. 3, no. 4.

Dariel, O. Wharrad, H. Windle, R. (2010). *Developing Q Methodology To Explore Staff Views Towards The Use Of Technology In Nurse education. In* Burns, N. Gray, J. Grove, S. eds. (2013). *The Practice of Nursing Research: Appraisal, Synthesis, and Generation of Evidence.*7th Edition. Elsevier. China.

Davies, E. (2013). Prevention and Control of Infection in Theatre. *North Tees and Hartlepool*. Version 2. NHS Foundation Trust. National Health System. United Kingdom.

De Graaf, G. van Exel, J. (2005). *Q Methodology – a sneak preview.* Vrije University. Netherlands.

Declaro, M. Gebremariam, T. (2013). Operating theatres as a source of nosocomial infection: A systematic review. *Saudi Journal for Health Sciences,* vol. 3, no. 3, pp. 5-8.

Department of Health and Human Services. (2011). Reprocessing Medical Devices in Health Care Settings: Validation Methods in labelling. Centre for Devices and Radiological Health. Centre for Biologics Evaluation and Research. United States of America.

Department of Health. (1993). Regulations relating to the course in Clinical Nursing Science leading to registration of an additional qualification. Government Notice. R. 212. Government Printers: South Africa.

Department of Health. (1996). Regulation 158. Government Printers. KwaZulu-Natal: South Africa.

Department of Health. (1998). Medical Schemes Act. No. 131 of 1998. Government Printer: South Africa.

Department of Health. (2004). National Health Act, no. 61 of 2003. Cape Town: Republic of South Africa.

Department of Health. (2005). Nursing Act, no. 33 of 2005. Cape Town: Republic of South Africa.

Department of Health. (2011). National Health Amendment Bill. Government Printers: South Africa.

Department of Health. (2014). *Good Pharmacy Practice in South Africa*. 4th Edition. The South African Pharmacy Council. Arcadia: South Africa.

Department of Trade and Industry. (2008). The Consumer Protection Act. No. 68 of 2008. Government Printer: South Africa.

Derrida, J. (1968). *Bulletin de la Société francoise de philosophie.* LXII, no. 3, pp. 73-101.

Dixon, N. Pearce, M. (2011). Guide to Ensuring Data Quality in Clinical Audits. *Health Quality Improvement Partnership*. The Information Standard.

Donnabedian, A. (1987). The Quality of Medical Care. *Science, 1987,* no. 200: 856-864.

Du Plessis, E. Jordaan, E. Jali, M. (2010). Chapter 20: Communication in a health care unit*. The Principles and Practice of Nursing and Health Care*. Van Schaik. South Africa.

Du Plessis, T. (2005). *A Theoretical framework of corporate online communication: a marketing public relations (MPR) perspective*. Chapter 5. University of South Africa. SAGE Publications. South Africa.

Einspruch, N. (2010). Innovation in Healthcare Delivery systems: A Conceptual Framework. *The Innovation Journal: The Public Sector Innovation Journal,* vol. 15, no. 1, article 2.

Emery, G. (2014). One in 25 Patients Battling Hospital-acquired Infections: CDC. Available from http://www.reuters.com/article/2014/03/26/us-usa-hospital-infections-idUSBREA2PIDG20140326 . Accessed on 26 November 2015.

Fluckinger, C. (2014). *Big Five Measurement via Q-Sort: An Alternative Method for Constraining Socially Desirable Responding.* pp. 1-8. SAGE Publications.

Ford, G. Gold, M. Karlet, M. Mani, M. (2012). Infection Control Guide for Certified Registered Nurse Anesthesia. *American Association of Nurse Anesthesia.* Park Ridge: United States of America.

Forder, A. (2007). A Brief History of Infection Control. *South African Medical Journal*, vol. 97, no. 11, pp. 1161-1164.

Freud, S. (1900). *The Interpretation of Dreams.* In Rivkin, J. Ryan, M. eds. (2004). *Literary Theory: An Anthology*. 2nd Edition. Blackwell Publishing. Oxford: United Kingdom, pp. 379-414.

Fulesdi, B. Kober, A. Scheck, T. (2001). Effectiveness of Resistive Heating Compared with Passive Warming in Treating Hypothermia associated with minor trauma: A Randomized Trial. *Mayo Clinic*, 76: 369-375.

Glaser, J. Laudel, G. (2011). *Life With and Without Coding: Two methods of early-stage data analysis in theory-guided qualitative research.* Zentrum Technik und Gesellschaft. Berlin.

Goodfellow, B. Lishman, G. Matron, J. Robb, A. Winter, C. (2013). Infection Prevention and Control Practice in the Operating Department. *The Newcastle upon Tyne NHS Hospitals Foundation Trust.* United Kingdom.

Grolman, D. Richards, G. (2005). Nosocomial Surgical Skin and Soft Tissue Infections. *The Southern African Journal of Epidemiology and Infection*, vol. 20, no. 2, pp. 74-76.

Health Protection Scotland. (2014). National Infection Prevention and Control Manual. *Infection Control Team*. Version 2.3. National Services Scotland.

Hofstede, G. (1980) in Abdullah, H. Kumar, N. Ling, G. Rose, R. (2008). Organizational Culture as a Roof of Performance Improvement: Research and Recommendations. *Contemporary Management Research*, vol. 4, no. 1: 44-56.

Hold, A. (2011). Infection Control in Theatre. *South African Journal of Anaesthesia*, vol. 17, no. 1, pp. 56-64. Durban: South Africa.

Hopper, W. Moss, R. (2010). Common Breaks in Sterile Technique: Clinical Perspectives and Perioperative Implications. *AORN Journal*, vol. 91, no. 3, pp. 350-367.

Hultman, K. (2005). Managing Resistance to Change. *Encyclopaedia of Information Systems*, vol. 3. San Diego: Academic Press.

Hutin, Y. Pruss-Ustin, A. Rapiti, E. (2005). Assessing the burden of disease from sharps injuries to health-care workers at national and local levels. World Health Organization. Geneva: Switzerland.

ISO 1466-1. (2004). ISO 1466-1: 2004. Cleanrooms and Associated Controlled Environments. Available from: http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_tc_browse.htm?commid=54874 Accessed: 30 November 2016.

Johnson and Johnson. (2006). Cidex OPA. *Advanced Sterilization Products*. Division of Ethicon. California: United States of America.

Johnson, J. Williams, A. (2013). *Mclaughlin and Kaluzny's continuous quality improvement in healthcare*. 4th Edition. Jones & Bartlett Learning.

Jovic, S. Velickovic, V. Visnjic, A. (2012). Measures for Improving the Quality of Health Care. *Scientific Journal of the Faculty of Medicine*, vol. 29, no. 2, pp. 53-58.

Klopper, H. Uys, L. (2013). What is the ideal ratio of categories of nurses for the South African public health system? *South African Journal of Science*, vol. 109, no. 5/6, pp. 1-4.

Marc, F. Salassa, T. Swiontkowski, M. (2014). Surgical Attire and the Operating Room: role in infection prevention. *The Journal of Bone and Joint Surgery*, vol. 96, no. 17, pp. 1485-1492.

Meloche, J. Qi, Y. (2009). The power of play in knowledge management. *NISS 2009 International Conference on New Trends in Information and Service Science.* pp. 219-224. Piscataway, United States of America.

Monds, P. (2012). *W Edwards Deming: Total Quality Management Thinker.* Management and Business Studies Portal. British Library. Available from:

http://mbsportal.bl.uk/taster/subjareas/busmanhist/mgmtthinkers.deming.aspx Accessed on 29 May 2017.

Morse, J. (2003)"" in Tashakkori, A. and Teddlie, C. (1998). *Mixed Methodology: Combining Qualitative and Quantitative Approaches*. Sage Publications.

Muller, M. (2013). *Nursing Dynamics*. 4th Edition. Heinemann. South Africa.

National Department of Health. (2011). National Core Standards for Health Establishments in South Africa. Department of Health: South Africa.

Nembhard, I. Alexander, J. Hoff, T and Ramanujam, R. (2009). Why does the quality of health care continue to lag? Insights from management research. *Academy of Management Perspectives.* Accessed on 10 June 2012. Available from: http://www.fraserhealth.ca/media/Why%20does%20the%20Quality%20of%20Health%20Care%20Continue%20to%20Lag.pdf

Netcare Internal quality Reviews. (2014). Infection Prevention Control. Netcare: South Africa.

Netcare. (2007). Basic Principles of Sterile Technique. *Netcare Education*. Nursing Faculty. South Africa.

Netcare. (2010). Skin Preparation and Draping. Netcare Education. Nursing Faculty. Netcare: South Africa.

Netcare. (2012). Clinical Services Surgical Services: Responsibilities Policy No. TH Section TH.2. Version, 8. Netcare Clinical Services. South Africa.

Netcare. (2012). Infection Prevention and Control: Sterile Services Management and Decontamination Process Policy. No. TH Section TH. 3. Version, 6. South Africa.

Netcare. (2013). Clinical Services Infection Prevention and Control Environment Policy no. IPC03 of 2013. South Africa.

Netcare. (2013) Clinical Services Infection Prevention and Control Nursing Techniques. IPC02. Netcare. South Africa.

Netcare (2013). Quality Alert 10-2013: Theatre Particle Count. Netcare: South Africa.

Netcare. (2013). Sterile Services Management and Decontamination Process Policy No. TH Section TH. 3. Netcare Sterile Services. South Africa.

Netcare. (2014). Clinical Services Nursing Standard Operating Procedures. Theatre Attire NUR05.S02. Netcare: South Africa.

Netcare. (2014). Clinical Services Theatre and SSD Managing of Loan Equipment. NUR05.S01. *Health Technology Division*. Netcare: South Africa.

Netcare. (2014). CSSD Internal Quality Review Document. Netcare: South Africa.

Netcare. (2014). Internal quality Review. *Occupational Health and Safety*. Netcare South Africa.

Netcare. (2014). Specialist Units. Internal Quality Review Document. Netcare: South Africa.

Netcare. (2015). Clinical Governance incident Management. Policy Number CG06. Netcare: South Africa.

Netcare. (2015). Healthcare Risk Waste. *Internal Quality Review Document*. Netcare: South Africa.

Netcare. (2015). Occupational Health and Safety. OHS01. Netcare: South Africa.

Operating Suite. (2013). Infection Control: Standard and Additional Precautions of the Operating Suite. *The Children's Hospital at Westmead*. United Kingdom.

Oullet, L. Richardson, L. Taylor, P. Werner, P. (2014). Evidence Education: Improving outcomes in the operating room. *Ansell Cares*. California: United States of America.

Ovretveit, J. (2000). Total quality management in European healthcare. *International Journal of Healthcare Quality Assurance,* vol. 13, no. 2, pp. 74-90.

Pear, S. (2007). Patient Risk Factors and Best Practices for Surgical Site Infection Prevention. *Managing Infection Control.* Education and Training. United States of America.

Pera, S. Van Tonder, S. (2013). *Ethics in Healthcare*. 3rd Edition. Johannesburg: Juta & Co.

Phillips, N. (2016). *Barry and Kohn Operating Room Technique.* 13th Edition. Elsevier: United States.

Pyrek, K. (2013). HAI Prevention and Environmental Hygiene: Changing The Landscape of Healthcare Delivery. *Infection Control Today*. Virgo Medical.

Pyrek, K. (2014). Updated Environmental Cleaning RP Addresses OR Imperatives. *Infection Control Today*. Available from http://www.infectioncontroltoday.com/Articles/2014/04/Updates-Environmental-Cleaning-RP-Addresses-OR-Imperatives/ . Accessed on 04 March 2015.

Radziwill, N. (2013). "What is Quality?" – The Best Explanation Ever. Available from https://qualityandinnovation.com/2013/01/20/what-is-quality-the-best-explanation-ever/ . Accessed on 10 March 2014.

Rothrock, J. (2015). *Alexander's Care of the Patient in Surgery.* 15th Edition. Elsevier: United States.

Rowley, E. Warning, J. (2012). *A Socio-Cultural Perspective on Patient Safety.* Ashagte Publishing. Surrey: United Kingdom.

Royal Cornwall Hospitals. (2014). Clinical Guideline for Theatre Practice Standards. National Health System. United Kingdom.

Rutala, W. Weber, D. (2014). Gastrointestinal Endoscopes: a need to shift from disinfection to sterilization. *Journal of the American Medical Association*, vol. 312, no. 14, pp. 1405-1406.

SAFMED. (2011). Protecting Surgical Instruments from Corrosion: the importance of passivation. The Surgical Post. Available from http://www.plattsnisbett.com/wordp/?p=190 . Accessed on 8 July 2015.

Satyanarayana, C. Yogesh, P. (2012). Measuring Hospital Service Quality: A conceptual framework. *International Conference on Humanities, Economics and Geography 17-18 March, 2012 Bangkok.*

Schein, E. (1990). Organising Culture. *American Psychologist Journal*, vol. 45, no. 2, pp. 109-119.

Sessler, D. (1997). Mild Perioperative Hypothermia. National English Journal of Medicine, 336: 1730-1737.

Sheard, D. (2013). CSSD Forum Standard Operating Procedure. Sterile Service Department. CSFA. South Africa.

Shenton, A. (2004). Strategies for Ensuring Trustworthiness in Qualitative Research Projects*. Education for information*, vol. 22, p. 36-75.

Shepherd, L. (2015). Part 1: Decontamination of Medical Devices. Part2: Environment Including Management of Spills of Blood/Body Fluids. *National Health Services Forth Valley.* United Kingdom.

Sieczkowski, C. (2014). Clipping not Shaving Intervention Guidelines. *Surgical Site Infection Improvement Programme*. 3rd Version. Health Quality and Safety Commission New Zealand. New Zealand.

Smart UVC. (2015). Smart UVC Disinfection. Available at http://tru-d.com/why-uvc-disinfection/how-uvc-works/ Accessed on: 2 February 2015

South Africa (Republic). (1996a). Constitution of the Republic of South Africa. Act no.108. Cape Town: South Africa. Government Printer.

South African Society for Anaesthesiologists. (2014) SASA Guidelines for Infection Control in Anaesthesia in South Africa. *South African Journal for Anaesthesia Analogue*, vol. 20, no, 3, pp. 1-39. South Africa.

Stevens, S. (1950). A definition of communication. *The Journal of the Acoustical Society of America*, vol. 22, pp. 689-690.

Talib, F. (2015). Service quality in healthcare establishments: a literature review. *International Journal of Behavioural and Healthcare Research,* vol. 5, no(s). 1 &2, pp. 1-24.

Tashakkori, A. and Teddlie, C. (1998). *Mixed Methodology: Combining Qualitative and Quantitative Approaches*. Sage Publications.

UK Essays. (2010). Role of Laminar Airflow in Controlling Operating Room Infections. Available from http://www.ukessays.com/essays/nursing/role-of-leminar-air-flow-in-controlling-oprating-room-infection-nursing-essays.php . Accessed on 14 May 2014.

Vaidya, A. (2013). 10 Best Strategies for Infection Prevention and Control. Available from http://www.beckershorspitalreview.com/quality/10-best-strategies-for-infection-prevention-and-control/ . Accessed on 10 March 2015.

Van den Akker,B. van Harten, W. van Manen, J. Vaartjies, S. Wubber, I. (2010). Equipment-related incidents in the operating room: an analysis of occurrence,

underlying causes and consequences for the clinical process. *Quality Saf Health Care*, vol. 19, no. 64. Netherlands.

Van den Bergh, D. (2014). Quality Leadership and Clinical Governance Report. Netcare: South Africa.

Van Nederpelt, P. (2013). ISO 9000's definition of quality. Available from http://pqrmodel.wordpress.com/2013/02/14/iso-9000s-definition-of-quality/ . Accessed on 10 March 2016.

Watts, S. (2012). Subjectivity as Operant: A Conceptual Exploration and Discussion. *International Journal of Q Methodology,* vol. 35, no. 1, pp. 37-47.

World Health Organization. (2008). Core Components for Infection Prevention and Control Programmes: Report of the Second Meeting Informal Network on Infection Prevention and Control in Health Care. Geneva: Switzerland.

World Health Organization. (2011). Report on the Burden of endemic Health Care-Associated Infection Worldwide. Geneva: Switzerland.

World Health Organization. (2012). Module 1: Definition, Sources and characteristics of healthcare. *Global Health Waste Project*. Geneva: Switzerland.

World Health Organization. (2012). Module 2: Health and Environmental Impacts of Healthcare Waste. *Global Health Waste Project*. Geneva: Switzerland.

World Health Organization. (2013). *Health-Care Associated Infection Fact Sheet*. Geneva: Switzerland.

World Health Organization. (2016). *Global Guidelines for the Prevention of Surgical Site Infection.* World Health Organization. Switzerland: WHO Document.