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**EXPLORING THE VIEWS OF PERI-OPERATIVE NURSES  
REGARDING EFFICIENT OPERATING THEATRE ROOM  
PREPARATION IN A SELECTED PRIVATE HOSPITAL**

by

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**Submitted in fulfilment of the requirements for the degree  
MNurs**

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## **DEDICATION**

I would like to dedicate this study to the life of Dr Richard Rikhotso for his dedication to the postgraduate programme in peri-operative speciality. His passion in the operating theatre made it possible for me to embark on the research in the peri-operative environment. He supervised this study during the early stages of proposal phase before he met his untimely death. May his soul rest in eternal peace.

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## **DECLARATION**

I, Tracey Kwenaita, declare that this dissertation, titled “Exploring the views of peri-operative nurses regarding efficient operating theatre room preparation in a selected private hospital”, is my own work. All sources referenced and quoted have been mentioned and acknowledged in a full reference list. Furthermore, I declare that this work has not been submitted for any other degree at any other institution.

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Researcher signature

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Date

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Witness signature

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Date

## **ABSTRACT**

Operating room efficiency continues to be a high priority for hospitals throughout the world. Operating theatres are valuable and costly resources that require adequate human resources, appropriate design, and are well equipped for efficient, quality, and safe patient care. Efficiency in operating theatre rooms is reported in terms of theatre start time, turnover time between cases, and number of cancellations. The preparation of the operating room is an important factor that contributes to efficiency. It requires that nurses ensure equipment, supplies, and instruments are readily available. The researcher observed that in the selected hospital, personnel had to leave the operating room during the procedure to fetch equipment or supplies that should have been available prior to the procedure. This practice might lead to delays and inefficiency in utilising theatre time.

The purpose of this study was to gain an understanding of peri-operative nurses' experiences in the operating theatre with regards to preparation of the operating theatre room. The study aimed to explore and describe the views of peri-operative nurses regarding preparation of theatres. The researcher employed a qualitative, explorative, and descriptive design for this study. Individual semi-structured interviews were conducted following purposive sampling of participants. Rich data was gathered and thematic data analysis was used to analyse the data.

Four themes emerged during data analysis which encapsulated the views of the sample of peri-operative nurses regarding preparation of operating theatre room. Theme one reflected that the preparation of the operating room was important because it prevented additional costs to patients and positively enhanced patients' experiences. Theme two reflected that preparing an operating room aids in the prevention of medical legal risks, surgical site infection, and allows peri-operative nurses to provide better care for patients' wellbeing. Theme three highlighted the factors that enhance efficient preparation of the operating room, such as updated doctors' protocols and checklists. Theme four displayed the role of having sufficient staff in allowing peri-operative nurses to prepare the operating room adequately. Furthermore, based on these findings, recommendations were offered to enhance the efficient preparation of operating theatre rooms. The recommendations may be used by peri-operative nurses, hospital management, and doctors.

*Keywords:* efficiency; operating theatre room; peri-operative nurses; private hospital; theatre environment; theatre preparations; turnover time

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## LIST OF ABBREVIATIONS / ACRONYMS

<b>Abbreviation / Acronym</b>	<b>Meaning</b>
APPSA	Association of Peri-operative Practitioners in South Africa
ODA	Operating Department Assistant
ENT	Ear Nose and Throat
OR	Operating Room
WHO	World Health Organization

# CHAPTER 1

## STUDY OVERVIEW AND INTRODUCTION

### 1.1 Introduction and background

The operating theatre is an important aspect of healthcare systems because it is the unit in the hospital that provides lifesaving surgical intervention for both elective and emergency cases. Furthermore, operating theatres are regarded as one of the most critical and expensive hospital divisions due to the required resources and patient-nurse ratios (Bilal, Abdellah, Lina, Oussama and Ghazi, 2019). Operating theatres have been described as expensive resources that requires sufficient personnel and adequate design and stocking to ensure efficient, quality, and safe patient care (Hammad, Shallik, El Ansari, Bali and Feki, 2019) and remains a high priority for hospitals throughout the world (Pedron, Winter, Opperl and Bialas, 2017).

Efficiency in operating theatre rooms comprises of the theatre start time, turnover time between cases, and the number of cancellations (Halim, Khan and Ali, 2018). Theatre start time has been described as a good measure for efficiency because it is definable, measurable, and theoretically comparable (Halim et al., 2018; Samudra, Van Riet, Demeulemeester, Cardoen, Vansteenkiste and Rademakers, 2016). First-case tardiness or a deviation from starting time is defined as the difference between the booked time and the actual starting time for the first case of the day (Halim et al., 2018). The percentage of total tardiness is measured by knife on skin/cutting time as compared to the time booked for the procedure (Pedron et al., 2017). According to Hartmann (2013), start time tardiness may be caused by medical professionals starting late, ad hoc list sequence changes by surgeons, complications during surgery, and the unavailability of resources such as nursing staff, instruments, equipment, and stock. Operating theatre time delays can result in inappropriate use of resources such as operating room and the theatre staff, which leads to increased cost for both the hospital and the patient (Hartmann, 2013). Underutilisation takes place when a planned surgery falls below the planned duration with the consequence being that the operating room is then idling, while overutilisation occurs when the planned surgery extends beyond the planned time which may result in delays, overlapping of theatre scheduling, and unnecessary overtime by personnel (Fügener, Schiffels and Kolisch, 2017; Samudra et al., 2016).

Time in the operating theatre room is measured according to the time that is billed for each patient undergoing surgery (Samuel and Reed, 2021). Billed time is measured according to the clock-in and clock-out times and allows private hospitals to charge patients for the precise services provided (Hartmann, 2013). The time between two cases or patients is called *turnover time* which also impacts on operating theatre room efficiency. Pedron et al. (2017) defined turnover time as the period between the finishing time of one patient and the starting time of the next patient. Turnover time in private hospitals is recorded as the time when the patient is clocked out and the next patient is clocked in (Hartmann, 2013). Turnover time includes transferring the patient to the recovery room, cleaning the operating room, and preparing stock, equipment, and sets for the following patient (Hartmann, 2013). Moreover, a reduced turnover time is noted to lessen various obstacles which would otherwise lead to on call staff members remaining to finish cases after the scheduled times have elapsed (Jafari and Levine, 2017).

Cancellations of theatre times further contributes to inefficiency in the operating room (Mavhungu, Bhuiyan and Machowski, 2017). When patients are delayed for elective procedures it may incur increased costs, reduced efficiency, duplication of the workload, and waste operating room time (Nigatu and Aytolign, 2020). Such may occur cancellations before or after the patient has been transferred to the operating room. Mavhungu et al. (2017) reported that in developing countries, already faced with serious financial constraints, cancellation of elective cases has a negative effect and negative financial implications for patients and hospitals therefore, resources should be managed with increased efficiency. Mavhungu et al. (2017) further observed that in most cases, termination of theatre cases was due to equipment failure or a lack of consumables.

An appreciable amount of research has been published pertaining to operating theatre room efficiency and models have been developed on improving efficiency in operating room (Fletcher, Edwards, Tolchard, Baker, and Berstock 2017; Jafari and Levine, 2017; Pedron et al. 2017). Pedron et al. (2017) incorporated various factors of efficiency into standardised key performance areas, while Jafari and Levine (2017) and Halim et al. (2018) introduced educational strategies and established specific roles and responsibilities to enhance an efficient workflow. Increasing the efficient



management of the operating theatre room peri-operative nurses are required to make sure that necessary preparations are done according to the specific operating procedure and the surgeon's preferences.

The studies carried out in Republic of South Africa also supported that there is challenge with efficiency in the operating theatre rooms. Sekoto (2019) mentioned that both private and public hospitals in Republic of South Africa are under pressure to increase operational efficiency in the operating theatres, the author continues to explain that the hospitals are investing in models of eliminating wastes such as patients' waiting time for surgeries. The rate of cancellation is one of the indicators of operating theatre efficiency; one of the avoidable reasons for cancellation of patients was equipment failure, which can be prevented if appropriate measures were taken timeously (Mavhungu, et al. 2017).

## **1.2 Problem statement**

The preparation of the operating room is an important factor that contributes to efficiency. It requires that peri-operative nurses ensure equipment, supplies, and instruments are readily available in the operating room for adequate care of patients (Dreyfus, Nair and Rosales, 2020). The researcher observed that in the selected hospital, personnel frequently left the operating room during a procedure to procure equipment or supplies that could have been prepared prior to the procedure. This appeared to result in delays and inefficiency in the utilisation of theatre time. Asmal, Keerath and Cronje (2019) argued that delays due to underprepared theatres compromised patients' safety during the surgical procedure because the personnel allocated to assist were unavailable when they had left to collect equipment or stock. The unavailability of the team members during the surgery compromises patients' safety as surgical care to the patient is compromised. Jafari and Levine (2017) reported that such delays and impediments to theatre time result in financial losses and prolonged waiting time for patients and surgeons. Furthermore, Fletcher et al. (2017) stated that failure to improve efficiency in the context of increasing demands for surgical interventions increases the number of those on waiting lists leaving patients with extended periods of discomfort, such as pain and reduced quality of life. With these factors in mind, it is important to explore the views of peri-operative nurses regarding efficient operating theatre room preparation to gain insight into their views.

The understandings and themes that emerged from the present study may be used to increase efficiency and decrease unnecessary delays in the operating room.

### **1.3 Significance**

The findings of the present study highlighted both facilitating factors and barriers that peri-operative nurses perceived as salient during the preparation of the operating theatre room. The identified factors may raise awareness regarding operating theatre efficiency. Furthermore, the findings may contribute to nursing practice by saving time and decreasing costs for patients undergoing surgery. The recommendations from the present study could additionally contribute to the development of strategies in hospitals which improve efficiency in the theatre complex. The themes identified regarding barriers to adequate preparation may also assist peri-operative nurses directly by providing guidance on possible solutions for improved efficiency and patient safety. Finally, the results of this study may assist nursing management by informing practical methods that can aid the hospital in saving costs in the operating theatre. This is important because it has been established that the operating theatre is the primary cost driver within hospitals. It is hoped that the findings of the study will highlight gaps in the efficient preparation of the operating theatre room and provide information from which further research can be done.

### **1.4 Research question**

Based on the study's problem statement, the following research question was formulated: *What are the views of peri-operative nurses regarding the preparation of theatres to enable efficiency in operating theatre rooms?*

### **1.5 Aim and objectives**

The aim and objectives of this study:

#### **1.5.1 Aim**

The aim of the present study is to explore and describe the perspectives of peri-operative nurses regarding the preparation of theatres to enable efficiency in operating theatre rooms.

### **1.5.2 Objectives**

The following objectives were identified as significant to the present study:

- To explore and describe the views of peri-operative nurses regarding the importance of preparing operating theatre rooms.
- To explore and describe the views of peri-operative nurses regarding factors that facilitate efficient preparation of operating theatre rooms.
- To explore and describe the views of peri-operative nurses regarding barriers to the preparation of operating theatre rooms.

## **1.6 Definition of key terms and concepts**

### **1.6.1 Efficiency**

The concept of efficiency refers to the optimal use of resources including time allocation, productivity during surgical cases without time wastage, and maximising output (Charlesworth and Pandit, 2020). In the present study efficiency is used in the context of both booked and emergency patients undergoing surgical intervention without unnecessary time wastage.

### **1.6.2 Operating theatre room**

The operating theatre room as described by Phillips (2016), refers to a complex of rooms in which surgical procedures are performed under local and general anaesthesia. In the present study, the operating room refers to the operating theatre complex of the selected hospital.

### **1.6.3 Operating room**

The operating room refers to a room in which actual surgical interventions are conducted (Bargetto, 2021). In this study, the operating room refers to the space in the operating theatre complex where surgical interventions take place.

### **1.6.4 Peri-operative nurses**

Peri-operative nurses are the surgical personnel who provide nursing care to patients during the operative phase of treatment, including the immediate preoperative stage, intraoperative stage, and immediate postoperative stage (Alexander, Rothrock and McEwen, 2011). According to South African Nursing Council, the operating room scrub

nurse is a professional nurse with general nursing diploma or a general nurse with a post-graduate diploma in operating room nursing science (Marais, 2020). In this study peri-operative nurses includes theatre trained or experienced professional nurses, enrolled nurses, and enrolled nursing assistants working in the operating room of the selected hospital. The various nurses listed above are all involved in the preparation of the operating room.

#### ***1.6.5 Theatre preparation***

Theatre preparation refers to allocation of theatre cases and personnel, and preparation equipment and anaesthesia (Divatia and Ranganathan, 2015). In this study, preparation encompasses ensuring that all necessary equipment, surgical stock, and instruments are available for each patient before they are transferred to the operating theatre room according to the scheduled time.

#### ***1.6.6 Turnover time***

Pedron et al. (2017) defined turnover time as the time between suture of one case and incision of the next patient. Said differently, it is the period between the finishing time of one patient and the starting time of the next patient. In the present study turnover time refers to the time spent between two consecutive patients on a theatre list.

### **1.7. Study setting**

The study was conducted in a selected private hospital in the Gauteng province of South Africa. The hospital contains 276 beds with a theatre complex that offers various complex surgical procedures. The operating theatre complex comprises seven operating theatre rooms, four recovery stations, and three receiving areas. Procedurally, the operating theatre complex performs approximately 120 surgical procedures weekly, including elective and emergency variants. The operating theatre complex is managed by the deputy nursing manager and two senior professional nurses, while staff members include 10 registered professional nurses, four enrolled nurses, three enrolled nursing assistants, four operating department assistants and two porters.

Allocation of operating rooms for surgeons is conducted using the slates allocation method, also known as block allocation (Bargetto, 2021). This provides the surgeons with a time allocation for each day for elective procedures while facilitating the provision of slates for emergency procedures. The operating theatre complex at the selected hospital has seven general surgeons, 13 gynaecological surgeons, four ear, nose, and throat (ENT) surgeons, four ophthalmologists, 2 neurosurgeon, six orthopaedic surgeons, two plastic surgeons, and various visiting surgeons who operate sporadically. Each day between noon and 14:00 p.m., theatre lists for the following day are received from the surgeons' rooms after which staff and resource allocations are planned by the theatre operational manager or supervisor. On Saturdays and Sundays, the operating theatre rooms employ the use of a call team who respond to booked elective cases and for emergency surgical procedures. This operating theatre complex provides services to approximately 30 to 40 patients daily, including both elective and emergency cases.

## **1.8 Philosophical assumptions**

This section provides a discussion regarding body of beliefs governing nature of theory and research. Creswell and Poth (2018) describe philosophical assumptions as the ideas that are implicit in the research but have a salient impact on the research methodology and therefore, should be identified. A paradigm is described as a worldview which emphasises the logical and scientific domains of the phenomenon being studied (Polit and Beck, 2017). During the present research, the researcher employed a qualitative approach with constructivist assumptions. Moreover, these constructivist assumptions were used as an underlying framework when describing the views of peri-operative nurses regarding the preparation of operating theatre rooms. The subsections that follow describe the underlying assumptions of the present study in more depth.

### **1.8.1 Ontological assumptions**

Ontological assumptions focus on the nature of being and address questions that are concerned with the nature of reality (Cuthbertson, Robb and Blair, 2020). The primary ontological assumption that underpins the present study is that reality is perceived by each participant in a unique and personal manner (Creswell and Poth, 2018). The researcher is of the belief that reality is best understood when it is explained by the

person or persons who have experienced it. Based on this assumption, the present study has explored the views of peri-operative nurses concerning their views of the preparation of operating theatre rooms and their perspectives regarding efficiency in an operating room.

### ***1.8.2 Epistemological assumptions***

Cuthbertson et al. (2020) argued that knowledge was derived from human perception and social experience. The researcher concurs and postulates that knowledge of the relevant issues may be best described by peri-operative nurses in the areas addressed by this study. The study employed semi-structured interviews to gain knowledge from the participants. Furthermore, having departed from constructivist or interpretivist assumptions, the researcher aligned with the assumption that knowledge is personal, distinctive, and malleable and occurs during the engagement between the researcher and participants. In this manner, knowledge is best described by the individuals who have experienced it (Ataro, 2020).

### ***1.8.3 Methodological assumptions***

Methodology has been defined as the strategic plan of action supported by the choice and use of particular methods, while linking the choice and use of methods to the desired outcomes (Al-Ababneh, 2020). A constructivist inquiry follows the assumption that knowledge is the end product of the interpersonal interactive process (Manning, 1997). The researcher speculates that through the interactive processes with the participants, their knowledge or views can be attained using a qualitative approach. The constructivist view was supported by Fosnot (2013) who purported that a researcher approaches a problem with predetermined knowledge or beliefs about the nature of the problem and possible solutions. During the present study the researcher acknowledged an existing awareness of issues pertaining to the research aim and remained cognisant that they could not be separated entirely from the problem since the researcher is actively employed in the environment addressed by the study. Moreover, the separation of the researcher and phenomena under investigation is hypothesised to be unfeasible (Mir and Watson, 2000). For the purpose of this study the qualitative approach was used to describe the views of perioperative nurses regarding operating theatre room preparation.

## **1.9 Delineation**

The focus of the study was to explore the views of peri-operative nurses regarding the preparation of operating theatre rooms. The study specifically addressed the views of peri-operative nurses and excluded the operating department assistants (ODA's) because the operating theatre mainly consists of nurses as opposed to ODA's. Nursing staff consisted of scrub nurses (registered professional nurse), anaesthetic assistant nurses (enrolled nurse/nursing assistant), and circulating nurses (enrolled nurse/nursing assistant). The study employed a qualitative approach using semi-structured interviews to obtain in-depth knowledge on the views of peri-operative nurses regarding the preparations of operating theatre rooms.

## **1.10 Ethical considerations**

Ethics in the context of research was defined by Polit and Beck (2017) as the moral obligation of the researcher to their participants. In order to honour this obligation, the researcher should distinguish between right and wrong and act in the best interests of the participants. The present study was granted ethical approval by the Faculty of Health and Sciences, University of Pretoria Ethics Committee, and the selected private hospital (see Annexure A: 107/2021). In addition, the researcher safeguarded the names of the participants and the interview discussions by ensuring they remained confidential and private. Pseudonyms were assigned by means of numbers and only the researcher has access to the real names of the participants. Ethical principles were also used to guide conduct during the study and these included respect for persons, beneficence, and justice. These principles were explained in the Belmont Report (Polit and Beck, 2012) and are discussed further in the sections that follow.

### ***1.10.1 The principle of respect for persons***

The principle of respect for persons includes the right to self-determination and full disclosure (Polit and Beck, 2012, Department of Health, Education, and Welfare, 2014). Respect for persons integrates two ethical assumptions. Firstly, individuals should be treated as independent representatives with the capacity to make informed decisions and secondly, persons with reduced autonomy are entitled to protection. The initial participant was voluntary and was given the right to withdraw at any time thereafter given the right to withdraw from participating at any given time during the interviews. They were further protected by anonymity through the use of pseudonyms

to hide their identity. The researcher obtained written informed consent from the participants before conducting interviews and explained the aim and purpose of the research.

### ***1.10.2 The principle of beneficence***

Dhai and McQuoid-Mason (2010) define beneficence as doing good for other people. Individuals should be treated in a morally correct manner by respecting their decisions and protecting them from harm, but also by making efforts to secure their wellbeing. The principle of beneficence was included in Belmont Report with the aim of protecting participants against potential harm from the research (LoBiondo-Wood and Haber, 2017). Ethics in research protect the participant from exposure to harmful situation during the research process. It was important to ensure that the participants experienced minimal harm and maximum benefit (Polit and Beck, 2017). Providing a safe environment during the interviews assisted the participants when describing their lived experiences in the operating theatre environment. In the present study, the interviews took place at a time that was suitable to the participants and the researcher ensured that the environment offered the participants a feeling of safety. Brink, Van der Walt and Van Rensburg (2012) advised that even though qualitative research has been regarded as non-invasive because it does not involve intervention or treatment, the researcher is still required to enter the participants' lives and thus, a researcher should use ethical clinical judgement.

### ***1.10.3 Principle of justice***

The principle of justice requires that participants have the right to be treated fairly and also to privacy (Polit and Beck, 2017). The participants were made aware that if they wished to withdraw at any stage of the study, they had the right to do so (see Annexure B). The principle of justice entails a fair process during subject selection (Brink, Van der Walt and Van Rensburg, 2006). The researcher informed all peri-operative nurses who met the inclusion criteria about the study and they were all asked to participate. In addition, the researcher should also ensure that the interviewee's information is protected (DeJonckheere and Vaughn, 2019). Furthermore, to ensure principle of justice all participants were given coded names to protect their identity. The researcher endeavoured to treat all the participants fairly, especially with the approach to questioning by standardising the process with all participants. Polit and Beck (2017)



define justice as a principle that requires the benefits and burdens of research be distributed equitably and no individual or population group be exposed to risks of harm while others receive benefit. All interviews were conducted in a private space and no incentives were given to any participants (Gray, Grove and Sutherland, 2016).

### 1.11 Layout of chapters

Table 1.1 briefly describes the contents of each chapter.

**Table 1.1: Structure of the dissertation**

<b>Chapters</b>	<b>Chapter title</b>	<b>Chapter description</b>
Chapter 1	Study overview and introduction	The chapter provides an overview of the study, an introduction, problem statement, purpose, aim, philosophical underpinnings and ethics of the study.
Chapter 2	Literature Review	This chapter includes a review of existing literature regarding the efficient preparation of the operating theatre room.
Chapter 3	Research Design and Methods	This chapter provides a discussion regarding the research design and method used by the study.
Chapter 4	Research Findings and Discussions	In this chapter the findings of the study are presented and viewed in the context of existing literature.
Chapter 5	Conclusions and Recommendations	The conclusions of the study are outlined followed by a discussion of recommendations. Thereafter, limitations and researcher reflections are presented.

### 1.12 Summary

Chapter 1 provided an orientation and overview of the study. The background and problem statement were discussed in collaboration with the significance of the study. Thereafter, definitions of key concepts were provided and philosophical assumptions underpinning the study were discussed. The ethical considerations guiding the study were also explored. In the next chapter, the researcher gives a detailed description of the literature review to underpin the study.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

Chapter 1 briefly outlined the activities regarding the preparation of the operating room. In this chapter a literature review is provided to regarding existing literature related to the study. The focus of the literature review is to provide an overview of the manner in which the operating theatre environment is operated and managed, the role players involved, costs associated with theatre time, and factors that influence operating room efficiency.

#### **2.2 Literature search**

The literature review was conducted using Google Scholar as the primary search engine. Terms used to search for data were related to operating room efficiency and preparation of the operating theatre room. The initial keywords used were important to identify the gaps in efficiency in an operating room and the preparation thereof. Reading through various articles afforded an opportunity to better understand the meaning of efficiency and costs pertaining to managing operating theatre rooms. The literature revealed that efficiency was a complex phenomenon and thus, further probing was required to gain an adequate understanding of the concept. A gap between efficiency and preparation of the operating room was identified which resulted in a secondary search.

The secondary search was conducted by exploring additional topics including staffing in operating rooms and scheduling of theatre cases. Various databases were used to search for literature articles and books such as World Cat Discovery, AORN (Association of Peri-Operative Registered Nurses), Google Scholar, additional databases, SAMJ (South African Medical Journal), and Annals of Medicine and Surgery. The search yielded more results and many publications.

In summary the literature search yielded 103 articles and after reading the abstracts, 95 were relevant to the topic and provided appropriate information on the topic. A total of 66 articles were used in the writing of the present literature review. Articles were

excluded because they were not relevant to the present study. The sections below discuss the information that was gathered during the search for appropriate literature.

### **2.3 Operating theatre environment**

The operating theatre environment consists of operating rooms where the actual surgical procedures are conducted, with the operating room having been described as the core of the operating theatre complex (Bargetto, 2021). Wang and Ju (2017) stated that the operating room is as a space in the hospital where surgical procedures are carried out in a sterile environment. Phillips (2016) suggests that operating theatres are usually located in an area that is easily accessible to the critical care and support services, such as the central sterile supply department. According to Minty-Walker, Donohoe, Hadlow and Wilson (2020), the operating theatre is the peri-operative setting located in either public or private hospitals, where surgical procedures include both elective and emergency variants. A registered nurse is assigned as the theatre manager and is in charge of the theatre environment including overseeing resources, staff, instruments, and equipment, and ensuring adherence to appropriate standards of infection control and professional guidance (Hartmann, 2013).

Most operating theatres are located in close proximity to the central sterile supply department (CSSD) which supplies operating rooms with sterile packs and sets used for surgery. CSSD should be located as near as possible to the operating theatre and in some cases, it is also situated close to the emergency department (Kumar and Baveja, 2021). The CSSD's main purpose is to dispense health products that are safe for use in health care units and do not cause risk to patients (Da-Silva, Pontes, Pereira, Monteiro, Cruz, 2020).

Furthermore, the CSSD is entrusted with processing and issuing supplies, such as the sterile equipment and instruments used in surgical procedures (Shettigar, 2019). The instruments processed in the CSSD include the linen packs used to form a sterile field during surgery (Da-Silva et al., 2020). The relationship between the operating theatre and the CSSD is that of a supply chain relationship and therefore, the operating theatre cannot function without supply from the CSSD. Sadati, Askarkhah, Hannani, Moazamfard, Abedinzade, Alinejad, Abedinzade (2020) noted that disinfecting and sterilising medical supplies mitigates the spread of infection to patients and staff, such

as surgical site infections that can occur in the operating room. The activities of the CSSD are controlled by the CSSD supervisor who reports to the theatre manager. Shettigar (2019) stated that ordinarily, the CSSD forms part of the nursing service department and is supervised by a nurse who reports to the director of nursing. The responsibilities of the CSSD supervisor are to ensure adequate decontamination, cleaning, and sterility processes.

### **2.3.1 Preparation of surgical stock and equipment**

Ahmadi, Masel, Metcalf and Schuller (2019) defined surgical supplies as the stock stored in the operating theatre which is procured according to doctors' preference cards. The surgical stock involved in surgery is stored in the pharmacy storeroom which is incorporated into the operating theatre environment to ensure ease of access. The stored surgical stock includes medical surgical supplies such as gauze, syringes, sterile procedure packs (swabs), and implantable medical devices (O'Mahony, McCarthy, O'Donoghue, Teeling, Ward and McNamara, 2021). The stock assigned to the store room is attended to by the theatre stock controller who manages the procurement of surgical stock from the supplies department. Forrester, Sullivan, Snoswell, Pillans, Barras and Sturgess (2020) conducted a study regarding the integration of the pharmacy into the peri-operative setting. The authors described the function of the stock controller or pharmacy assistant as the personnel responsible for managing stock rotation, monitoring expiry dates, and maintenance of the cold chain where medication is kept on uninterrupted chain of cold temperature (Forrester et al., 2020). On a daily basis peri-operative nurses and ODAs acquire stock for the operating room according to patient needs on the booked list, while taking into consideration the possibility of unforeseen emergencies which necessitate the availability of additional stock. The stock rooms servicing the operating theatre render the equipment and supplies for procedures for the day according to booked theatre cases (Cordier, 2019).

Ahmadi et al. (2019) stated that surgical supplies and instruments should be readily available for the surgical staff to facilitate the performance of diverse procedures. During preparation of the operating theatre room, the peri-operative nurses should identify any shortage of stock before the commencement of surgery to allow them time to access the necessary stock or communicate the shortage to the relevant

surgeon. In a study conducted by Moons, Waeyenbergh and Pintelon (2019) regarding a redesign of the supply chain to the operating room department, the authors note that clinical staff experience *out of stock* situations as undesirable. Furthermore, not having the correct surgical stock during a surgical intervention can impact patients' quality of care (Moons, et al. 2019). Failure to provide needed stock during surgical procedures can put patients' lives at risk. Minty-Walker et al. (2020) hold a similar view, stating that preparation is vital because unavailable equipment might delay the surgery starting time and thus, put the patient's life in danger. The equipment needed in an operating room is crucial and often related to the saving of lives, for example, the anaesthetic machine aids in breathing after induction of anaesthesia (Rothrock, 2018). Both Phillips (2016), Rothrock (2018) and Moon et al. (2019), report that the specialised equipment allocated to the operating theatre room, such as the machinery used to coagulate bleeding blood vessels, forms part of the requirements for an operating room and should be inspected before commencing with the theatre list.

Bilal et al. (2019) describes the operating theatre as one of the most financially burdensome units in a hospital because the allocated equipment and supplies must be sufficient enough to provide for the total number of allocated surgical cases. The implementation of surgical procedures, including the preservation of all surgical equipment, requires enhanced skills and technical knowledge of all involved human resources which in turn, increases the cost account of running an operating theatre (Bargetto, 2021).

The peri-operative nurses and ODAs should ensure that equipment is prepared according to the booked list so that each patient has allocated stock and equipment before the commencement of their surgery. Adetayo, Ayedebinu, Titilope and Oluwaseun (2022) conducted research regarding common factors that cause delays in an operating room in a hospital located in Nigeria. The authors found that one of the factors that leads to delays is failure of or a lack of, equipment (Adetayo et al., 2022). Cordier (2019) emphasised that patients place their trust in the surgeons and other members of the surgical team, expecting the team to do their best in rendering services. The ability of the team to do their best is dependent on having access to the correct equipment and supplies for the specific procedure.

As part of preparing the operating room, as outlined by Phillips (2016), the author explains that checking of equipment and ensuring it is in working condition forms part of the allocated tasks to peri-operative nurses. Moreover, failure to perform this task might risk to the patients. If an operating room is prepared efficiently, equipment failure can be noted timeously to prevent delays or cancellation of surgery, especially those occurring once the patient has been transferred to the operating room (Mavhungu et al., 2017). Mavhungu et al. (2017) stated that of the 44.5% cancellation rate in a Pietersburg hospital, 7.1% was due to equipment failure or a lack of surgical stock. While noting that one of peri-operative nurses' duties is to check the equipment before the commencement of surgery, it has been reasoned that cancellation of patients may be prevented and risk to patients reduced through adequate preparation practices.

### ***2.3.2 Infection control and air ventilation***

Surgical site infection is an infection that is acquired during or after surgical interventions (Dallolio, Raggi, Sanna, Mazzetti, Orsi, Zanni, Farruggia, and Leoni, 2018). Roy, Stevens and FIDSA (2018) explained that surgical site infections are primarily acquired during the surgical procedure while the wound is open and therefore, a number of infection control practices merit inspection and implementation in the operating room. The World Health Organization (WHO) found that surgical site infections are one of the most common causes of surgical complications (World Health Organization, 2008). Pati and Rathore (2022) reported that one of the most common microbiological causes of surgical site infection is *Staphylococcus aureus* from the patient's skin flora, but the germs that cause these infections may differ according to the specific surgical intervention. Therefore, it is important that all members of the surgical team have knowledge of common sources of mechanism of microorganism in the operating theatre to provide preventative and protective measures against contamination (Phillips, 2016). Surgical site infections cause significant patient morbidity and mortality which may result in additional physical pain and have been noted as the second most common cause of healthcare-associated infections, especially in low- and middle-income countries (Mukamurenzi, 2019). There is convincing evidence that an effective ventilation system can significantly reduce the incidence of surgical site infection (Pati and Rathore, 2022).

A correctly designed operating theatre room contains air conditioning that reduces the number of airborne organisms by removing dust and aerosol particles (Phillips, 2016). An effective and frequently used ventilation method in an operating room utilises laminar airflow because it enhances uniform flow of clean air through the surgical area and removes microbial contaminants (Pati and Rathore, 2022). Dallolio, Raggi, Sanna, Mazzetti, Orsi, Zanni et al. (2018) and Pati and Rathore (2022) further reported that the number of people inside the operating room and frequency of opening the door can lead to an additional increase in the level of bacteria and airborne particles. If an operating room is prepared sufficiently prior to the surgery, the frequency of the staff exiting and entering the operating room will be minimised and thus, the correct airflow can be maintained. The effective functioning of air conditioning is impacted by the traffic of personnel in the operating room and should be minimised by discouraging the movement of personnel in and out of the operating room. Moreover, the frequent opening of doors compromises the performance of the ventilation system in controlling environmental contamination (Dallolio et al., 2018; Phillips, 2016). It is important to ascertain and avoid instances where the surgical team may need to open doors due to a lack of preparedness of the operating room.

#### ***2.3.4 Scheduling of theatre cases***

As noted in Chapter 1, allocation of operating rooms for surgeons is conducted using a slate or block allocation system, seen in Figure 2.1 (Luo and Wang, 2019). The slate allocation system is a scheduling model that considers various factors including time allocation of surgeons for the day, resource availability for planned elective procedures, and provision for emergency procedures. (Haghnegahdar and Sarkar, 2018). To schedule surgical cases, the surgeon creates a booking after consulting with the patient and conducting necessary surgery preparation. Luo and Wang (2019) stated that operation scheduling management involves two possible strategies that may be used by managers: (a) open scheduling; and (b) slate/block scheduling. Bargetto (2021) defined open scheduling as a process that allows surgical cases to be assigned based on the availability of an operating theatre room at the convenience of surgeons, while block scheduling allocates theatre operating rooms according to set time blocks and may be planned months in advance. Samudra et al. (2016) also defines scheduling of theatre cases as a cyclic process which assigns blocks to

surgeons. Akbarzadeh, Moslehi, Reisi-Nafchi and Maenhout (2020) described the block booking system as a master surgery booking system which divides operating room time between surgeons based on case mix planning. Freeman, Zhao and Melouk (2017) defines case mix planning as a tool that allocate available operating time in the operating room among different surgical speciality.

Effective management of surgery scheduling prevents, among other issues, delays, especially those caused by incorrect time allocation that can result in under or overutilisation of theatre time. Björn, Rissén, Wadensten and Josephson (2017) argued that the increased demand for productivity in operating departments partly depends on effective management of surgery schedules. Samudra et al. (2016) stated that if lists commence later than planned, the operating theatre may be underutilised and in turn, result in overlapping theatre scheduling and unnecessary personnel overtime. Operating room managers may be required to navigate delays that occur when a presiding surgeon finishes later than expected and delays the commencement of the following surgery (Li, Gupta and Potthof, 2016). Non-adherence to schedules plausibly results in the subsequent surgery beginning later than scheduled and impacts the theatre team's ability to adequately prepare the operating room for the next surgery. Some delays result from a lack of adequate schedule planning (Luo and Wang, 2019). Scheduling blocks that are either too long or too short may lead to adverse consequences such as decreased productivity, overtime, or rescheduling surgical cases (Fügener et al., 2017). Planning involves staff, equipment, and operating room availability. Chaganty and Sharma (2021) noted that a lack of planning, staff miscommunication, staff unavailability, equipment failure, and emergency case prioritisation are preventable factors in this regard.

In a well-planned theatre, care is taken to provide for exemptions or emergency cases. Elective procedures are usually planned in advance following consultations while emergency cases are unexpected and require surgical intervention within a certain time limit (Kroer, Foverskov, Vihelmsen, Hansen and Larsen, 2018). In addition to planning for elective cases, the surgical team is required to consider the importance of planning and preparing for non-elective cases by ensuring that there is an operating room for emergencies or that the emergencies can be incorporated amongst the elective cases (Van Zyl, Burger and Ferreira, 2021). According to Van Zyl et al.,



(2021), failure to plan for emergency cases may result in frequently compromising elective surgery lists to manage the trauma load and delays in performing urgent surgery often occur. Operating theatre scheduling also requires scheduling resources for different patients and challenges that arise relating staffing, for example, outsourcing nursing can impact staffing costs (Bargetto, 2021). Samudra et al. (2016) emphasises the adverse impact of delays caused by overutilisation which leads to unnecessary staff overtime and increased staffing costs.

**Figure 2.1: Scheduling of theatre cases example**

	Mon		Tue		Wed		Thu		Fri	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
OR1	1	4	7	10	13	16	19	22	25	28
OR2	2	5	5	11	14	17	20	23	26	29
OR3	3	6	9	12	15	18	21	24	27	30
	T=1 T=2		T=3 T=4		T=5 T=6		T=7 T=8		T=9 T=10	

Source: (Luo and Wang, 2019).

### **2.3.5 Scheduling of staff in an operating theatre**

Scheduling staff in any organisation enables the organisation to decrease operating costs while also facilitating safety and punctuality (Ernst, Jiang, Krishnamoorthy and Sier, 2004). Medical doctors are not employed by private hospitals as regulated by the National Health Act 61 of 2003. This implies that the medical doctors are sole traders and free agents and therefore, they are legally liable in their own individual capacity (National Health Act 61 of 2003; Hartmann, 2013). This applies to surgeons, who do not form part of the staff complement of the hospital and as a result, the hospital allocates theatre slates to doctors for their surgical interventions.

One of the challenges faced by the operating theatre manager with regards to scheduling of staff is the variance in surgical case mix and daily workload (Xiang, Yin and Lim, 2015). To enhance optimal and efficient functioning in the operating theatre, the staff should be adequately scheduled in a manner that clarifies each person's responsibilities in the operating room. The hospital is required to schedule peri-operative nurses and other nursing staff such as ODAs. Operating theatre nurses have

been noted to be an expensive resource with a substantial portion of the operating room budget spent on staff wages and benefits (Haghnegahdar and Sarkar, 2018). The ratio of patient to nurse in an operating room is one patient to three nurses to ensure patient safety (Haghnegahdar and Sarkar, 2018). Therefore, it is imperative to be sensible when scheduling the staff and take care to limit overtime. In their literature review, Akbarzadeh et al. (2020) reported that most operating theatres and hospitals experience a shortage of nurses and in such cases, avoiding overtime hours might not be feasible. This results in the majority of operating theatres relying on the use of agency staff to reduce their shortage of nurses.

The theatre manager has access to the historical case count and case length which is helpful when scheduling days with an increased case load (Bandi and Gupta, 2021). The historical case counts assist the theatre manager by making them more aware of what an increased case load entails and how they can best schedule staff for such days. The theatre manager's responsibility is to synchronize the surgical teams to perform surgical operations efficiently, timeously, and safely (Di Martinelly and Meskens, 2017). Consideration should also be given to the capabilities, qualifications, and surgeons' preferences when allocating staff. Allocation or delegation of duties in an operating room plays an important role in the efficient preparation of, and processes in, the operating theatre.

#### **2.4 Role players in the operating theatre**

In the operating theatre, the role players include medical doctors, nurses, and operating theatre department assistants (ODA). These role players form the team that is responsible for the provision of healthcare services to the patient. Phillips (2016) categorised the theatre team into nonsterile and sterile team members. Nonsterile members are the individuals that are not directly involved in the surgical intervention of the patient, but still form part of surgical team. These team members consist of anaesthesiologists, circulating nurses, and anaesthetic assistants. According to Phillips (2016), sterile team members consist of surgeons/medical doctors, assistant surgeons/medical doctors, and scrub personnel such as professional nurses or ODAs. The sterile team is primarily responsible for performing the operation on the patient. Michalak and Kotomska (2021) detailed the roles and responsibilities of a surgical

nurse and included preparing the operating theatre in an extensive, self-sufficient, and professional manner.

#### **2.4.1 Peri-operative nurses**

The term peri-operative nursing emerged from work done in the United States of America by theatre nurses with the aim of defining their professional role and increasing awareness of the content of nursing care (Kilvered, Öhlén and Gustafsson, 2012). Rothrock (2018) mentions that the essential features of peri-operative practice include care, conscientiousness, discipline, and technique. The South African Nursing Council clearly states that the peri-operative nurse specialist verifies the availability of the equipment, inspects its condition, and arranges for it to be updated where necessary to ensure effective and adequate service delivery (Nursing Act, 2005). Scope of practice R2598 Chapter 2 of South African Nursing Council states that the preparation for, and assistance with, operative acts with patients relies on registered nurses executing their duties (South African Nursing Council, 1991). Furthermore, the South African Nursing Council (SANC) continues by describing the perioperative nurse specialist as a nurse who provides care during pre-operative, intra-operative, and post-operative phases of surgery.

Blomberg, Bisholt and Lindwall (2018) outlined that peri-operative nursing includes anaesthetist nurses, operating theatre nurses, and pre-operative, intra-operative, and post-operative nurses who provide care for patients undergoing surgery. Moreover, peri-operative nursing includes all nursing activities related to surgical treatments, organisation, and leadership required during peri-operative practice. However, Rothrock (2018) identified two traditional peri-operative nursing roles: (a) the circulating nurse; and (b) the scrub nurse. Other authors have divided the peri-operative nursing roles into three categories: (a) the scrub nurse; (b) the anaesthetic nurse; and (c) circulating nurse (Philips, 2016).

Minty-Walker et al. (2020) stated that the scrub nurse's responsibility is to ensure that the instruments, equipment, and sutures are available prior to the surgical procedure according to the surgeon's preference and that all these items are in working condition. Additionally, the scrub nurse is also responsible for planning the execution of nursing duties for each patient. A registered nurse with experience in the operating room and

a registered nurse with additional qualifications related to operating theatre room practice both fall under the same scope of practice (South African Nursing Council, 1991). Wang and Ju (2017) noted that an additional duty of the scrub nurse is to assist the doctor during the surgery.

Phillips (2016) described the circulating nurse as a qualified registered nurse with the primary role of ensuring the smooth flow of events in the operating room. The circulating duties may also be performed by a licensed vocational nurse/staff nurse or a licensed practical nurse/assistant nurse under the supervision of the registered nurse (Phillips, 2016). The scope of practice for nurses in South Africa reinforces the requirement of supervision for the staff nurse and assistant nurse in the performance of their duties (South African Nursing Council, 1991). The circulating nurse assists the scrub nurse with preparation by collecting surgical stock, such as sterile gowns and instruments. Furthermore, a circulating nurse ensures that the sterile team is supplied with all the items required which implies that they should maintain a working knowledge of the stock needed for each surgery (Phillips, 2016). The anaesthetic nurse ensures the availability and functionality of anaesthetic equipment and preparation of medicinal stock used to anaesthetise patients according to their individual needs before the commencement of the surgical procedure (Minty-Walker et al., 2020).

Peri-operative nurses are responsible for safe and effective patient care and maintaining sterile equipment and stock levels used for surgical procedures (Kilvered et al., 2012). Therefore, it is essential that effort should be expended to enhance efficient and cost-effective services without compromising standards of patient care (Fletcher et al., 2017). Patients' safety and welfare are entrusted to the operative nurse from the time that the patient arrives in an operating room until the patient is transferred to another healthcare team (Phillips, 2016). Inspecting the proper functioning of equipment and adequate supply of stock forms an integral aspect of ensuring patient safety (Rothrock, 2018). Kamat and Parker (2015) concur with this and highlight that peri-operative nurses' pre-operative preparation is vital for patient safety and flow in the operating room. This level of planning requires peri-operative nurses to use knowledge and information about the patient to prepare adequately for surgery.

## **2.5 Efficiency in an operating room**

Operating room efficiency remains a high priority for hospitals across the world (Pedron et al., 2017). Bilal et al. (2019) reported that the primary objective of the operating room is to perform surgical interventions at the correct time without experiencing excessive delays to optimise the use of surgical resources profitability. Therefore, it is imperative to ensure that surgical interventions commence promptly once the patient is transferred to the operating room and without time wastage. Efficiency in the operating theatre can be divided into various subheadings, including theatre start time, turnover time between cases, and number of cancellations (Halim et al., 2018). There are no individual criteria to assess theatre room efficiency however, there are proposed metrics for measurement which include procedure cancellation rate, first case start time, operating room utilisation, operation room turnover time, and others (Lee, Ding and Guzzo, 2019).

Peri-operative nurses impact the efficiency of the operating theatre, especially in the context of their responsibility of ensuring that the theatres are ready for surgery by preparing and planning for the surgical procedures. Peri-operative nurses plan for the intra-operative execution of patient care to enhance patient safety (Rothrock, 2018). The planning process involves advanced preparation, consideration what may occur during procedures, and prioritisation of patient care (Rothrock, 2018). A primary function of theatre nursing is to ensure patient safety by employing control over the working environment throughout procedures by proactive strategising and control of aseptic conditions (Kolvered et al., 2012). Dreyfus et al. (2020) observed that most delays of five to 10 minute occur because of missing equipment which were not timeously prepared.

Mavhungu et al. (2017) conducted a study in a Limpopo hospital where they observed that an additional reason for inefficiency was the cancellation of patients caused by a shortage of linen; this could have been avoided through appropriate and timeous measures. During preparation of the operating room, the peri-operative nurses should endeavour to identify any shortages in working apparatus, timeously report any shortages, and enable alternative measures. Dreyfus et al. (2020) noted that surgeons' have an aversive response to missing stock and equipment during surgery and nurses are aversive to interrupting surgery to gather additional supplies. This may

result in undesirable conditions for the patient while under anaesthesia and increase potential risks (Wang and Ju, 2017).

In this manner, lack of preparation might lead to an increase in potential risks. Furthermore, the potential risk might lead to *never events* which includes incorrect site, patient, or procedure, retained product, and operating on the wrong side such as left limb instead of the right limb (Wang and Ju, 2017). These have been termed never events and refers to safety issues that should not occur under any circumstances (Wang and Ju, 2017). The patient's safety is entrusted to the peri-operative nurse from the time the patient enters the operating room until the patient is transferred to the recovery area (Rothrock, 2018). If the operating room is not well prepared before surgery commences, peri-operative nurses might be required to exit the operating room to procure stock or equipment which then implies that there may be insufficient staff to care for the patient. Patient safety is an important aspect of good clinical outcomes and clinical performance indicators for hospitals. Pedron et al. (2017) describes that operating room efficiency is measured in terms of first case tardiness, turnover time and raw utilisation of operating room.

### **2.5.1 First case tardiness**

First case tardiness is measured by comparing the time of knife on skin or cutting time with the time the patient was originally booked for on the theatre list (Pedron et al., 2017). First case tardiness or the deviation from starting time is defined as the difference between booked time and the starting time of the first case of the day. According to Hartmann (2013), start time tardiness results from medical professionals starting later than planned time, ad hoc list sequence changes by surgeons, complications regarding the surgery, and unavailability of nurses, instruments, equipment, or stock. Operating room inefficiency and decreased productivity arises from delays in commencing with the first case because cases that follow might also be delayed (Coffey Jr, Cho, Wei, Luu, Ho, Amaya, Pecson, Dalton, 2018). A study by Scalea, Carco, Reece, Fouche, Pollak and Nagarkatti (2014) pertaining to the provision of incentive bonuses for operating room staff based on starting on time, demonstrated the importance of efficiency in an operating theatre.

Halim et al. (2018) stated that delaying the theatre start time may be potentially dangerous to patients where, for example, a patient with diabetes mellitus remains nil per os for a prolonged time, predisposing them to additional complications. Efficient preparation of the operating theatre may decrease first case tardiness in turn, facilitating timeous commencement of all the cases that follow cases. Theatre start time is an effective measure of efficiency because it is explainable, easy to calculate, and theoretically comparable between studies (Halim et al., 2018; Hartmann, 2013).

Javed, Peck, Salthouse and Woodruff (2013) introduced the concept of the *golden patient* in their study in a trauma unit. The golden patient is identified by a staff member as the patient who is most ready to be operated on first; usually they were admitted at least a day prior to the surgical intervention (Javed et al., 2013). Evidence suggests that the first patient of the day creates the pace at which the remainder of the day continues and therefore, if the first case begins on time, further delays may be reduced. This factor further highlights the significant impact of efficient theatre preparation. It was also noted that starting time is not the individual responsibility of peri-operative nurses, but the other team members also have a role to play in efficiency of the operating room (Halim et al., 2018).

### **2.5.2 Turnover time**

Turnover time refers to the duration of the interval between the transfer of a post-operative patient to the recovery room and the arrival of the next patient at the operating room (Pimentel, Flanagan, Philip and Urman, 2015). The time between the two patients is primarily used to clean and prepare the operating room for the following patient (Hartmann, 2013). Patients receive surgical intervention according to consecutive planning which is ordinarily decided by the surgeon. The sequencing chosen by the surgeon is based on patient needs and age, and the complexity of the surgical intervention (Jafari, 2017). Extended turnover time may cause idling time which increases delays and inefficiency. Poor pre-operative preparations have been found to be a significant contributory factor concerning delays during turnover time (Ang, Sabharwal, Johannsson, Bhattacharya and Gupte, 2016).

During turnover time, Hamid, Nasiri, Werner, Sheikahmadi and Zhalechain (2019) reported the various functions of different team members which include among other

functions the preparation of operating room for the next patient. Ninan, Zhu, Kore, Wasson, Fullerton and Ninan (2017) stated that turnover time can be impacted in the context of emergency cases if there is insufficient instruments and equipment available and therefore, results in delays and inefficiencies. Efficient preparation of the operating theatre also includes preparation for complications during surgical interventions which may result in an emergency situation. This involves ensuring the functionality of emergency equipment, medications, and consumables. Proactive planning and preparedness for an unexpected event or error that may occur during an operation is an imperative component of the peri-operative nurse's duties (Vogelsang, Swenne, Gustafsson and Brynhildsen, 2020). Surgeons rely on peri-operative nurses and expect them to be proactively prepared for surgical procedures to achieve an efficient patient flow and effective use of the available resources; this requires that theatre managers have sufficient knowledge and experience pertaining to the organisation of equipment (Sandelin, Kalman and Gustafsson, 2019).

Ninan et al. (2017) describes turnover time as necessary, but also as non-income generating time in an area which incurs increased expenditure due to the advanced level and large numbers of trained staff. Patients are billed per minute spent in the operating room and therefore, turnover time does not allow the hospital to generate income. Hartmann (2013) noted that private hospitals in South Africa generate revenue by billing the patient per minute spent in an operating room. This implies that prolonged turnover times result in lost in revenue. Therefore, underutilised theatre time incurs a loss to the hospital and not to the surgeon. Billed time refers to the period between patients being clocked in and clocked out of the operating room which allows private hospitals to charge patients accurately for the services that are provided. Prior to the commencement of surgery, peri-operative nurses prepare according to the sequence on the list to limit any delays. Schock and Blickensderfer (2019) stated that if turnover time is managed appropriately, the hospital functions increasingly efficaciously. Machovec and Ushakumari (2017) supports the aforementioned authors who noted that if the turnover time is not managed correctly, a chain reaction may be triggered which affects hospital occupancy levels, decreases patient care, and adversely impacts hospital revenue. However, the operating theatre does not function in isolation without the involvement of other hospital units who are responsible for patient admission, care and transfer prior to, and following surgery. Therefore, these



units also retain an amount of responsibility concerning the efficient management of patients undergoing surgical interventions.

### **2.5.3 Operating room costs**

Efficiency in an operating room cannot be holistically explored without attending to the costs of running the operating room. Operating theatre rooms represent a significant cost to hospitals, accounting for approximately 40% of a hospital's budget (Chaganty and Sharma, 2021). Additionally, Hartmann (2013) reported that operating theatres in South African private hospitals contribute a large portion of hospitals' revenue because patients undergoing surgical interventions are billed per minute spent inside the operating room. Appreciable attention in hospitals is devoted to the operating theatre rooms which has been described as one of the salient sources of both hospital revenue and costs (Pedron et al., 2017). Similarly, Lee et al. (2019) stated that operating rooms pose a possible financial burden while many patients undergo important interactions with the healthcare system. Both studies describe the operating room as a financial resource and liability to hospitals (Pedron et al., 2017 and Lee et al., 2019).

The primary aim of the operating theatre room is to perform surgical interventions at the correct time while limiting time wastage to enhance the use of this medical resource and its profitability (Bilal et al., 2019). Peri-operative nurses play a significant role in this regard by maintaining awareness of these goals and facilitating cost effective and efficient peri-operative services (Rothrock, 2018). Knowledge and understanding of cost-effective strategies enables peri-operative nurses to avoid activities that hinder efficiency in an operating room. If operating theatre rooms are not prepared timeously cancellation of booked cases may result. This may be addressed by confirming the availability of materials before commencing with a booking or surgery to avoid unnecessary cancellations (Okeke, Obi, Tijani, Eni and Okorie, 2020). Huda (2014) argued that the cost-effective use of surgical facilities necessitates efficient use of theatre time and personnel.

Weil, Bernstein, Maqungo, Khoury, Liebergall and Laubscher (2020) highlighted that a large network of private hospitals in South Africa supply all aspects of medical care, including emergency medical and surgical care, to those with private medical insurance. Björn et al. (2017) also emphasises that efficiency may be hindered by the

spending unnecessary time locating the right equipment during surgery resulting in delays and extended surgery time. If delays occur once the patient has been clocked in, that implies that the patient will plausibly pay for inefficiency by healthcare providers. Every minute that is wasted accumulates into financial loss and extended waiting periods for both patients and doctors (Jafari and Levine, 2017). Furthermore, a simple exercise, such as gathering additional supplies, during the provision of healthcare services may extend the time a patient spends under the effect of anaesthesia which is undesirable and costly to the patient's health and billing (Dreyfus et al., 2020).

## **2.6 Summary**

Chapter 2 provided an overview of existing literature concerning the preparation of, and efficiency in, the operating room. The importance of theatre scheduling and staff scheduling was addressed as well as the impact of inefficiency on the costs to both the hospital and the patient. Furthermore, the chapter reviewed literature concerning the significant role played by peri-operative nursing in enhancing positive and efficacious strategies in the operating theatre complex. Chapter 3 provides an in-depth discussion of the research methodology and research design used in the present study.

## **CHAPTER 3**

### **RESEARCH DESIGN AND METHODOLOGY**

#### **3.1 Introduction**

The previous chapter provided a literature review pertaining to the concept of preparation of the operating theatre room, efficiency, and the manner in which the two concepts are interrelated. Chapter 3 provides a description of the research design and methodology. The details addressed include the qualitative approach, the exploratory descriptive nature of the research, and the research methods that were utilised to conduct a systematic inquiry of the views of peri-operative nurses in operating theatre room preparation. Furthermore, the chapter includes descriptions of the sample and sample demographics, sampling, data collection, data analysis, and measures of trustworthiness. Thereafter, the chapter is concluded with a summary.

#### **3.2. Research design**

Creswell and Poth (2018) described the research design as the type of investigation which provides direction to the research process. A research design is a comprehensive strategy that offers techniques with which to conduct a study (Marais, 2020). Furthermore, the research design provides guidance during planning and implementing the research steps which facilitates the justification for the study (Martins, 2018). The research design selected should facilitate the goals of the study pertaining to the research question, aim, and purpose (Gray et al., 2016). A qualitative, explorative, and descriptive design was selected for the purposes of the present study. The qualitative approach was believed to be well suited to the research and the aim of gaining insight into the views of peri-operative nurses regarding operating theatre efficiency. The rationale for this research design was its capacity to describe the phenomenon being explored in a manner that met the objectives of the study and adequately answered the research question.

##### **3.2.1 Qualitative study**

The term qualitative research refers to research that produces non-quantified findings (Cypress, 2017). Conversely, qualitative research focuses on examining individuals' lived experiences, behaviours, and emotions without employing statistical measures, but rather by incorporating multiple realities expressed by the participants of the study

to gain in-depth idiographic insight (Rahman, 2020). The qualitative approach is described as useful in contexts where little is known about the phenomenon or when the nature and boundaries of a phenomenon are unclear (Brink et al., 2006). The present study employed a qualitative approach because it involves exploring and describing human experiences from the viewpoint of the participants in the context in which their experiences took place (Brink et al., 2012). The study aimed to understand the views of peri-operative nurses regarding preparation of the operating room. Similarly, it facilitates the identification of in-depth and explanatory information that facilitate an understanding of various elements of the problem under analysis (Queirós, Faria and Almeida, 2017). The following subsections provide advantages and disadvantages of the qualitative approach to research. Rahman (2017) noted that the qualitative approach allows the researcher to interact with participants during data collection and therefore, data collection is subjective and detailed. During the present study, subjective data was sourced from the views of peri-operative nurses in the selected hospital. An additional advantage is its ability to understand different participants' perspectives, experiences, and events and thus, the origin of the knowledge in this approach lies in the extraction of meaning from different circumstances (Richardson, 2012). This approach was selected to understand the views of the peri-operative nurses by engaging with the participants to collect their views as the participants experienced and perceived them.

### ***3.2.2 Explorative research design***

Polit and Beck (2017) stated that exploratory research is designed to emphasise the manner in which a phenomenon manifests and is especially useful in uncovering the full nature of phenomena that are not well understood. Numerous researchers have conducted studies on operating theatre room efficiency, but there is limited qualitative research on the preparation of the operating room and the manner in which it influences operating theatre room efficiency. Reid-Searl and Happell (2012) purported that that a qualitative exploratory design permits the researcher to explore a narrow topic with limited existing literature while and affording the participants an opportunity to contribute to the development of new knowledge. The peri-operative nurses offered the researcher an opportunity to explore the phenomenon using semi-structured interviews to gain an in-depth understanding of their rich lived experiences in their

real-world contexts. Exploring individuals' views has offered an opportunity to increase the understanding of preparation of the operating theatre room. Furthermore, the exploratory method facilitates the collection of additional quantitative data, such as the participants' demographics, to support the study (Hunter, McCallum and Howes, 2019).

### **3.2.3 Descriptive study**

Pretorius (2018) defined the descriptive research design as a scientific method which entails observation and description of behaviours of individuals. Descriptive approaches to nursing and healthcare research provide broad insight into a particular occurrence and can be used in a variety of ways, including as a stand-alone research design (Doyle, McCabe, Keogh, Brady and McCann, 2020). Bradshaw, Atkinson and Doody (2017) reported that qualitative descriptive research has gained popularity in nursing and midwifery in recent years. Qualitative descriptive research identifies details that describe the who, what, and where of events or experiences from an individual's perspective (Kim, Sefcik and Bradway, 2017). The descriptive approach is noted to have been used in a large quantity of qualitative studies (Polit and Beck, 2014). During the present study, peri-operative nurses described their views regarding efficient preparation of the operating theatre room. The most frequently cited rationale for the use of the descriptive approach is to provide an illustration of individuals' experiences and perceptions (Sandelowski, 2010). Bradshaw et al. (2017) describes the descriptive design as a useful research design because it recognises the subjective nature of the research problem, the diverging experiences of the participants, and presents the findings in relation to the research question.

### **3.3 The context**

The study was conducted in a selected private hospital in the Gauteng province of South Africa. The setting was discussed in detail in Chapter 1, and therefore, in the current chapter, the researcher will discuss the process around preparation of the operating theatre room. Preparation of the operating theatre rooms begins when the operating theatre receives the list of booked patients from the surgeons' rooms. Planning for the booked cases involves booking an operating room and allocating staff. The allocated staff are primarily responsible for ensuring the preparation of an operating room before surgery commences. The frequency with which doctors

complain and staff exit and enter the operating rooms during surgical procedures highlighted that the operating rooms are often underprepared prior to the commencement of surgeries.

### **3.4 Research method**

The following sections provide a discussion regarding the research method employed during the present study. The discussion will refer to the sample population demographics, sampling, data collection, and data analysis.

#### **3.4.1 Population**

In definitions by various authors, a population is the particular group of individuals that are the target of the research and meet a set of inclusion criteria that demonstrates their relevance regarding the phenomena being studied (Burns and Grove, 2010; Polit and Beck, 2017). Brink et al. (2012) noted that it is critical for the researcher to carefully define and describe the population of the study. Following this, criteria for inclusion and exclusion in the study should be specifically stipulated. The process of selection is beneficial because it reduces the work load and cost that would be involved in studying the entire target population (Rahi, Alnaser and Abd Ghani, 2019).

The following inclusion criteria applied to the present study: (a) at the time of data collection, all the participants were peri-operative nurses permanently employed by the selected private hospital; and (b) all the selected participants had more than a year of experience and ranged from five to 25 years of service.

#### **3.4.2 Sampling method and sample size**

For the purpose of this study, purposive sampling was selected to ensure that the chosen participants would be able to provide rich information on the phenomenon of the study. Only peri-operative nurses who displayed a willingness to participate were included in the data collection process. The inclusion criteria used included nurses who have been employed in the theatre environment for at least one year. This time frame was used as an inclusion criterion because after one year of experience participants are believed to be better able to give a clear view and understand the activities that take place in an operating theatre complex. Furthermore, it is also recommended that exclusion criteria be identified (Brink et al., 2012). These are

factors that indicate that an individual should not be included as a participant in the study. Exclusion criteria in the present study included nurses working in the post anaesthesia unit or recovery room because they do not form part of the peri-operative nursing team who are responsible for preparing the operating theatre rooms.

Maree (2016) stated that the first issue regarding sample size is its ability to represent the given population and this depends on the degree of homogeneity of the population. The higher the degree of homogeneity of the population, the smaller the sample may be to adequately represent population (Ames, Glenton and Lewin, 2019). There was increased homogeneity or similarity between participants who were all peri-operative nurses. The estimated number of participants required was a minimum of 12 participants from the seven operating rooms in the operating theatre complex of the selected hospital. The aim of was to interview 14 participants but data saturation was reached at 12 participants which will be explained in further detail in section 3.5.3.1.

Purposive sampling for inclusion is one manner of attaining a manageable amount of data (Creswell and Creswell, 2018). The more data that requires synthesising, the less depth and richness of experience may be elicited from the data (Ames et al., 2019). Selecting as few participants as is required for data saturation facilitates increased richness of data. The study selected participants from each of the seven operating theatre rooms and required at least two peri-operative nurses from each. The two nurses from each theatre will include one registered professional nurse/scrub nurse and either an enrolled nurse or an enrolled nursing assistant/circulating nurse or anaesthetic assistant.

The inclusion of two nurses from each theatre, allowed the researcher to gain a deeper understanding of the activities that take place during the preparation of the operating room before the commencement of surgery. The scrub nurse who is the leader of the operating theatre room was represented for each of the seven theatres and the second participant was either an assistant nurse or an enrolled nurse who occupy interchangeable roles according to their allocation for the day.

### **3.5 Data collection**

For the purpose of the present study, data collection took the form of a semi-structured interview. The researcher made use of semi-structured interviews with open ended questions to explore the participants' views on the preparation of theatres and the meaning and implementation of efficiency. This data collection technique involves a discussion between the researcher and each participant, facilitated by a flexible interview guide (Annexure D) and supplemented by follow-up questions, probes, and comments (DeJonckheere and Vaughn, 2019). The semi-structured interviews were conducted individually because the operating theatre environment is complex and often has full caseloads and therefore, removing more than one staff member at the time might have compromised the working processes of the environment. For this reason, a focus group study was not feasible. The data collection is described below and addresses introducing the study, the pilot interviews, and collecting data.

#### ***3.5.1 Introducing the study***

The data collection process began with an explanation of the study to the unit manager of the selected operating theatre complex and permission was granted. The second phase involved informing the management of the selected hospital. The nursing manager invited the researcher to attend a management meeting to consult with the various role players. During the meeting, the researcher explained the purpose, aim, and objectives of the study. Permission was granted pending approval from the ethics committee of the selected hospital body corporate. Thereafter, the study was discussed with the peri-operative nurses during a morning handover meeting where the researcher requested that those who may be interested in participating, make contact with the researcher. In order to avail the information regarding the study to all of the peri-operative nurses, the information was placed on a notice board and included contact details for potential participants. The researcher scheduled a meeting with potentially interested participants where written informed consent for participation was signed by both the participant and the researcher. During these meetings, a date for the interview was determined based on suitable times for both the participant and the researcher.



### **3.5.2 Pilot interview**

A pilot study is a study designed to test features of the method that has been planned for a larger and more rigorous inquiry at a later stage (Arain, Campbell, Cooper and Lancaster, 2010). Pilot interviews are designed to gain insight into the usefulness of methods as opposed to providing answers to research questions (Lowe, 2019). The pilot interview assists the researcher by assessing if the interview questions and data collection methods will provide answers to the research question adequately. In summary, pilot studies are used by researchers to evaluate the acceptability and utility of their planned methods and procedures (Polit and Beck, 2017). Specifically concerning studies about nursing interventions, Polit and Beck (2017) defined the use of pilot studies as a means of evaluating: (a) the acceptability of an intervention with its intended audience; (b) the comprehensiveness and clarity of an intervention protocol; and (c) the effective dosage for interventions. A pilot study was conducted during the present research by holding pilot interviews with ODAs, who form part of the surgical team and have a similar role to peri-operative nurses. The research proposal had originally planned to interview four ODAs, but two individuals were unavailable for the pilot study. Furthermore, one of the two available ODAs resigned from employment and thus, the researcher was only able to conduct the pilot study with one ODA. However, the interview was helpful in determining the clarity of the questions and it was established that there was no need to make alterations to the interview guide. The pilot interview was conducted at the selected hospital after attaining informed consent from the participant. The same interview guide that would be used to gather data from the research participants was used to conduct pilot interviews. The researcher was able to assess the clarity of the language used in the interview questions and if the questions would enable the researcher in answering the research question. Furthermore, it had been necessary to ensure that the stipulated time of 45 minutes would be sufficient to ask all the questions.

### **3.5.3 Data collection**

Data was collected by means of an in-depth semi-structured interview with open ended questions. The purpose of using a semi-structured interview for data collection has been noted to be its ability to gather information from participants who have had personal experience, and developed attitudes, perceptions, and beliefs related to the topic of interest (DeJonckheere and Vaughn, 2019). In-depth interviews provide rich

information and offer the opportunity to ask follow-up questions, probe for additional information, justify previous answers, and establish connections between various topics (Queirós et al., 2017). Semi-structured individual interviews were selected for the present study because the operating theatre room environment is such that it cannot continue to function adequately in the absence of a large group of nurses. Signed informed consent was received from each participant in accordance with the Belmont Report (Department of Health, Education, and Welfare, 2014). Conducting interviews began in July 2021 and continued until March 2022. The primary reason for the prolonged period of data collection was the Covid-19 restrictions which were implemented during the course of the study was conducted. Furthermore, this health-related crisis resulted in peri-operative nurses being reassigned to assist in the general wards during surges in infection rates. The researcher, as a member of the operating theatre staff, was also reassigned to assist in the wards, specifically in the intensive care unit. Other peri-operative nurses were assigned to the recovery area of the operating theatre complex where the overflow of patients from the intensive care unit were accommodated and ventilated.

### **3.5.3.1 Description of the interviews**

The interviews primarily occurred at the place of work during the lunch break period or outside of work hours to avoid interfering with work-related activities. The first interview took place in an office situated in the operating theatre complex. Covid-19 protocols were observed during the interview by implementing social distancing between the researcher and participants. Furthermore, the room was well ventilated and alcohol-based spray was used to sanitise the space. The interview guide (see Annexure C) was used to ask questions with the addition of relevant probing questions. Brink et al. (2012) stated that during semi-structured interviews, the researcher should ask certain specific questions, but may also pose additional probes. The present study utilised an interview guide (Annexure D) to ensure that questions were partially standardised between participants. The first interview took place in 12 minutes which was below the expected interview duration. In addition, participants had been asked to give consent for the interviews to be voice recorded.

During the research proposal, it was intended to have a moderator present for the first interview, but due to Covid-19 and hospital restrictions, visitors were not allowed into

the hospital. As COVID-19 surges increased hospitals had to develop the policies regarding visitor restriction in an attempt to mitigate spread of infection (Jaswaney, Davis, Cardigan, Waltz, Forcier and Joyner, 2022). Instead, the interview was conducted with only the researcher and the participant present. Following the first interview, the researcher consulted with their supervisor regarding the interview process and sent the voice recording and verbatim transcriptions to conduct a member check for the purposes of credibility. Creswell and Poth (2018) defined a member check as a process that increases validity by allowing a more experienced researcher to examine collected data. During the present study, the research supervisor was consulted during the member check because they met the criterion of being an experienced senior researcher. The research supervisor provided positive feedback and gave permission to proceed with the remaining interviews. Data collection continued and suitable times and locations were allocated for the remaining interviews with special consideration given to securing an appropriate interview environment. The supervisor's office in the operating theatre complex was selected as the most conducive location because there would be limited noise and disturbances. Some of the interviews took place in the early hours of the morning to facilitate the staff who worked night shifts.

The researcher began the interviews with informal conversation with the participants to establish comfort, rapport, and trust. Thereafter, the interviews commenced with a brief explanation of the research study, consent procedures, a rationale for participation, and a description of the interview format and agenda (DeJonckheere and Vaughn, 2019). All interviews were voice recorded and written notes were taken. While conducting interview number 10, it appeared that the study was approaching data saturation. Data saturation in qualitative research has been defined as the point at which additional data no longer leads to the discovery of new information related to the research question (Lowe, Norris, Farris and Babbage, 2018). A further two interviews were conducted which confirmed that data saturation had been achieved. The interviews ranged from 12 to 18 minutes in length. The participants included registered nurses, enrolled nurses, and nursing assistants as stipulated in the research proposal.

The collected data was stored in the recording device which was only accessed by the researcher prior to transcribing. The verbatim transcribing process was undertaken by the researcher using word document to transcribe from the recorded voices. The hard copies were locked in the cupboard at home to ensure privacy and anonymity in the laptop.

### **3.6 Data analysis**

Qualitative data analysis often utilises a content or thematic analysis (Miles, Huberman and Saldaña, 2018). Qualitative data analysis usually involves the categorisation and examination of verbal or visual material to infer meaning from the data (Flick, 2014). The present study employed the method of thematic data analysis. Initially, the research proposal had included content data analysis as the intended method however, following data collection, the researcher and supervisor agreed that thematic data analysis would be better suited to the present study. It was noted that a thematic analysis would be beneficial because of the study's underlying constructivist positioning. Thematic analyses facilitate the process of data analysis by facilitating an in-depth understanding of how certain social phenomena have been developed and maintained (Kiger and Varpio, 2020). This process involves searching for meaning and themes that emerge from identified meanings. According to Kiger and Varpio (2020), thematic analysis is a useful method for analysing data because it seeks to understand experiences thoughts, and behaviours.

The qualitative data analysis is comprised of various steps that occur during the research process (Flick, 2014). The sections provide a description of the steps that were used for data analysis in the present study.

#### ***3.6.1 Thematic analysis process***

##### **3.6.1.1 Step 1: Familiarising yourself with the data**

This step entailed listening to all of the audio recordings and creating verbatim transcripts for each of them. The process of transcription serves as a useful tool that allows the researcher to familiarise themselves with the data in an in-depth manner (Kiger and Varpio, 2020). Thereafter, the transcribed data was read and re-read to facilitate further immersion in the data by increasing the researcher's awareness of what the participants had expressed during their interviews.

### **3.6.1.2 Step 2: Generating initial codes**

The second step of data analysis involved the initial coding of data. During the previous step of reading and re-reading the transcriptions, the researcher began to derive codes from the data. Kiger and Varpio (2020) stated that this phase is a time during which data is described and interpreted to elicit and select codes. Codes were created by dividing the transcribed data into meaningful units. Maree (2016) stated that the coding process enables researchers to readily retrieve and collect all the text that they have associated with a particular theme and by doing so, meaningful units may be derived. Units of meaning are components of the participants' verbal communications which initiate the analysis process (Marais, 2020). All data that indicated possible reasons for peri-operative nurses' difficulties with adequate preparation of the operating theatre rooms were identified and coded. Through the identification of these codes, researchers may begin to create an audit trail that enhances the trustworthiness of data and the study (Nowell, Norris, White and Moules, 2017).

### **3.6.1.3 Step 3: Searching for themes**

This step involved deriving themes from the initial codes. Themes are developed by organising the codes in such a way that the researcher is able to identify similarities between the codes (Clarke and Braun, 2017). The themes were identified in discussion between the researcher and the supervisor of the study and have been discussed in detail in *Chapter 4 Findings and Interpretations*. Clarke and Braun (2017) stated that themes are driven by the data that emerges during data collection rather than the questions asked to the participants. Furthermore, they should not merely reflect the researcher's own interests or beliefs on the topic being studied (Kiger and Varpio, 2020). All data that provided insight into peri-operative nurses' difficulties concerning the efficient preparation of the operating room were captured and incorporated into themes.

### **3.6.1.4 Step 4: Reviewing the themes**

This stage of data analysis involves the review of coded data, ensuring that it has been allocated to the appropriate theme, and confirming the fit between coded data and a particular theme (Kiger and Varpio, 2020). During this stage, it is recommended that the researcher modify the themes where necessary to ensure that each unit of coded

data aligns with a relevant theme; themes that do not fit well with the data may then be discarded or adjusted accordingly (Braun and Clarke, 2006). The final themes were agreed upon in discussion between the researcher and the supervisor and those that did not fit well were removed or replaced.

#### **3.6.1.5 Step 5: Defining and naming the themes**

The purpose of this stage is to provide more detailed descriptions of the themes and delineate the scope of each theme (Clarke and Braun, 2017). The researcher initially determines if the coded data is covered by an appropriate theme and thereafter, ensures that there is no overlapping between themes. Braun and Clarke (2006) suggested that during this stage, the researcher should begin to identify emerging subthemes within each theme. During the present study, the emerging subthemes were grouped together from the participants and codes were added. The researcher and supervisor co-developed four themes from the data which represented the views of the peri-operative nurses regarding efficient operating theatre room preparation in the selected hospital and each theme comprised of various subthemes. The codes elicited from the data displayed the barriers which the participants perceived to be the salient factors preventing them from adequately preparing the operating theatres.

#### **3.6.1.6 Step 6: Producing the report**

According to Braun and Clarke (2006), this stage involves writing up a final description and analysis of the findings. Moreover, Kiger and Varpio (2020) suggested that the researcher use narrative description with data extracts when constructing the report because it offers a line of argumentation that explains how the data answers the research question. During this stage, the researcher provided direct quotations from participants and cited literature that supported the participants' views. Literature control enables the researcher to produce meaningful answers to questions asked during interviews (Fain, 2020). The researcher and supervisor discussed the findings and it is believed that the findings have provided meaningful answers to the research question.

### **3.7 Trustworthiness**

Quality control in the present study was conducted through measures of trustworthiness. Lincoln and Guba (1986) purported that trustworthiness is comprised

of four criteria which include credibility, dependability, confirmability, and transferability. To enhance trustworthiness in qualitative research, it is suggested that researchers employ a systematic process of organising and analysing data, for example, coding, identifying shared themes, categorising themes, and demonstrating a clear theoretical or logical rationale for eliminating overlapping themes (Creswell and Poth, 2018). The subsections below discuss the four criteria identified by Lincoln and Guba (1986) followed by Table 3.1 illustrating the various ways in which the present study sought to enhance trustworthiness.

### **3.7.1 Credibility**

Credibility relates to the truth and confidence researchers have in the accuracy of their findings (De Swardt, 2012). It can be increased by providing detailed explanations of data analysis and confirmation of sources of data obtained from participants maybe by allowing them to check the coded data (Daniel, 2019). As suggested by Creswell and Poth (2018), a researcher should allow their participants the opportunity to review the collected data and correct any misunderstandings. The researcher of the present study showed the participants the data that had been collected from the interviews to confirm the correctness thereof. However, Maree (2016) describes an additional measure that enhances credibility as frequent debriefing sessions between the researcher and their supervisor and member check.

### **3.7.2 Dependability**

Dependability is a measure of quality based on the replicability of the findings if the inquiry were repeated with a similar cohort of participants, methodology, and context (Forero, Nahidi, De Costa, Mohsin, Fitzgerald, Gibson et al., 2018). Marais (2020) mentioned that the steps for research must be consistent from the development of the study to the recommendations in order to ensure dependability.

### **3.7.3 Confirmability**

Lincoln and Guba (1985) describe confirmability as the degree of neutrality in a study. Neutrality and thus, confirmability is influenced by researcher bias, motivation, or interest. It is recommended that to enhance confirmability, measures be taken that decrease researcher bias and increase the accurate portrayal of the participants'

experiences (Martins, 2018). The coded data should be true reflection of what the participants have said in the voice recordings.

### 3.7.4 Transferability

Transferability is a quality measure based on the study's ability to apply its findings to other settings or groups of people. Forero et al. (2018) reported that to demonstrate transferability, the researcher may ensure that the selection of a sample is based on participants' knowledge of the phenomena being studied. Qualitative researchers utilise descriptions of real-life settings and understandings of participants' worldviews, not only to achieve transferability, but to bridge the gap between practical application and theoretical research (Ospina, Esteve and Lee, 2018). The researcher also needs to be aware of any personal biases and to remain cognisant that the findings of any qualitative study are subject to multiple realities (Daniel, 2019).

**Table 3.1: Strategies to ensure trustworthiness**

Strategy	Actions	Application of criteria
Credibility	Prolonged engagement	Researcher's profile: -actively involved in operating room nursing -various positions in the operating theatre room (scrub nurse, senior professional nurse in the operating theatre and deputy nursing manager)
	Persistent observation	-following a process of consistent and tentative analysis
	Triangulation	-conducting semi-structured interviews -conducting a literature review -using the assistance of experts to validate data
	Referential adequacy	-use of audio tapes -verbatim transcripts -debriefing summaries
	Peer debriefing	-with supervisor and co-supervisor
	Member checks	-validation of data obtained
Transferability	Thick transcription	-provide rich and comprehensive transcription of data -provide detailed descriptions of research methodology
	Purposive sampling	-purposively selecting participants -obtain maximum quantity of specific information (data saturation)



	Dependability audit	-personal logs and field notes have been kept
	Dense description	-describing research methodology comprehensively
Dependability	Triangulation	-consensus of supervisor and researcher during data analysis -using more than one source of data
	Peer examination	-expert supervisors
	Code-recode procedure	-a consensus discussion between researcher and supervisors
Confirmability		-using expert supervisors and co-supervisor

### 3.8 Summary

This chapter gave an overview of the research design, and research methodology. It began by exploring qualitative research designs and sampling. Thereafter, it included details regarding data collection, data analysis, and trustworthiness. Chapter 4 provides a discussion regarding data analysis and presents the results of the study.

## CHAPTER 4

### FINDINGS AND INTERPRETATION

#### 4.1 Introduction

Chapter 3 provided an explanation of the research methodology. Chapter 4 presents, discusses, and interprets the findings of the present study. The findings were gathered from semi-structured interviews conducted with peri-operative nurses at the selected hospital. The findings involve four recurring themes and additional subthemes which are regarded as the views of peri-operative nurses in the selected private hospital regarding efficient operating theatre room preparation.

#### 4.2 Participants' demographic profiles

The present study included 12 participants, all of whom were peri-operative nurses at the time of data collection. The participants' years of service ranged from five to 20 years. There were eight females and four males, and their ages ranged from 28 to 57 years old with the majority being 30 to 36 years old. From the 12 participants in the study, four had an additional qualification in operating theatre nursing while the other eight were experienced. Table 4.1 outlines the demographics of participants' information.

**Table 4.1: Summary of the participants' demographic information**

Participant number	Gender	Age	Position	Qualification	Years in service
1	Female	39	Scrub nurse	Professional nurse (additional qualification in OR)	7
2	Female	48	Scrub nurse	Professional nurse (additional qualification in OR)	15
3	Male	37	Anaesthetic nurse	Enrolled nurse	8
4	Male	33	Scrub nurse	Professional nurse (additional qualification in OR)	10
5	Female	57	Anaesthetic/circulating nurse	Enrolled nurse	20
6	Female	30	Anaesthetic nurse	Enrolled nurse	8
7	Female	38	Scrub nurse	Professional nurse	6

8	Female	30	Scrub nurse	Professional nurse	5
9	Female	28	Scrub nurse	Professional nurse	4
10	Female	30	Circulating nurse	Enrolled nursing assistant	2
11	Male	33	Anaesthetic nurse	Enrolled nursing assistant	10
12	Male	35	Scrub nurse	Professional nurse (additional qualification in OR)	6

### 4.3 Findings

Four themes emerged from a qualitative thematic analysis: (1) Patient aspects; (2) environmental aspects; (3) adhering to guidelines; and (4) human resource management and barriers. Table 4.2 outlines the themes, subthemes and barriers.

**Table 4.2: Themes, subthemes, and identified barriers**

Themes	Subthemes	Barriers
Patient aspects	Preventing charging patients extra costs	
	Pre-operative visits	Lack of information
	Patient experience	
Environmental aspects	Prevention of medical legal risks	
	Infection control	
	Stock inventory	Shortage of stock
	Equipment positioning and preparation	Inappropriate equipment and broken equipment
	Scheduling of cases	Overbooking, squeezing of doctors
	Preparation time	Lack of time to prepare
Adhering to guidelines	Doctors' protocols	Outdated protocols
	Checklists	
Human resource management	Enough staff	Shortage of staff and absenteeism
	Staff allocations and delegation	Feeling of being overwhelmed
	Communication	Lack of communication
	Staff competency, knowledge, responsibility, and roles	

#### **4.4 Theme 1: Patient aspects**

The participants view the preparation of the operating theatre room before the commencement of surgery as highly important. The subthemes that emerged under Theme 1 were: (1) Preventing charging patients' additional costs; (2) pre-operative visits; (3) patient experience; and (4) lack of information as the primary barrier.

##### **4.4.1. Preventing charging patients additional costs**

The participants associated the preparation of the operating theatre room prior to surgery with the prevention of additional costs for patients. Some participants stated that if the operating room is not prepared timeously, the patient will plausibly wait in the operating room while unnecessary time is spent completing preparations. For example, participants stated:

*If the patient stays a long time in theatre, it is consuming. It will make the patient pay more because you lengthen the time in theatre (Participant 5).*

*Another thing it [preparation] also minimises the cost to the patient because the more the patient is in theatre, the more they need to pay (Participant 8).*

*And then you save the patient's time as well because the longer the patient is in theatre, the more he pays (Participant 5).*

The participants further reasoned that the practice of not preparing operating rooms before commencement of surgery incurs more costs because billing begins immediately once the patient enters the operating room. The following extracts from participants demonstrate these views:

*When your theatre is not prepared well, and remember you have clocked the patient, for instance you're doing a caesarean section. There is a time limit for those cases, so going above that, there is also more charges for the patient and delays the doctors who have to follow (Participant 11).*

*So if a theatre is well prepared, we are going to reduce motion- moving in and out of theatre- which is going to reduce the costs to the patients. And another thing, when we keep going in and out of the theatre- as we are opening the doors- we are disturbing the environment (Participant 1).*

*So, the preparation is very important. The first point is that it saves time in the operation (Participant 3).*

The issue of costs emerged because various surgical procedures are assigned a time limit by medical aid companies regarding what they will pay for a procedure (Samuel and Reed, 2021). If the time frame is exceeded, additional costs are paid by the patients themselves. According to a study that evaluated the operating room throughput in a stand-alone soft-tissue trauma operating theatre at Cork University Hospital in Ireland, operating room time has a significant hourly cost and it is suggested that the accumulation of additional costs may be avoided by not having patients in the theatre for longer than necessary (O'Donnell, Walsh, Murphy, McElroy, Iohom and Shorten, 2017). In South Africa, during 2018, each private hospital had a comparative charging system for major theatre time, charging patients between ZAR155.00 and ZAR273.00 per minute (Samuel and Reed, 2021). Samuel and Reed (2021) also revealed that patients in private facilities are billed for theatre time separately for theatre time, the consumables used during their surgery, and the professional fees of the surgeon and anaesthetist. A systematic review of interventions to reduce operating time in lung cancer surgery reported that operating room inefficiency remains a common obstacle (Hoefsmit, Cerfolio, De Fries, Dahele and Zandbergen, 2021). The authors further stated that improving operating room preparation is necessary and can lead to improved financial factors for both the patients and the hospital. By ensuring that the operating room is prepared before the commencement of surgery, costs relating to the time spent in the operating room may be reduced.

#### **4.4.2. Pre-operative visits**

Pre-operative visits before surgery also assist with preparing for the operation. Specifically, the pre-operative visit assists the nurse with preparing the theatre for any special needs that the patient might have. This was evidenced in the following extract:

*What we normally do is we go and see the patients, we introduce ourselves and then from there, we do a proper assessment like comorbidity, comorbidities, or risk factors that may have an impact on the intra-operative process of the patient. And also it is a process that reassures the patient (Participant 9).*

#### **4.4.2.1. Barriers associated with pre-operative visits**

The results from the interviews demonstrate that one of the barriers indicated by the participant was a lack of knowledge regarding patients' conditions. A participant expressed the following:

*The lack of knowledge of your patients, if you do not know that this time around you have a patient who cannot raise their legs and you want to put the patient in a lithotomy position that might be affected by not knowing your patients. So, it's basically poor knowledge if I may put it that way (Participant 4).*

The issue regarding pre-operative visits emerged with the participants because engaging with the patient before surgery affords the peri-operative nurses and all the surgical team members insight into the patient's condition and possible limitations. Sandelin et al. (2019) views pre-operative visits as a tool to gain an overarching view of a patient prior to surgery which, in turn, empowers peri-operative nurses with knowledge that facilitates the preparation of the operating room. Lack of information regarding a patient's condition might compromise an efficient preparation of the operating room. Moreover, the pre-operative visit offers an opportunity to collect information to better manage patients during the surgical procedure and to educate the patient about the surgical process (Xu, Wang and Yang, 2020). Gómez-Urquiza, Hueso-Montoro, Urquiza-Olmo, Ibarro-Crespo, González-Jiménez and Schmidt-Riovalle (2016) described the waiting time before surgery as an agonizing period for the patient with increased anxiety. Pre-operative visits afford the surgical team an opportunity to reassure the patient and provide them with information regarding the surgery. Collectively, the aforementioned authors have highlighted the need for pre-operative visits to enable the nurses to prepare the operating room for each individual patient's needs. Operating theatre nurses endeavor to gain adequate information

about patients' care to ensure that the equipment and consumables are prepared for optimal intra-operative nursing care (Sandelin et al., 2019).

#### **4.4.4. Patient experience**

The preparedness of the operating room can also be evidenced in patients' ratings of their overall experience. This was indicated by Participant 9, who stated:

*Patients experience it is okay and what the overall experience of the patient was from admission to discharge. How the patient will rate the hospital and based on the rating it will tell you whether the patient will come back and refer the hospital to other patients (Participant 9).*

*Good preparation reduces patient stress because when the patient comes and sees people being there, all of them and working with no ups and downs, then they can also develop trust in the team that is operating on the patient (Participant 2).*

The participants viewed the patient experience factor as an important aspect. This may have emerged because the patient's experience in the operating room forms part of the patient's outcomes. A study of patients who had undergone surgical intervention by Gobbo, Saldaña, Rodríguez, Jiménez, García-Vega, De Pedro et al. (2020) demonstrated that all the patients experienced fear related to the operating room environment itself. Furthermore, they described the environment as intimidating and they feared the risk of complications during surgery (Gobbo et al. 2020). Pandit (2018) emphasises patient-centred care as a priority in operating room management and stated that improving the patient's experience should be a primary goal when planning services. The patient might feel increasingly safe if all members of the surgical team are present before induction because it affords the patient the support and attention of all the team members. Jones, O'Neill, McLean, Wigmore and Harrison (2017) noted that the outcome of a patient's experience should be confidence and trust in their clinical team. If the operating room is prepared efficiently, the clinical team will plausibly be more able to give the necessary attention to patients' needs in comparison to the impact of team members having to leave the patient in the operating room while attempting to organise equipment and stock.

## **4.5 Theme 2: Environmental aspects**

Theme 2 involved various environmental aspects. Subthemes emerged relating to environmental aspects and included: (1) Prevention of medical legal risks and care of patient wellbeing; (2) infection control; (3) stock inventory; (4) equipment positioning and preparation; (5) scheduling of cases; and (6) preparation time. Barriers that emerged under environmental aspects included: (1) Shortage of stock; (2) broken and inappropriate equipment; (3) overbooking squeezing of doctors; and (4) lack of time to prepare.

### **4.5.1. Prevention of medical legal risks and care for patient wellbeing**

The participants indicated that preparing the operating theatre before surgery commences is important to minimise medical legal risks and ensure that the patient is treated appropriately according to their requirements. This was evident in the following statements by the participants:

*[When] preventing medical legal risks, we have to look at the safety of the patient (Participant 2).*

*If there is something wrong with the bed, it can injure the patient. So the patient came here for a small thing and then they encounter another injury on top of what they came in for (Participant 6).*

*The preparation of the theatre is very important before commencement of surgery because it is there to determine the quality of service that you are going to render to the patient, but most importantly it is there to determine the safety of which we are concerned most about (Participant 4).*

*An operating room that hasn't been fully prepared for surgery can impose unnecessary risk to patients. That is to maintain sterility, to limit prolonged operating time and to reduce movement (Participant 10).*

*And then you must know that the patient must be safe, so if you are in theatre you'll see all the changes of the patient (Participant 5).*



One of the participants indicated during the interview that preparing the operating theatre before surgery commences is important to care for the patient's wellbeing. This participant stated:

*So, the importance of surgery, either being elective or emergency, is to care for the wellbeing of the patient or to treat a medical condition or others are used to diagnose (Participant 2).*

The subtheme regarding the prevention of medical risk and caring for the wellbeing of patients emerged during the interviews. There appeared to be a general understanding that preparing an operating room before the commencement of surgery helps prevent these risks. Other studies have demonstrated that an increased number of patients are injured or disabled during healthcare (Donaldson, Kelley, Dhingra-Kumar, Kieny and Sheikh, 2017). Rothrock (2018) reported that WHO has estimated that one in ten patients are harmed during surgical procedures. Patients' safety is a core concern for healthcare providers because every patient undergoing surgery has the right to be protected from harm. Sandelin et al. (2019) stated that the surgical team, consisting of members with different educational backgrounds, have the moral and ethical responsibility to provide the patient with reliable, healthy, and safe peri-operative care. Inspecting instruments and equipment during preparation of the operating room allows the peri-operative nurses to identify and mitigate the risks that result from unsuitable equipment. The patient's safety and welfare are entrusted to peri-operative nurses from the time that the patient arrives in the operating room until the patient is transferred to another healthcare team (Phillips, 2016).

#### **4.5.2. Infection control**

Another subtheme which emerged was the importance of preparing the operating theatre before surgery to decrease the risk of hospital-acquired infections that result in extended admissions and treatment expenses for the patient. This subtheme was evidenced in the following statement by a participant:

*So, if a theatre is well prepared, we are going to reduce motion- moving in and out of theatre- which is going to reduce costs to the patients. And another thing is when we keep going in and out of the theatre, as we are opening the doors, we are*

*disturbing the environment inside the theatre which ends up inflicting, I mean bringing infection on the patient. It's going to go back to the costs as well as if the patient gets infected, they have a prolonged stay in the hospital (Participant 1).*

Other participants noted that traffic inside of the theatre poses a potential risk of introducing adverse organisms to the patient and the environment. The participants explained this in the following statements:

*When you are doing an operation, ideally we don't want movement in and out of the theatres because you are taking organisms from outside the theatre and you are bringing them in the theatre. And remember the theatre setting is a sterile area when we start surgery and then we want everything to be sterile (Participant 8).*

*Because if you have prepared everything then nobody will come in and out during the surgery which minimises the risks of infection to your patient (Participant 8).*

*The main focuses that we look at in theatre is infection control and prevention. So, for a theatre to be ready it must be ready even in terms of infection prevention control. Starting at the door, I normally go in a circular way. When I look at the theatre, I start in the scrubbing area (Participant 4).*

*When we are preparing theatres, we damp dust by decontaminating surfaces and equipment that will be used. And then we also make sure that overall, the theatre is clean, and then we also assess the theatre temperature (Participant 9).*

*Then that the in and out of theatre causes breakages in the airflow of the theatre, the positive and negative pressures. That will also have an impact on the patient and on the potential infection of the patient (Participant 9).*

The subtheme concerning the potential risk of infection in an operating theatre emerged during interviews with the participants. Traffic exiting and entering the operating room and the frequency with which the door is opened poses a risk of surgical site infection. There is evidence demonstrating that an effective ventilation system can significantly reduce the incidences of surgical site infections (Pati and

Rathore, 2022). According to Mukamurenzi (2019), surgical site infections cause significant patient morbidity and mortality and are the second most common cause of healthcare-associated infections, especially in low- and middle-income countries. Air ventilation in the theatre has been shown to be the most salient factor in controlling microorganisms in the operating room environment and thus, controlling traffic to and from the operating room reduces the potential risk of infection. Phillips (2016) stated that an air conditioning system is a basic feature of a well-designed operating room because it reduces the number of airborne organisms by removing dust and aerosol particles. Various studies have documented that increased personnel and frequency of opening the door can lead to an increase in the level of bacteria and airborne particles (Dallolio et al., 2018; Phillips, 2016; Mukamurenzi, 2019).

#### **4.5.3. Stock and inventory control**

The participants indicated that preparing the operating theatre room in time helps peri-operative nursing ensure that stock levels are optimal and that all the resources required for the operation are available. This also reduces the risk of stock becoming depleted during procedures. Participants said the following statements in this regard:

*You notice what is not there as well so that when you are busy operating, you don't run out of stock (Participant 1).*

*I think also with preparing the theatre, we need to make sure that we have all the surgical items and equipment (Participant 2).*

*When you prepare on time, you can tell the stock controller to get your extra stock (Participant 1).*

*If they see that some other equipment or medication is not there, they can easily request it from the storeroom people to get it before the operation (Participant 3).*

*Make sure that all the machinery that will be needed during the operation is in theatre, accessible, and are functional (Participant 7).*

*It prevents delays, like running in and out of theatre for stock or equipment that hasn't been prepared for, or equipment that is there but you are not aware that it is*

*not working properly. And that also leads to the in and out of theatre which causes breakages in the airflow of the theatre and the positive and negative pressures (Participant 9).*

#### **4.5.3.1 Barriers associated with stock control.**

The participants identified shortages of stock as a barrier to efficiency in the operating room. Participants stated the following:

*If you are short of stock then we are not going to work. The work is not going to be efficient like we are expected to be (Participant 6).*

*Okay, when there is no stock and then also not enough time (Participant 9).*

*Barriers that we encounter is more actually when we don't have enough stock on our shelves. This is actually the things that are able to prevent us from preparing (Participant 12).*

Participants highlighted the stock and inventory subtheme. It is speculated that this lack of stock causes delays if not easily accessible. Ahmadi et al. (2019) noted that surgical supplies and instruments should be readily available to staff to facilitate the performance of diverse procedures. According to a study related to the implications of reducing waste in the hospital operating room, the availability of supplies is vital for patient care during surgery (Dreyfus et al., 2020). Mavhungu et al. (2017) reported that the second most common reason for cancellation of patients' surgeries was a lack of consumables. The lack of equipment and surgical stock can delay the starting time of the surgery when peri-operative nurses are still attempting to gather stock while the patient is waiting in the operating room. Minty-Walker et al. (2020) also noted that preparation of the operating room is vital and unavailable supplies may delay the starting time. Gajewski, Bijlmakers, Mwapasa, Borgstein, Pittalis and Brugha (2018) demonstrated in their findings that a shortage of essential surgical supplies has a negative effect on service provision, especially in low- and middle-income countries.

#### **4.5.4. Equipment preparation and positioning**

The participants indicated that the positioning of equipment and preparation is an additional factor that enhances efficiency and demonstrates the preparedness of the operating room. This was evidenced by the following statements by participants:

*If your theatre is well prepared, when you go through the operating theatre door you can just see that you've got your straps there, lithotomy poles, your stack machines are ready, prepared, checked and they are on. Your operating lights are well positioned above your operating theatre bed, the cushions are well positioned. When you bend the bed you don't have to find that there is a single mattress that is overlying where the bed is supposed to bend (Participant 1).*

Participants stated that readiness is one of the factors that enhances the efficacious preparation of the operating room. The following extracts demonstrate this subtheme:

*We must not be running around still looking for whatever we will be needing for the operation (Participant 7).*

*And sufficient stock and working equipment which is available at the time of the surgery also implicates on your preparation for the surgery (Participant 8).*

Another participant noted that efficient preparation of operating room requires that the equipment is accessible.

*Make sure that all the machinery that will be needed during the operation are in the theatre, accessible, and functional (Participant 7).*

##### **4.5.4.1. Barriers associated with preparation of equipment**

Results from the interviews show that one of the barriers indicated by the participants is the presence of equipment that is outdated and old. Participants stated in this regard:

*And then the equipment as well must be up to date. There are some operations that need equipment, you check that the equipment are in good working condition before you start working (Participant 5).*

*Equipment, if maybe for example, in orthopedics we have three cases and find that the equipment is not working or it has been used in the other theatre (Participant 10).*

Participants described experiencing a sense of panic that occurs as a result of having to rapidly locate equipment when the operating room is not prepared. This barrier to efficiency was described by participants in the following statements:

*If you are operating on a child for instance, and don't have the right size cuff tourniquet for the child then you'll be going from one theatre to another looking for it. I mean, it will waste time going from one theatre to another or from the stock room. Or, the way we put the machines sides looking for a particular cuff size. That is what I mean by running around (Participant 7).*

The subtheme of equipment preparation and positioning emerged as an important factor. Efficient preparation of the theatre requires the availability of equipment for each surgical intervention and the equipment should be readily available in the operating room to avoid delays. Appropriate equipment in the operating theatre enhances safety during surgery and increases the quality of treatment (Michalak and Kotomska, 2021). Participants reported that it can be challenging to find equipment that is moved between theatres and this may result from the manner in which the equipment is stored. In a study by Björn et al. (2017), the authors described delays and increased surgery time that had resulted from registered and assistant nurses having to spend time attempting to locate the right equipment and moving medical equipment during surgery. This is supported by Hammad et al. (2019) who noticed that despite arranging equipment in an orderly manner, the staff still had to locate equipment which led to delays in allocating the correct equipment at the right time. Additional challenges that have been noted concerning the preparation of equipment included a lack of equipment, broken equipment, or outdated equipment which, in turn, poses an increased risk to patients' safety. These challenges are not isolated to the

present study at the selected hospital and have been identified in other studies conducted at various hospitals. One such study was conducted in the operating room of the Institute of Child Healthcare Lahore and showed that most staff also encountered problems pertaining to insufficient and outdated equipment which compromised their patients' safety (Siddique, Hassan, Saeed, Moazzam, Shahzadi and Ashraf, 2021). Appropriate equipment in the operating theatre and up-to-date technologies facilitate safe patient care and enhanced quality of service provision. Cordier (2019) emphasised that patients put their trust in the surgeons and other members of the surgical team with an expectation that the team will do their best in rendering services. However, the ability of the team to do their best is partly dependent on having access to the correct equipment and supplies required for the procedure.

#### **4.5.5. Scheduling of theatre cases**

Another subtheme that emerged was the interrelated nature of scheduling, resource allocation and efficient preparation of the operating room. The importance of preparing the theatre room before the commencement of surgery allows management to schedule cases appropriately and allocate the resources required to manage the case.

*When we schedule the cases, we look at the number of staff that we have and the number of patients that we are running on that day (Participant 12).*

*When booking cases, you have to at least check times in between and you cannot book when you know that you have only four teams that can help the doctors with operations, you cannot book, let's say five 8 o'clock cases while you know you have four teams (Participant 6).*

##### **4.5.5.1. Barriers associated with scheduling of cases**

Barriers encountered during preparation of the operating room pertain to the booking of patients for the theatre room. Participants expressed the following statements regarding this barrier:

*Another thing is the bookings wherein doctors just book out of the blue. They just book and add keep on adding cases you don't get time to prepare (Participant 1).*

*The scheduling of theatres, ok as I have said, like you cannot book a case you know. Let us say you've got one team you cannot book, you... cannot set a time frame for a certain case. Like book a case caesarean section at 8 o'clock and expect that that team will be done by half past eight, they have to go to another theatre (Participant 6).*

Barriers encountered by peri-operative nursing during preparation of the operating room was the squeezing of doctors by allowing surgeons to work of the slates of doctors which results in clustering and a lack of preparedness. A participant expressed these views in the following statement:

*And the other issue is if maybe, like in theatre we can try to squeeze a doctor to come work you see, but then now cases become a cluster. When there is clustering, there is no time to prepare (Participant 3).*

Difficulties pertaining to the scheduling of theatre cases emerged as a subtheme. It has a direct impact on the manner in which preparation of the operating room is planned. The participants indicated that a lack of preparation can result from scheduling errors where surgeons have overbooked or added additional cases. Problems pertaining to the scheduling of theatre cases has received attention in previous studies (Bilal et al., 2019; Gul, Denton and Fowler, 2012; Samudra et al., 2016). According to Hartmann (2013), surgeons and anaesthetists occasionally deviate from the theatre scheduling management system which can result in inefficiency and increased delays. Challenges due to scheduling of theatre cases often occurs from inadequate planning. Decisions pertaining to scheduling are made based on case mix planning and staff scheduling. A factor that impacts these decisions is the anticipated demand which is determined by historical data, such as the number of surgical procedures that have taken place in the preceding months (Akbarzadeh et al., 2020). Chaganty and Sharma (2021) stated that a lack of planning, staff miscommunication, staff unavailability, equipment failure, and emergency case prioritisation are preventable barriers. Akbarzadeh et al. (2020) noted that surgical



case planning and scheduling should take into consideration the availability of nursing resources. A further difficulty that arose from this subtheme is inaccurate time allocation for each case which results in overlapping cases. Participants noted that when insufficient time has been allocated to a case, preparation for the following case may be adversely affected. These experiences were confirmed by Fügener et al. (2017) who stated that inaccurate allocation of theatre time could result in negative consequences, such as loafing time, overtime, or rescheduling cases.

#### **4.5.6. Preparation time**

The participants noted that preparation time is one factor that enhances the efficacious preparation of the operating room. The participants expressed the following views with regards to adequate preparation time:

*The other thing is time. You find that you've got theatre procedures or cases on the list, and it is given certain times, or maybe saying like two hours or three hours per case (Participant 2).*

*The staff needs time to prepare to ensure that everything that they need is there (Participant 3).*

*Availability of staff and also availability of stock, and proper working equipment and time. And also if doctors' protocols are updated, updated doctors' protocols and then CSSD if there is not enough linen then the operation that can take place. So, and what else if doctors' protocols are properly updated then (Participant 9).*

*When you are on time, you will be able to prepare thoroughly, and you will be able to spot the missing thing that you will need during the surgery (Participant 8).*

##### **4.5.6.1. Barriers associated with preparation time**

A lack of adequate time was indicated as one of the barriers encountered by the participants during the preparation of the operating room. Participants stated the following in this regard:

*Remember the 15 minutes that you get in the beginning is for checking your theatre, not preparing it's prepared the theatre already. So when you move from one theatre to another and you don't even have that 15 minutes ...how are you going to prepare your theatre adequately and be able to just spot check your theatre if it's well prepared? We don't have that time, so doctors get frustrated a lot. They get frustrated, and patients are the ones who get to suffer- they get hit in the pockets (Participant 1).*

*And then no time will also be our barrier here because if you don't have time to prepare then it means that your surgery time will come and you won't have everything that you will need for that time (Participant 8).*

*Not having enough time to prepare. It will cause the theatre to be not well prepared. You'll be under pressure while you prepare because they are waiting at the theatre entrance- they want to work. So, that causes you to forget things unlike if you were calm doing preparing at your pace (Participant 3).*

*The time is if the same scrub team and the anaesthetic team are still busy with another list and there is a delay from that list. Then, in the end it hinders how you are going to prepare for the list or the case that is to follow the one that you are busy with (Participant 7).*

*If the case is booked for 8 o'clock you would expect that the patient would be in that theatre. Anaesthesia will be commencing, but you find instances where surgeons are late, anaesthetics are late, or even the nursing team is late (Participant 7).*

*Okay, when there is no stock and then also the time, not enough time (Participant 9).*

*One of you are given a list that you prepare as per the list, then all of the sudden a doctor adds two or three cases on that list. Then you don't get time to prepare for those others as you already prepared for that one. Then you have to run around preparing for the other cases which you don't have enough time for (Participant 1).*

One of the participants noted that this barrier may also arise when other staff members are not punctual with beginning the preparation of the operating room. The participant expressed this in the following extract:

*You find out that when you are preparing, some others will tell you that I'll prepare later on. When that later on time comes, they will prepare in a rush, ending up forgetting some important things which cause them to run around when the operation is about to commence (Participant 1).*

Efficient preparation of the operating room requires that the staff have adequate time to conduct their preparations. The subtheme relating to time as a barrier emerged during interviews with the participants. Inadequate time may result in ineffective communication between various surgical team members (Işık, Gümüşkaya, Şen and Arslan Özkan, 2020). Efficient preparation requires sufficient time to enable the nursing staff to ensure that the correct equipment and stock for each case is both available and in working condition. Sillero and Buil (2021) have also noted inadequate preparation time as a barrier to the surgical team in addition to an excessive workload. However, literature pertaining to the allocation of sufficient preparation time was limited.

#### **4.6. Theme 3: Adhering to guidelines**

Adhering to guidelines was identified as the third theme. (1) Doctors' protocols, (2) operating room checklists, and (3) adhering guidelines, appropriately emerged as subthemes during interviews with the participants. Multiple participants noted this theme as one of the factors that may enhance efficient operating room preparation. Furthermore, a barrier identified in this regard was the use of outdated protocols. The following subsections provide a discussion of these findings with extracts from the interviews that support the relevance of this theme.

##### **4.6.1. Doctors' protocols**

The participants reported that updated and approved doctors' protocols enhance efficient preparation of the operating room. Doctors' protocols are instructions in a form of a document that gives guidelines on the preference of each doctor regarding which

surgical stock and equipment that each prefers during surgery. The following extracts depict the participants' views regarding the adequacy of doctors' protocols:

*The factors that enhance. Okay, the availability of protocols of doctors that are updated and approved by the surgeons (Participant 4).*

*You must first know which procedure you are going to do so that you can prepare according to the procedure (Participant 5).*

*Since we have different doctors and they work in different ways, we decided that we actually have to have protocols to ask them or to follow their procedures in terms of what they use and the different kind of operation they are performing (Participant 12).*

*Okay, and then the use of protocols when you are working with certain doctor and you prepare according to protocol, you have stock or equipment ready as per his or her preference (Participant 4).*

*It is important to prepare the theatre accordingly using the doctors' protocols (Participant 2).*

*Remember, there are guidelines or protocols to follow when preparing theatres (Participant 11).*

#### **4.6.1.1. Barriers associated with doctors' protocols.**

Barriers encountered during preparation of operating room are doctors protocols that, if not updated, can cause a lot of confusion.

*We have doctors' protocols that has to be updated more frequently because doctors also change their specifications or specific items that they are using in theatre so*

*when the protocols are not updated then we cannot prepare theatre efficiently (Participant 2).*

Doctors' protocols emerged as a prominent subtheme during discussions with the participants. Each surgeon has their own protocols, also known as a preference card, which aids the peri-operative nursing staff with preparations of the operating room. Surgical interventions require a large amount of surgical stock, which is kept in a stock room and must be transported to the operating rooms before a surgery commences (Phillips, 2016). A surgical preference card provides the peri-operative nursing staff with a specific list of items that are required for each surgical procedure (Görgülü and Sarhangian, 2022). One benefit of surgical preference cards is their utility in training students and mentoring new peri-operative nurses. Ghasembandi and Mojdeh (2019) noted that surgical preference cards or protocols enhance the performance of students and, therefore, it is recommended as an additional training tool.

#### **4.6.2. Checklists**

In addition to doctors' protocols, checklists were reported to be another factor that enhances the effective preparation of an operating room before surgery commences. Checklists allow the peri-operative nursing staff to verify that they have addressed all the relevant activities in advance. Participants stating the following pertaining to checklists:

*We actually check on the things that are required. That's where we tick and check if everything that they need is there depending on the doctor (Participant 12).*

Preparations done according to checklists emerged as an important subtheme. The participants explained that if an operating room is prepared according to a standardised checklist, it increases the possibility of preparing efficiently prior to the commencement of a surgical intervention. According to Sillero and Buil (2021), non-compliance with the procedure stipulated on the surgical checklist often results in operating room inefficiency. Costa, Dibai, Silva, Firmo, Rêgo, Rabêlo et al. (2021) highlighted the importance of the checklist during the preparation of operating rooms. Furthermore, the authors noted that it has well established reliability and internal consistency and facilitates the safe surgical care of patients (Costa et al., 2021).

Checklists may be used for immediate, pre-procedural, and post-procedural inspections, but they may also be usefully applied throughout a surgical intervention (Fong, Smith and Langerman, 2016). Conversely, Weiser and Haynes (2018) cautioned that checklists may encourage a box-ticking approach to preparation of the operating room and decrease the responsibility of each staff member when attending to the various tasks.

#### **4.7 Theme 4: Human resources management**

Human resources management was identified as the fourth theme during data analysis. Furthermore, the theme comprised of various subthemes including: (1) enough staff; (2) allocation and delegation; (3) communication; and (4) staff competency, knowledge and roles. Participants also identified barriers pertaining to the management of human resources: (1) shortage of staff; (2) feelings of being overwhelmed; and (3) lack of communication.

##### **4.7.1. Enough staff**

One of the factors highlighted by the participants was the need to have a sufficient staff complement to enhance efficient preparation. Sufficient staff decreases or prevents instances of individual team members having to complete an excessive array of tasks without assistance. The participants stated the following in this regard:

*Well as per the policy that we read in our hospital, there should be at least three people in the theatre as the nursing personnel per shift per theatre. That is at least meaning there must be a scrub person, an anaesthetic nurse, and a circulator. Sometimes it's just the scrub person and anaesthetic nurse who have to do anaesthesia and be a circulator at the same time (Participant 1).*

*Shortage of staff as well whereby, you find the theatre being run by two nurses. So you have to fill up the other space and even staff that does not come to work (Participant 11).*

*If there is one sister preparing the sets and also preparing equipment, like diathermy, tourniquets and also doing extras, sometimes you forget because it's a lot of things (Participant 3).*

*If we are enough in the theatre, every case should have its own groups- scrub, circulating, and anaesthetic nurse (Participant 6).*

*Availability of staff and also availability of stock and proper working equipment and time (Participant 9).*

#### **4.7.1.1. Barriers associated with staffing.**

Additional barriers were indicated pertaining to the availability of sufficient staff members and the impact that a lack of staff has on the other peri-operative nurses' ability to adequately prepare the operating room for surgery. This barrier may arise as the result of insufficient staff or absenteeism. Participants evidenced this in following statements:

*Wherein we don't have enough staff members, let's say we are two in the theatre, and it is just me who is scrubbing, and I have to prepare. And there is somebody who is doing anesthesia, who has to prepare. So, when we don't have enough staffing, we end up forgetting some of the things and the preparation is not up to standard as like when we've got enough staff (Participant 1).*

*Most of the time the human resources which is mostly determined by the employer, you find that if in a working setting I am working in, there is not enough staff for the day therefore I have to prepare alone (Participant 4).*

*Shortage of staff because you'll be busy in another theatre and then the doctor books a case next door so you'll have to (Participant 5).*

*Sometimes its equipment issues, or it can be inadequate staffing, or workplace pressure, or violence (Participant 10).*

*And again, staffing. If we have less staff in the unit only to find out that there are few people that are able to prepare the theatres. And then again, you can be, let me see, it can be from poor planning in terms of the protocols again (Participant 12).*

*Staffing can be a barrier if there is not enough staff and if the staff is not efficient or if our staff is incompetent or if our staff is resistant to change. Because, most of the time even if the staffs there, but if they don't know what to do or they are reluctant to do what they have to do then it means that we are not going to be able to reach our target or our proposed target for or proposed goal for that day (Participant 8).*

As noted previously, one reason for insufficient staff was failing to allocate sufficient team members required for that day. However, staff shortages may also occur because of absenteeism, which hinders efficient surgery preparation. A participant expressed their views regarding absenteeism in the following statement:

*Absenteeism can be a disturbance if maybe an employee has not reported on time, so proper outsourcing or maybe extra allocation of somebody to be allocated to their space. Then it will mean that our team is not complete on time (Participant 8).*

The operating theatre is a specialised unit which requires adequate staff members to complete their tasks and duties efficiently. Therefore, a shortage of staff emerged as a barrier to efficient preparation of the operating room. Both private and public hospitals in South Africa have reported shortages of nursing staff, specifically in the operating theatre. In response to this barrier, a private hospital in Gauteng has applied a principle termed *lean management* (Sekoto, 2019). Human resource levels should be cost effective while retaining the safety of patients as a primary priority (Van Zyl et al., 2021). Sekoto (2019) highlighted that pre-operative patient care has become increasingly difficult as a result of this staff shortage. In a study conducted by Siddique et al. (2021), the authors emphasised a staff shortage and excessive workload as two salient factors that affect the management of operating theatres. A study conducted in Sweden by Björn et al. (2017) demonstrated that even if absent staff members were replaced by temporary nurses, the ongoing staff shortage persisted, especially in the areas of specialised nursing.



#### **4.7.2. Staff allocation and delegation**

Various participants expressed that careful allocation of staff and delegation of duties before commencement of surgery enhances the efficient preparation of the operating room. This was evidenced by the following statements made by participants during the interviews:

*We have to have three people per theatre per surgical procedure, which with the three people, is teamwork. The person that is responsible for the theatre or the scrub personnel need to delegate (Participant 2).*

*Delegation is also another factor. To delegate responsibilities to the other team members (Participant 2).*

*You must delegate people so that you must rely on what they are going to do. So there won't be the mixing up of whatever. Everybody will know what he is going to do, so you prepare your things (Participant 5).*

##### **4.7.2.1. Barriers associated with allocation and delegation of personnel.**

Participants expressed that, at times, they had become overwhelmed by the scope of their duties while preparing the operating room. This presented a further barrier to efficiency that was encountered by the participants. The participants stated the following:

*You find that a person will work more than 42 hours per week. And with that you find that someone works from seven to seven for three or four consecutive days. It is with theatre that you work 12 hours and you have calls on that as well. So, a person will have to work Monday, Tuesday, Wednesday, and Thursday. By the time you reach Thursday, a person is tired (Participant 2).*

*Sometimes you find that I'm just not well emotionally and this is the thing that you really need to concentrate on. I consider it as human factors, if I may put it that way because if you are really hungry or you are really mentally disturbed you will forget just a simple thing (Participant 4).*

*Our seniors or our scrubs push other staff to work and you find that the patient in the theatre is not ready, just that they want to finish on time. Then, when you push them, you work under pressure because you are not prepared (Participant 10).*

The subtheme pertaining to the allocation and delegation of personnel prior to surgery emerged during interviews with the participants. An operating room requires adequate nurses with well-defined duties and responsibilities to function optimally. A common challenge in the management of an operating room is the extreme variations in daily workloads; this renders it difficult to assess staffing needs in advance (Xiang et al., 2015). Breuer, Lahrichi, Clark and Benneyan (2020) designed a model that assists with staff scheduling and is capable of accommodating deviations should they arise. Bjorn et al. (2017) noted that there is an increased demand for productivity in the operating theatre environment which further affects the management of surgery scheduling.

The feeling of being overwhelmed might arise because of imbalances in allocation and delegation of duties which results in pressure for staff to perform at an increasingly high level. Sandelin et al. (2019), who noted that peri-operative nurses felt that they lacked control over their allocations and delegations and that this hindered their ability to provide safe patient care, also reported the experience of becoming overwhelmed. The pressure and stress experienced by peri-operative nurses occurs because of extended working hours in the absence of adequate rest periods during complex, combined, or consecutive surgical cases (Zhou and Gong, 2015). Peri-operative nurses play a critical role in healthcare service delivery and, therefore, they require a working environment that facilitates their ability to carry out their duties efficaciously (Björn et al., 2017). Fair allocation and delegation of nurses in the operating room may mitigate some of the pressure and decrease experiences of becoming overwhelmed. Peri-operative nurses are expected to retain adequate concentration when inspecting surgical equipment and attending to patient safety, even in the context of stress and pressure resulting from lengthy work hours (Li, Zhang, Li and Lu, 2021).

### **4.7.3. Communication**

The participants expressed their beliefs pertaining to the benefits of effective communication between surgical team members. They viewed it as one of the factors that may enhance the efficacious preparation of the operating room.

*The communication between the nurses and the doctors. The list should have been discussed before it commences. A scrub nurse and a surgeon, and perhaps maybe the anesthetist team should really discuss the slate (Participant 4).*

*Team talk, which is to maintain communication with your staff, because it's going to avoid delay time to start. It's going to also, you have to track the second and each time and create easy surgery scheduling process (Participant 10).*

*Alright, I think team talk is so much important. Delegation, so that one should know his or her duties, responsibilities, and roles in that theatre (Participant 11).*

#### **4.7.3.1. Barriers associated with communication.**

Inadequate communication amongst team members represents an additional barrier described by one participant. The participant stated the following:

*There is a lack of communication amongst team members. Other team members show a lack of interest as well (Participant 2).*

Inadequate communication between various team members was highlighted as a barrier to efficient preparation of the operating room. Sandelin et al. (2019) found that pre-operative dialogue between the team members involved in a surgical procedure is a requirement for efficiency and safe patient care. The participants of the present study concurred with this finding and expressed that adequate communication during the preparation of the operating room would improve their ability to complete their duties with increased efficiency. Işık et al. (2020) stated that communication was the most important aspect of peri-operative care and was necessary for effective teamwork. A lack of communication amongst team members may lead to confusion regarding team members' roles and responsibilities. Fong et al. (2016) described communication in the operating theatre as the motivator of teamwork and furthermore, the authors view communication as a primary factor that leads to successful surgery;

all team members play an integral role in planning interventions before surgical procedures commence. Wang and Ju (2017) noted that poor communication creates unsafe conditions that may compromise patient care. Communication should take place during all the phases of operating room activities, including preparation, commencement of surgery, teaching and training, and the completion of procedures (Wang and Ju, 2017). The factors that lead to effective communication have been less documented than those that create communication barriers; however, factors that have been noted include team integration, the use of checklists, and team briefings (Etherington, Wu, Cheng-Boivin, Larrigan and Boet, 2019).

#### **4.7.4. Staff competency, knowledge and roles**

One of the participants stated that adequate knowledge regarding peri-operative nursing, procedures, and equipment enhances the efficient preparation of the operating room. This participant expressed the following:

*They must be knowledgeable about the machines, how to connect the machinery that will be needed, and how to position the patient for the procedure (Participant 7).*

Another participant focused more attention on the impact of adequately understanding the roles and responsibilities of each surgical team member and the manner in which this increases efficiency when preparing the operating room prior to surgery. This participant stated:

*You need to make sure that they have done their part on their side. Whatever that they have been delegated for. And, it also adds to their responsibilities as well because they go together (Participant 11).*

The importance of knowledge, responsibilities, and roles arose as a prominent theme during interviews with the participants. One possible reason for the significance of this theme is that role clarification is important when attending to the various responsibilities that encompass operating room preparation. Peri-operative nurses are responsible for familiarising themselves with the equipment in the operating room and how it functions to enhance patient safety and increase efficiency. Ma, Mu, Wei and

Wang (2021) stated that operating theatre nurses should acquire the skills necessary for working with the advanced technological equipment present in an operating room to ensure the efficacious and successful completion of complicated surgeries. Jafari and Levine (2017) conducted a study pertaining to measures for improved efficiency. The authors noted that access to education and adequate training enhanced surgical team members' awareness of their roles and responsibilities and in turn, improved workflow, promoted increased accountability, and facilitated teamwork during the turnover process (Jafari and Levine 2017). Michalak and Kotomska (2021) described the responsibilities of surgical nurses and stated that they include the total preparation of an operating theatre room according to a planned case and to assist during the surgical intervention. Role clarification when preparing an operating theatre is important because it decreases confusion and ensures that all role players are aware of their responsibilities.

#### **4.8 Summary**

Chapter 4 presented the results and interpretations of the present study. This included the importance of preparing the operating theatre room before surgery commences, factors that enhance the efficient preparation of the operating room, and barriers that have been encountered in the preparation of an operating room. The majority of participants indicated that it is important to prepare the operating room before surgery commences. Extracts from the interviews with the participants were provided to demonstrate the findings of the study. In addition to this, the findings of the study were viewed in the context of existing literature. Chapter 5 provides a discussion of the conclusions and recommendations.

## CHAPTER 5

### CONCLUSION, RECOMMENDATIONS, LIMITATIONS AND REFLECTION

#### 5.1 Introduction

The preceding chapter (Chapter 4) outlined the findings of the current study. Chapter 5 discusses the conclusions and recommendations based on the research aim, objectives, and research question set out in the beginning of the study. Moreover, this chapter includes the limitations of the study and the researcher's personal reflection of the study and research process.

#### 5.2 Research aim and objectives

The aim of the current study was to explore and describe the views of peri-operative nurses regarding preparations of theatres to enable efficiency in operating theatre room. The objectives of the study included:

- To explore and describe the views of peri-operative nurses on the importance of preparing operating theatre rooms.
- To explore and describe the views of peri-operative nurses regarding factors that facilitate efficient preparation of operating theatre rooms.
- To explore and describe the views of perioperative nurses regarding barriers to preparing of operating theatre rooms.

#### 5.3 Conclusions

Based on the findings of the study, majority of the participants agreed that it is important to prepare the operating theatre room before commencement of a surgery. The factors that facilitated efficient preparations were also outlined by the participants, as well as the identified barriers.

##### ***5.3.1. The importance of preparing operating theatre rooms***

In reference to the importance of preparing operating theatre rooms, the participants viewed it as a crucial facet in order to prevent additional costs for a patient. These costs were associated with keeping a patient inside the operating rooms and was deemed unnecessary if the operating theatre room is prepared on time. Costs were believed to be reduced if the perioperative nurses were not moving to and from the operating theatre room to collect stock and equipment. In addition, the surgical site

infection associated with prolonged operating time was viewed by perioperative nurses as a preventable exercise- closed off theatre doors and subsequent sterile operating theatre were deemed to be a preventable aspect associated with surgical site infection. This is mainly because the theatre environment inside the is regulated by ventilation system which allows the operating rooms to be temperature controlled and in an optimal sterile condition, which also amongst other aspects, relies on the theatre doors being kept closed.

Further, participants viewed the preparation of an operating theatre room as important as it allows them to prepare stock and inventory by ensuring that surgical equipment and resources are easily accessible before surgery. Preparation of the operating room also allows perioperative nurses to identify and retrieve out of stock consumables from the stock controller before commencement of surgery. Thus, the preparation of an operating room regarding stock and inventory before prevents time delays of surgery. Moreover, additional movement in and out of the theatre is viewed as an adverse aspect that potentially endangers a patient's life. In this sense, participants noted that nurses who roam around during surgery was viewed as a lack of care for the patient's wellbeing. Overall, participants acknowledged the importance preparing the theatre operating room as it not only affects surgery delays, additional costs, but also affects patient experience associated with attentive care from operative staff.

### ***5.3.2. Factors that facilitate efficient preparation of operating theatre rooms***

Different views from participants were put forward regarding the factors that enhance that effective preparation of the operating theatre room. Preparation of equipment and positioning to easily access instruments ensured that the operating room was prepared efficiently and that surgery ran smoothly. The preparation of equipment included checking that the equipment was in working condition for the surgery staff. Moreover, allocation and delegation of staff members before surgery was viewed as an enabler as perioperative nurses are aware of their responsibilities with regards to the preparation of theatre room beforehand. Further, having sufficient resources was also viewed as a factor that enhances efficient preparation of the operating room. For example, a sufficient amount of resources included having enough staff to effectively prepare the operating theatre room. Additionally, participants noted that time issued to prepare the operating theatre was another enabler. Time is considered an important

factor to effectively prepare the operating theatre room before the arrival of a patient. The perioperative nurses mentioned time management is a necessary factor in ensuring that the patients are booked and admitted for surgery, considering the sequence and time in between theatre lists. It was noted that it was important that the booked cases/surgeries matched the number of staff on duty. By doing so, the preparation of the operating theatre is more likely to be efficient and to afford easy operational dynamics.

Furthermore, doctors' protocols and checklists were also viewed as factors that enhance the efficient preparation of the operating theatre. Updating protocols as per doctors' preference and suggestions allowed peri-operative nurses to ensure that all the equipment and stock that were going to be needed for the surgery, was available beforehand. The use of checklists also made it easy for participants to check and ensure that all equipment and resources, needed for each case, were available. However, the disadvantage of checklists was that they are often considered as *tick lists* – in this sense, staff will just 'tick' without properly checking the availability of the equipment or stock. Moreover, communication between the surgical team was deemed an important factor as it ensures that all members of the surgical team are informed about what is expected from them during each case.

### **5.3.3. Barriers to preparation of operating theatre rooms**

The perioperative nurses mentioned different barriers towards preparing the theatre operating room efficiently. The barriers mentioned were found to counter act efficiency and some of the barriers were noted to be beyond the control of participants. Perioperative nurses mentioned that one barrier included surgeons booking patients without a proper scheduling system, as well as surgeons not adhering to their pre-scheduled slots. The disorganisation of the scheduling system prevented participants from preparing the operating rooms in time before surgery commences. Another barrier that was mentioned included the clustering of cases due to the pressure placed on nurses by surgeons, which resulted in the lack of efficient preparation. Pressure from surgeons often occur when surgical staff book patients without following proper channels or systems, even if the patient is not an emergency case. This culture of non-adherence to scheduling causes confusion, frustration, and overwhelming feelings



amongst perioperative nurses. In turn, the mismanagement of theatre lists result in participants staying after-hours and leaving the hospital late.

Moreover, peri-operative nurses feel that the allocation of their work hours is a barrier on the efficient preparation of operating rooms as they end up being over worked with longer work hours per week, without being given a rest day in between shifts. As a result, participants noted that they become fatigued and unable to concentrate on their duties. The long hours and being on call after 19h00 which results in them leaving very late in the evening and sometimes early hours of the following day. This is further exacerbated by the shortage of staff. In the context of this study, the shortage of operative staff may cause delays in the efficient preparation of the operating room. Findings showed that lack of equipment and shortage of stock were also identified as another barrier. Participants also mentioned that they found themselves destitute and unable to prepare operating rooms due to a lack of resources and staff.

#### 5.4 Recommendations

The recommendations presented in Table 5.1 were made in accordance with the themes. The recommendations were also based according to the group of professional body who are responsible to affect the recommendations as provided from this research.

**Table 5.1: Themes and recommendations table**

Theme	Recommendations
Patient aspects	<ul style="list-style-type: none"> <li>The patient should only be “clocked in” once the operating room is ready to cater for the needs of the patient. Clocking in beforehand will likely lead to charging the patient with additional costs due to the time spent in the operating theatre.</li> </ul>
Environmental aspects	<ul style="list-style-type: none"> <li>The hospital could introduce a scheduling system that includes a prediction of procedure duration which will aid the theatre manager in efficiently managing time allocation to surgeons and having more control over bookings.</li> <li>The squeezing of doctors can be mitigated by ensuring that the surgeons start on time and additional cases may be accommodated if they do not inconvenience the following on-call surgeon.</li> </ul>

- Adhering to guidelines

    - Ensuring availability of stock can be enhanced by adhering to the maximum and minimum availability levels. The stock controller should be able to note when the stock has reached minimum levels and order additional stock in a timely manner.
    - The perioperative nurses should update protocols and encourage doctors to acknowledge these by signing a written document detailing the protocols.
    - It is recommended that the surgical safety checklist should be strictly followed as it addresses the patients' safety and includes measures that prevent harm to patients. The checklist also reinforces that all team members must be available in an operating room during all three phases of the checklist.
  - Human resource management

    - The hospital management could consider re-hiring retired nurses who are still able to perform the job profile of a perioperative nurse.
    - A program to absorb newly qualified registered nurses in a specialised environment, such as the operating theatre, with further mentoring in operating theatre skills.
    - It is recommended that delegation and allocation procedures should be adhered to in the operating theatre in line with other nursing units, taking into consideration busy days, the days that staff are put on call to finish the lists, and to adequately allocate rest days.
    - The team should have briefing sessions before the commencement of a surgery and involve all surgical staff. This session might reinforce positive communication and help clarify the responsibilities of each individual.
- 

#### **5.4.1 Recommendations to the nursing practice**

- A standard can be introduced where it mitigates against the bottle neck effect of patients inside the operating room before checking that all surgical stock, equipment, and sets are ready for the procedure.
- The researcher recommends that the surgical safety checklist should be followed up to the last phase because the checklist addresses the patient's safety and measures that prevent patient harm. The checklist tool also enforces that all team members must be available in an operating room during all three phases of the checklist.

- The nurses need to ensure that the management of stock is communicated to the management team and ensure that the stock is charged for a simpler replacement process.
- The researcher recommends the surgical team should have a briefing session before commencement of surgery which involves all surgical staff members. This session might enforce more effective communication and understanding of operative responsibilities.
- The peri-operative nurses should make time to update protocols and allow doctors to acknowledge them by signing relevant documents.
- The nursing staff can have meeting sessions after long and difficult days where they can have an environment to debrief and support each other. These sessions can mitigate the feeling of helplessness and enhance comradery.
- Skills planning and in-service training can be organised and implemented to upskill and impact more knowledge to peri-operative nurses.

#### ***5.4.2 Recommendations for hospital management***

- Movement of staff in and out of the operating room is mainly due to inadequate preparation of the theatre. The researcher recommends that the practice of having surgical stock trolleys inside the operating rooms should be revisited as this practice allow the staff to place stock that might be used in case of surgery complications or when a surgeon decides to use the surgical stock that is not normally on the protocol or preference card.
- The stock control issue can be mitigated by hospital management support, especially by the pharmacy manager by ensuring that there is enough stock in operating theatre. The theatre manager can also ensure that stock is charged and billed by having processes in place that ensures that the used stock is charged and billed to allow easy replenishment of stock.
- The hospital should invest in new equipment through Capex budget and also ensure that broken equipment is repaired or replace as soon as possible. There is also a need to ensure that there is enough equipment for booked cases. Alternatively, the sequencing of cases can be planned in such a way that it allows equipment to be shared amongst patients and theatre rooms.

- The hospital can introduce a scheduling system which includes a procedure duration prediction which will aid the theatre manager in managing time allocation to surgeons and to have better control over bookings. Another solution might be to have measures to control the additional cases which inconveniences nurses when they have to prepare for the unplanned surgeries.
- The researcher recommends that principles of delegation and allocation should be adhered to in the operating theatre like any other nursing unit in the hospital - taking into consideration busy workflow days, the days that staff are put on call to finish the lists, and to allocate rest days adequately to prevent burnout.
- Another recommendation is that the theatre manager could arrange a staff member, even on a lower category, to prepare the operating room for other cases while the surgical team is busy in another operating room. This should also include all parties involved.

#### **5.4.3. Recommendations for doctors**

- Lack of time to prepare the operating theatre goes back to the scheduling system for cases. The surgeons need to adhere to the scheduled time for their booked cases which will decrease instances where the cases overlap to the next booked surgery. The spacing of cases should also give the perioperative nurses enough time to prepare.
- The surgeons can standardise the availability of their preference with regards to the equipment and stock that they require for each surgical intervention and ensure that other surgical staff are familiar with what their preference cards entails.

#### **5.5 Future research**

The researcher recommends that future research could entail a quantitative inquiry to audit the efficiency and standardisation regarding the preparation of an operating theatre room. The study can be carried out in the hospital group in South Africa to benchmark the efficiency within the different operating theatres. The study could further identify the gaps during preparation of operating theatre rooms which will enable future researchers to come up with strategies to mitigate these delays. Furthermore, there is a need to research theatre case scheduling systems which often creates barriers in hospital settings. Recommendations and strategies can allow for

cases to be booked in a way that it allows the surgeons to be able to see their utilisation of slates and out of slates utilisation. This will enable the hospital to identify the gaps within the booking system and mitigate the effect of overlapping cases, and surgeons who book out of their slates.

## **5.6 Limitations**

The study was limited in the process of data collection as the researcher was promoted to the Deputy Nursing Manager position of the operating theatres during the time of the current study. This position is a position of power and participants who were interviewed after the researcher assumed the managerial position, could have answered the interview questions in a biased or favourable manner. However, the researcher mitigated this by explaining that the study was initiated long before the researcher assumed the position. Another limitation is that the study collected data from only one hospital which might entail that the views shared in the current study did not represent the whole population of the private hospitals in South Africa.

## **5.7 Researcher's reflections**

My career as a nurse in the operating theatre started more than a decade ago, which made it possible for me to engage in the research within a familiar environment. The study was a memorable journey which allowed me to listen to the stories of perioperative nurses as they unfolded during the interviews. The frustrations in their voices gave me a new perspective on how to plan the activities within the operating theatre and on how to plan and manage off duties. The study made the peri-operative nurses aware of the costs implications of not preparing the operating rooms which was a moment of realisation on their part. The perioperative nurses who participated in the study later understood the need to prepare operating rooms before commencement of surgery. After the interviews they would come up with suggestions on the ways to improve the practice which made it clear to me that there was really a need to create more awareness on the efficiency in an operating theatre. It made me feel that my study was already having an impact by changing the conscientiousness of participants even before the study was concluded. The study also gave me the opportunity to plan staff development and to engage with staff and learn from their subjective experiences. As a new manager and having the responsibility of increasing the efficiency in operating theatres, the process of immersing myself within the literature gave me

insight on how other operating theatres are being managed, worldwide, which formed part of important new knowledge. I used the information from prior research to respond to the difficult questions and to support my answers with scientifically based evidence. Further, this research study gave me insight in how to write in an academic manner which enhances skills to write reports, to investigate root causes, and the research assisted with encouraging analytical and critical thinking which is helpful in a medical environment. However, I found that the research journey was not an easy one it offered many challenges, as well as learning experiences, which helped in building self-resilience.

The most difficult part during this process was when my initial supervisor passed away during the proposal phase. But my then co-supervisor stepped up to become my supervisor and further assisted me to continue with the research study. There were days where I would feel like giving up but I had a very supportive supervisor who would often encourage me and this made me continue to sit down and work on my research. In addition, the comments and feedback from supervisors were sometimes upsetting, and I would initially read these as criticism, until I had to re-read the comments which they then would make sense and found them more constructive in ensuring a well written research study. Later on, I got used to accepting negative feedback as constructive, rather than taking it personally and learning to defend some of the aspects with facts.

The other major challenge was the Covid-19 pandemic which made it difficult to collect data as the perioperative nurses were sent to the wards to take care of Covid patients. I had a daunting fear of not being able to finish the study due to these challenges but the need to earn and acquire more knowledge outweighed the fear. The realisation that I am about to finish came when I was writing Chapter 4 that is when the sense of relief came about and that was a proud moment to see the results the study produced.

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