EVALUATION OF HOSPITAL-ACQUIRED INFECTIONS PREVENTION AND CONTROL PROGRAMME FOR NURSES IN THE PUBLIC HOSPITALS OF LIMPOPO PROVINCE

DOCTOR OF PHILOSOPHY

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EVALUATION OF HOSPITAL-ACQUIRED INFECTIONS PREVENTION AND CONTROL PROGRAMME FOR NURSES IN THE PUBLIC HOSPITALS OF LIMPOPO PROVINCE

By

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THESIS

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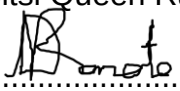
DECLARATION

I declare that “Evaluation Of Hospital-Acquired Infections Prevention And Control Programme For Nurses In The Public Hospitals Of Limpopo Province ” is my own work and that all the sources that I have used or quoted have been indicated and acknowledged utilizing complete references and that this work has not been submitted before for any other degree at any other institution.

Lebitsi Queen Ranoto — 03 June 2025



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ABSTRACT

Background: Hospital-acquired infections (HAIs) are a critical global health challenge, posing risks to patient safety and increasing healthcare costs. Infection Prevention and Control (IPC) programs are vital for reducing the incidence of HAIs. However, effective implementation of these programs, particularly in resource-constrained settings, remains a challenge. This study evaluates the implementation of IPC programs in public hospitals in Limpopo Province, South Africa, applying a mixed-methods approach guided by implementation science frameworks.

Purpose: The study aims to: (1) conduct a baseline assessment of IPC activities using retrospective data and the Infection Prevention and Control Assessment Framework (IPCAF); (2) explore the attitudes and practices of hospital IPC nurses toward IPC program implementation; and (3) develop an evidence-based strategy to address gaps and improve program outcomes, informed by the WHO Multimodal Strategy.

Methodology: This three-phased mixed-methods study began with a quantitative analysis (Phase I) of hospital compliance with IPC standards using the IPCAF tool. Phase II employed qualitative methods to explore nurses' attitudes and practices through interviews, analysed using the Theoretical Framework of Acceptability (TFA). Thematic analysis highlighted constructs such as perceived effectiveness, burden, ethicality, and self-efficacy. Phase III integrated these findings into a tailored improvement strategy using the WHO Multimodal Strategy to design iterative, sustainable interventions. Furthermore, the results from both phases were integrated and interpreted.

Findings: Phase I revealed inconsistencies in IPC compliance, with gaps in resource allocation and program governance. Phase II highlighted critical themes influencing nurse engagement, including ethicality, perceived burden, and affective attitudes. The proposed improvement strategy incorporates the WHO Multimodal Strategy's core components—system change, training, monitoring, reminders, and institutional safety culture—adapted for the local context.

Conclusion: The integration of the WHO Multimodal Strategy with implementation science frameworks provides a robust approach to addressing systemic challenges in IPC program implementation. This study demonstrates the potential for tailored, evidence-based interventions to improve healthcare outcomes in resource-limited settings.

Key words: Hospital-acquired infections, infection prevention and control, WHO Multimodal Strategy, implementation research, mixed-methods study, Limpopo Province, healthcare quality improvement.

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LIST OF ABBREVIATIONS

AMR	Antimicrobial Resistance
CC	Core Components
HAI	Hospital Acquired Infections
IHR	International Health Regulation
IPC	Infection Prevention & Control
IPCAF	Infection Prevention & Control Assessment Framework
IPCAT	Infection Prevention & Control Assessment Tool
ICREM	Ideal Clinic Realisation Model
MMIS	Multimodal Implementation Strategies
PHC	Primary Health Care
SDG	Sustainable Development Goal
WASH	Water, Sanitation & Hygiene
WHO	World Health Organisation
CAUTI	Catheter-Associated Urinary Tract Infection
CLABSI	Central Line–Associated Bloodstream Infection
PLABSI	Peripheral Line-Associated Bloodstream Infection
NHSN	National Healthcare Safety Network

DEFINITION OF CONCEPTS

Evaluation: Evaluation is defined as the systematic collection and analysis of information about a program's activities, characteristics, and outcomes to reduce uncertainties, improve effectiveness, and inform decision-making. This process incorporates the goals, concerns, and perspectives of stakeholders, ensuring that the evaluation is both comprehensive and contextually relevant. It serves various purposes, such as guiding program improvement (formative evaluation), assessing program delivery (process evaluation), determining program success (summative evaluation), measuring program results (outcome evaluation), and assessing long-term effects (impact evaluation) (Rossi et al., 2003).

Intervention Development: The perception that describes the rationale, decision-making processes, methods, and findings that occur between the idea or inception of intervention until it is ready for formal feasibility, pilot, or efficacy testing before a full trial or evaluation (Hoddinott, 2015). In the context of this study, intervention development referred to the rationale for improving infection prevention and control through interventions that were piloted and evaluated in health facilities.

Strengthening: In the context of public health, strengthening refers to deliberate and sustained efforts aimed at enhancing the capacity, efficiency, and resilience of health systems. This includes initiatives to improve various health system functions, such as service delivery, workforce, information systems, access to essential medicines, financing, and governance, to achieve better health outcomes through improved access, coverage, quality, and efficiency (Senkubuge et al., 2014).

Implementation: According to Merriam-Webster, implementation is an act or instance of implementing something: the process of intervening actively or effectively (Merriam-Webster, 1995). This definition was employed in the study.

Infection prevention and control: The World Health Organisation (WHO) describes Infection Prevention and Control (IPC) as a practical, evidence-based approach that prevents patients and health workers from being harmed by avoidable infection

because of antimicrobial resistance. This approach is based on infectious diseases, epidemiology, social science, and health system strengthening (WHO, 2013). In the context of this study, the WHO's definition of IPC was adopted. Limpopo has 4 types of public hospitals, namely; tertiary, regional, district, and specialised hospitals.

Programme: a series of actions which are designed to achieve something important (Merriam-Webster, 1995). In the context of this study, programme referred to activities, procedures and policies designed to reduce the spread of infections in hospitals.

Infection prevention and control (IPC) nurse: A health worker that has a qualification equivalent to the minimum of Fundamental or Postgraduate diploma/degree in IPC (Stone et al., 2009). In the context of this study, infection prevention and control practitioner referred to a healthcare worker with relevant qualifications to implement the IPC programme.

Hospital Acquired Infections (HAI): Healthcare-associated infections (HAIs), or "nosocomial" and "hospital acquired infections", are infections that occur after 48 hours of receiving healthcare, and were not present or incubating at the time of admission (Thathi, 2023). In the context of this study, the foregoing definition of healthcare acquired infections was adopted.

Public Healthcare Facilities: In this study, public healthcare facilities were defined by Stone et al., as entirety of a public non-profit health institution, facility, building or place, that is operated or designed to provide treatment; diagnostic or therapeutic interventions, nursing, rehabilitative, palliative, convalescent, preventative, or other health services (Stone et al., 2009). In the context of this study, public healthcare facilities were referred to as hospitals.

Healthcare worker: A healthcare worker is any person who delivers healthcare and services (directly or indirectly) in a health facility to users. It includes healthcare professionals and support staff (cleaners, food service workers, laundry staff, administrative staff etc.) (Subramanian et al., 2017). In the context of this study, healthcare workers were referred to as nurses in public hospitals.

CHAPTER ONE: ORIENTATION TO THE STUDY

1.1 Introduction and background

The accomplishment of better health outcomes, comprehensive health coverage, and generally improved value of health requires a combined and continuous healthcare delivery system supported by strengthening the health system's building blocks (Storr et al., 2017). One of the important building blocks is infection prevention and control (IPC) in the healthcare system. This is a practical, evidence-based approach aimed at preventing patients and health workers from being harmed by avoidable infections (Haque et al., 2020). This IPC programme is considered one of the important building blocks because it is a collection of activities, resources, policies, and procedures designed to control and prevent the transmission of infectious diseases within the healthcare environment and the community (Vandijck et al., 2013). These relate to not only protecting those accessing health services from the spread of infectious or pathogenic disease, but also to protecting healthcare workers, their families, and other persons associated with health services (Haque et al., 2020).

1.1.1 The scope of IPC programme

The IPC programme is a critical component of healthcare systems designed to minimise the risk of healthcare-associated infections (HAIs) and ensure patient safety (Allegranzi et al., 2011a; Storr et al., 2017). The scope of the IPC programme encompasses a wide range of activities and interventions aimed at preventing the spread of infections within healthcare facilities (Pittet et al., 2006).

1.1.2 Main purpose

The primary purpose of the IPC programme is to protect patients, healthcare workers, and visitors from the risk of acquiring infections within the healthcare setting(Kubde et al., 2023). It aims to reduce the incidence of HAIs through evidence-based practices, ensuring that healthcare services are delivered in a safe environment (Allegranzi et al., 2011a). The programme also seeks to promote a culture of safety and hygiene

among healthcare workers, thus encouraging adherence to infection control protocols and guidelines (Pittet et al., 2006).

1.1.3 Implementation of the IPC programme

The IPC programme is implemented through a structured approach that includes the development and enforcement of policies and guidelines, continuous monitoring and evaluation of infection control practices, and regular training and education of healthcare workers (Alhumaid et al., 2021; Wang et al., 2019). Key strategies involve the establishment of an IPC committee, regular audits and feedback, and the use of surveillance data to inform decision-making (Abraao et al., 2022). Additionally, the programme emphasises the importance of hand hygiene, proper use of personal protective equipment (PPE), and environmental cleaning as foundational practices in preventing the spread of infections (Pittet et al., 2006). Implementation is supported by regular training sessions for healthcare workers, ensuring that they are updated on the latest guidelines and practices. Furthermore, the programme integrates feedback mechanisms where healthcare workers can report challenges or non-compliance, thus allowing for a continuous improvement and adaptation of strategies (Allegranzi et al., 2011a).

The intent behind the IPC in the medical field is to prevent the transmission of HAIs to patients, healthcare providers, guests, and other individuals connected to medical institutions (Thakur and Rao, 2024). These infections could be endemic or epidemic which means that endemic infections could be connected to or not to the use of tools or procedures during medical care; while the epidemic infections could be starting within the patient population in the medical facility; or a result of community-acquired infections spreading to patients in the medical facilities that offer care, leading to the amplification of epidemics of community-acquired infections (H. A. Khan et al., 2017). The IPC programme not only focuses on preventing HAIs, but also plays a crucial role in addressing broader public health concerns (Gilbert and Kerridge, 2019). It aims to equip medical facilities with the necessary tools and strategies to manage both endemic and epidemic infections effectively (Storr et al., 2017). In this context, the IPC programme has several key objectives to get medical facilities ready for the early

identification and management of epidemics and to plan an efficient and timely response. These objectives are listed below:

- To support a coordinated effort to control community-acquired infectious diseases, endemic or epidemic, that might be “amplified” through medical care;
- To contribute to a coordinated response to control community-acquired infectious diseases, endemic or epidemic, that may be “amplified” via healthcare;
- To contribute to preventing the emergence of antimicrobial resistance and/or dissemination of resistant strains of microorganisms; and
- To minimise the environmental impact of these infections or their management.

Hospital IPC programmes are designed to minimise rates of preventable HAIs and acquisition of multidrug-resistant organisms, which are among the most common adverse effects of hospitalisation (Gilbert and Kerridge, 2019). The ultimate aim of the IPC programme is to ensure a high quality of health service delivery for every person accessing healthcare, and to protect the health workforce delivering those services (Nejad et al., 2011). Failures of hospitals’ IPC programmes in recent years have led to nosocomial and community outbreaks of emerging infections, causing preventable deaths and social disruption. Therefore, effective IPC programmes are essential, but can be difficult to sustain in busy clinical environments (Gilbert and Kerridge, 2019).

1.1.4 The infection prevention and control core components

WHO’s core components for IPC are important building blocks for effective IPC programmes worldwide (Tomczyk et al., 2022). There are eight core components proffered by WHO for IPC, which are the foundation for establishing or strengthening effective programmes at various levels of care (Storr et al., 2017). These eight core components are IPC programme; IPC guidelines; IPC education and training; HAI surveillance; multimodal strategies; monitoring and auditing of IPC practices and feedback; workload, staffing, and bed occupancy; and the built environment, and materials and equipment for IPC (Sonpar et al., 2025). The guidelines cover eight core

components of IPC, incorporating best practice recommendations and offering specific suggestions for effective implementation. These core components have been discussed further in Chapter 2 under the literature review.

1.1.5 Infection prevention and control assessment framework

Implementing IPC effectively requires ongoing monitoring and assessment (Sonpar et al., 2025). To support the implementation of the WHO's guidelines on essential elements of IPC programmes in acute healthcare institutions, the IPC Assessment Framework (IPCAF) was developed (Tomczyk et al., 2020a). IPCAF is a structured, closed-formatted questionnaire with an associated scoring system and is typically self-administered, allowing healthcare facilities to evaluate their IPC practices and identify areas for improvement (Tomczyk et al., 2020a; Wood et al., 2024). It comprises 81 indicators subdivided into eight sections corresponding to the eight WHO IPC core components.

Each section generates a score between 0 and 100. According to the final score (ranging from 0 to 800), the facility IPC programme implementation is categorised into four levels: inadequate (0–200), basic (201–400), intermediate (401–600), or advanced (601–800). The eight WHO core components are used as the basis for the scoring system in the IPCAF, a questionnaire designed to assess the degree of IPC implementation (Azak et al., 2023). The instrument underwent qualitative pre-testing, revisions, and selective translations (Azak et al., 2023).

1.1.6 The burden of HAIs

On average, 1 in every 10 patients is affected by HAIs worldwide (Raoofi et al., 2023). In acute care hospitals, out of every 100 patients, 7 in developed and 15 in developing countries will acquire at least one hospital-acquired infection (Abban et al., 2023). In high-income countries, up to 30% of patients are affected by at least one hospital-acquired infection in intensive care units, and in developing countries, the frequency is at least 2–3 times higher (Gautsch, 2024). Although good success has been seen in many countries, HAIs such as methicillin-resistant Staphylococcus aureus (MRSA)

remain an important challenge for many countries (Henderson and Nimmo, 2018). In addition to MRSA, there are some drug-resistant microorganisms such as multidrug-resistant Escherichia coli and carbapenem-resistant Enterobacteriaceae which are becoming problems of public health importance (Henig et al., 2022).

While each year hundreds of millions of patients are affected by HAIs, this problem usually receives public attention only when there is an outbreak or epidemic, as with the recent Ebola virus disease outbreak in West Africa and the most recent COVID-19 pandemic (Anis, 2019; Read et al., 2021). Although often hidden from public attention, the IPC challenges are a very real ongoing problem, and no institution or country can afford to ignore it (Anis, 2019).

1.1.7 The impact of HAIs in a health facility

The risk of HAIs is increasing, and they also occur with healthcare interventions including invasive, diagnostic, surgical, and medical procedures (Friedrich, 2019). The HAIs have a detrimental effect on individuals' quality of life and are very costly as they contribute to significant morbidity and mortality (Calfee, 2012; Friedrich, 2019). These infections are the most common complications affecting hospitalised patients and are the fourth most common cause of death (Vandijck et al., 2013). HAIs represent the most frequent adverse event associated with healthcare delivery and result in prolonged hospital stays and deaths worldwide (Teixeira et al., 2021).

1.1.8 Evidence before this study

According to WHO, IPC programmes and practices are essential for ensuring outbreak preparedness and control, patient safety, and the overall quality of care within healthcare systems worldwide (WHO, 2013). These practices are critical components of universal health coverage, as they help to prevent the spread of infections, protect healthcare workers, and ensure that healthcare services remain safe and effective across various settings worldwide (Pittet et al., 2006). However, detailed IPC evaluations using standardised validated tools, such as the WHO IPC self-assessment framework, IPCAF in South Africa, are limited.

The researcher searched PubMed, and WHO global health databases between Jan 1, 2011, and June 30, 2021, for peer-reviewed and preprint articles that reported local assessments of IPC programme implementation at the facility level using the search terms “infection control” and “global survey”. The researcher identified one study using the IPCAF in a comparable result varied by income level, between private and public hospitals. This national study in South Africa used an adapted version of the IPCAF; a self-assessment to obtain the baseline for the components. The challenges noted by researchers while monitoring IPC in hospitals in Limpopo Province, include, among others:

- *Training*

A shortage of experienced and properly trained Infection Control Practitioner officials exists in Limpopo Province and if no interventions are put in place, this shortage will continue to worsen, as currently practicing IPC nurses retire or move on to other positions (Malematja et al., 2025). Healthcare workers currently practicing as Infection Control nurses have received variable training, while others have received no training at all, and some expressed the concern that the type of training they received did not fully equip them to run efficient infection prevention and control program. Therefore, in addition to the lack of confidence, these ill-equipped infection control officers often had no authority to act, which renders them ineffective (Malematja et al., 2025; Moyakhe, 2014).

- *Staffing*

The lack of dedicated infection prevention and control posts on staff establishments at all levels, from the institutional to the district level is concerning (Malematja et al., 2025; Moyakhe, 2014). This approach to IPC is associated with the lack of clear job descriptions for IPC. Due to staff shortages, it is not always possible to adequately orient and do in-service training to nursing staff on infection control issues before they are allocated to the wards.

- *Structure*

The IPC function is managed by different structures under different directorates in the districts (Malematja et al., 2025). Often where infection control committees do exist in hospitals, the roles, and responsibilities of members of such committees are not clearly defined.

- *Infrastructure*

Some of the public hospitals were not designed with infection control in mind. Structural design limitations compromise healthcare workers' capacity to effectively implement isolation precautions (Albergoni, 2024). Other challenges are the lack of isolation units, insufficient hand basins, and wrongly designed taps.

- *Surveillance of hospital-acquired infections*

Surveillance of HAIs is still a challenge in Limpopo, but attempts have been made to conduct the surveillance (Moyakhe, 2014).

1.1.9 Added value of the study

This study reports findings from the first peer-review survey in Limpopo Province, assessing IPC programme implementation at the facility level using IPCAF, a validated and standardised tool to assess the WHO IPC core components, which represent the global gold standard, evidence-based, recommendations for IPC at the national and health-care facility level. Using the robust methodology, this study provides a provincial snapshot of IPC programme implementation across Limpopo Province.

1.1.10 Implications of all the available evidence

Overall, healthcare facilities had an advanced level of IPC implementation, but this varied across income levels (Malematja et al., 2025; Moyakhe, 2014). Although most facilities reported having an IPC programme, few met all IPC minimum requirements recommended by WHO. Efforts to support the long-term development of IPC programmes and stepwise improvement are crucial, particularly in rural districts, which remain the most vulnerable (Malematja et al., 2025; Moyakhe, 2014). This evidence

suggests that further investments are needed in all countries to improve the effective implementation of IPC training programmes and meet adequate workload and staffing requirements, and standards for bed occupancy and spacing between beds. Therefore, the current study focused more on the evaluation of the IPC programme, aiming to contribute to the prevention of HAIs in public hospitals of the Limpopo Province. Thereafter, the findings were used to develop an evidence-based management strategy to improve the IPC programme in Limpopo Province.

1.2 Research problem statement

IPC programmes are essential for ensuring patient safety and reducing HAIs in hospitals (Tomczyk et al., 2020a). Despite the recognised importance of IPC, many public hospitals, particularly in resource-limited settings such as the Limpopo Province of South Africa, struggle with the effective implementation and sustainability of these programmes. Literature indicates that factors such as inadequate staffing, insufficient management support, and limited resources are significant barriers to the successful execution of IPC practices (Allegranzi et al., 2011a).

Ideally, for hospitals to prevent and curb infection transmission related to their activities, there should be an IPC programme led by a collaborative health team with a designated policy and trained personnel to implement and respond to infection outbreaks (Abraao et al., 2022). A designated coordinator should oversee the team, coordinating both planned and emergency meetings to prepare for hospital infection responses (Rebmann, 2009). In addition to having an established policy and team, regular training should be provided for coordinators, staff, and patients to effectively prevent and manage infection outbreaks (Salwa et al., 2022).

In the Limpopo Province, previous studies identified critical gaps in IPC programme implementation, including inconsistent adherence to guidelines, lack of continuous professional development for healthcare workers, and poor integration of IPC strategies into daily clinical practices (Malematja et al., 2025; Moyakhe, 2014). These deficiencies contribute to higher rates of HAIs, which in turn lead to increased morbidity, mortality, and healthcare costs (Nair, 2018).

Given the high burden of infectious diseases in South Africa and the pivotal role of IPC in mitigating these risks, there is an urgent need to develop and implement an evidence-based management model tailored to the specific challenges faced by public hospitals in the Limpopo Province. Such a model could address the systemic issues of staffing, resource allocation, and management support, thereby enhancing the overall effectiveness and sustainability of IPC programmes. Among the aspects identified as contributors to the minimal or lack of IPC programmes' implementation in a setting such as the Limpopo Province were the following:

- Training

A shortage of experienced and properly trained Infection Control Practitioners exists in the Limpopo Province, and without interventions, this shortage is expected to worsen as current IPC nurses retire or transition to other positions (Sikhipha, 2023). Healthcare workers currently serving as Infection Control nurses have undergone varied training, with some having received no formal training at all. Many have expressed concerns that the training they did receive did not fully equip them to manage IPC effectively (Lowe et al., 2021). Consequently, in addition to lacking confidence, these inadequately trained infection control officers often lack the authority to act, rendering them ineffective in their roles (Albergoni, 2024).

- Structure

The IPC function is managed by various structures under different directorates in the districts. In many cases, where infection control committees exist in hospitals, the roles and responsibilities of committee members are not clearly defined, leading to inefficiencies in programme implementation and oversight (Mugomeri, 2018). This lack of clarity hampers the effectiveness of IPC efforts, contributing to gaps in infection control measures and overall healthcare-associated infection (HAI) management (Abalkhail and Alslamah, 2022a).

- Infrastructure

Many public hospitals were not originally designed with IPC in mind. Structural design limitations compromise healthcare workers' ability to effectively implement isolation precautions (Udomiaye et al., 2022). Common challenges include the absence of dedicated isolation units, insufficient handwashing facilities, and the use of inadequately designed taps that hinder proper hand hygiene practices (Kalubi, 2019). These shortcomings significantly impede the hospital's capacity to manage and contain infections, especially during outbreaks (Lowe et al., 2021).

- Surveillance of HAIs

A surveillance of HAIs remains a significant challenge in the Limpopo Province, although efforts have been made to implement surveillance systems. These challenges include inadequate reporting mechanisms, lack of dedicated personnel, and limited resources for consistent data collection and analysis (Allegranzi et al., 2011a). Despite these difficulties, some hospitals have initiated attempts to conduct surveillance, but the overall effectiveness remains limited (Lowe et al., 2021)

This study sought to fill the gap by exploring the current state of IPC programme implementation in Limpopo's public hospitals and developing a comprehensive management strategy to improve IPC practices. By leveraging both qualitative and quantitative research methods, this study aimed to provide actionable insights and practical recommendations for policymakers, hospital administrators, and healthcare workers to enhance IPC outcomes and ultimately improve patient safety.

1.3 Research questions

The questions below were intended to guide the researcher throughout the study:

- What is the baseline measure of the IPC programme performance in the public hospitals in Limpopo?
- Are IPC structures and activities well established in public hospitals, in the Limpopo Province?
- What are the attitudes and practices of hospital IPC nurses in the Limpopo Province?

- Which implementation strategies could be developed to improve the implementation of the IPC programme in the public hospitals in the Limpopo Province?

1.4 Aim of the study

The main aim of this study was to assess the effectiveness and implementation of the HAIs' prevention and control programme, specifically targeted at nurses working in public hospitals.

1.5 Objectives of the study

The objectives of this study were grouped into three phases, which followed the adopted methodology. The objectives were:

Phase I: Situational analysis:

- To provide a baseline assessment of the IPC programme for the research study to review the current IPC structures, directly relating to the problems of inadequate training, staffing, and infrastructure.

Phase II:

- The study explored the attitudes and practices of IPC nurses, focusing on their roles and responsibilities in infection prevention.

Phase III:

- To address the gaps identified from the research findings so as to focus on creating an improvement strategy to resolve the identified gaps and deficiencies.

1.6 Purpose of the study

The purpose of the study was to evaluate hospital-acquired IPC programmes for nurses in the public hospitals of Limpopo Province to develop an intervention strategy

to contribute towards the improvement of the working environment of the hospitals in the province. The purpose of the study entailed the following aspects:

- Identify strengths and weaknesses in the implementation and execution of the HAI prevention and control programme.
- Determine the level of adherence to infection prevention protocols and guidelines among nurses.
- Provide recommendations for improving the HAI prevention and control programme to enhance patient safety and healthcare quality in public hospitals.

1.7 Methodology

The current study used mixed-method research, which is a research method aimed at combining quantitative and qualitative approaches. In this study, the sequential explanatory approach was followed, and the pragmatism paradigm was used for this study because it made it possible to gather and combine both quantitative and qualitative data into a single investigation. A detailed description of the research design, data collection procedures, data analysis, and data collection tools has been presented in detail in Chapter 4, including the validity, reliability, trustworthiness, and ethical considerations that were adhered to.

1.8 Significance of the study

The research assessed the current IPC situation in hospitals, that is, existing IPC activities or resources, and identify strengths and gaps that can inform future improvement strategies. The results of the research can be used to develop an action plan, using the interim practical manual for the implementation of the IPC core components at all levels, among other resources, to strengthen existing measures and motivate facilities to intensify efforts where needed. A provincial research strategy was developed in partnership with provincial research partners to address gaps in current scientific and clinical knowledge about how to manage and reduce HAIs.

1.9 Outline of the thesis

The thesis is organised into eight chapters and the section below indicates details of the contents of each chapter:

1.9.1 Chapter one includes an introduction and background of the study, research problem, research aim, research question, research objectives, research methodology, chapter summary, and organisation of the thesis.

1.9.2 Chapter two entails a literature review which has been divided into sections: introduction, search strategy, evaluation of the IPC, WHO's IPCAF tool, and IPC core components.

1.9.3 Chapter three presents the theoretical framework that guided the study.

1.9.4 Chapter four consists of the research methodologies used in the study.

1.9.5 Chapter five presents the research findings, and they were presented according to methods and data collection tools used guided by the research objectives:

- Phase one: Quantitative strand
- Evaluation of the status of the IPC programme utilising IPCAF tool
- Phase two: Qualitative strand
- Exploring the perception of hospital IPC nurses on the IPC programme and its practices and challenges.

1.9.6 Chapter six presents the integration of qualitative and quantitative results; and interpretation of results findings.

1.9.7 Chapter seven presents proposed intervention strategies which were guided by study findings, literature review, and model for improvement of the IPC programme.

1.9.8 Chapter eight provides a synopsis of the research findings, demonstrates how the research objectives were met, offers suggestions to different stakeholders, highlights the study's limits, adds to the body of knowledge, and concludes the thesis.

1.10 Chapter summary

Chapter one emphasised the orientation to the study, the introduction and background, the research problem statement, the research question, the research aim, the research objectives, the purpose of the study, the introduction of the research

methodology process, and the significance of the study. Chapter two provided the literature review.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

To demonstrate what has previously been done on this subject and what will be done to contribute to the body of knowledge already in existence, this chapter examines the pertinent sources and material that fall within its purview. Using a systematic approach, the researcher examined pertinent papers from several sources to establish if the chosen issue merits further investigation and formulated a workable research question. This process is known as a literature review, which is the understanding of the body of knowledge regarding the subject under study, which requires a survey of the literature (Garrard, 2020). A literature review can also be defined as a method of combining research findings to demonstrate evidence, identify areas that require more investigation, and guide the development of theoretical frameworks and conceptual models (Templier and Paré, 2015). A theoretical framework was employed in this study to give an existing knowledge structure and a logical summary.

Through a survey of the literature, the researcher in the current study learnt how other researchers have approached similar research challenges and identified trends in the field to determine what is new and old and gaps that previous researchers have found. Additionally, by using a literature search to locate relevant papers, the researcher reported on the state of knowledge regarding a topic after summarising and synthesising a range of sources, including books, journal articles, and web-based resources. In summation, to constructively search for sources' keywords such as "healthcare-acquired infections, infection prevention and control, infection prevention and control assessment framework, and infection prevention and control assessment tool" were used to conduct a thorough search across several searches engines, including PubMed, the Cochrane library, the *Biology Medical Journal*, Elsevier, Sage publications, Springer, Taylor & Francis, Wiley, Google Scholar, and others.

2.1.1 Infection Prevention and Control (IPC) programmes

IPC refers to a set of practices and procedures that are implemented to prevent or reduce the risk of transmission of infectious agents in healthcare settings. IPC is essential in maintaining patient and healthcare worker safety by minimising the spread of HAIs (Wood et al., 2024). The Infection Prevention and Control program involves the use of evidence-based strategies, such as hand hygiene, the use of personal protective equipment (PPE), environmental cleaning, and adherence to protocols for sterilisation and disinfection (Almalki, 2016).

It is reported that IPC is excellent in the field of patient safety and quality of care, as it is generally relevant to every health worker and patient, at every healthcare interaction (Asgedom, 2024). Malfunctioning IPC produces harm and can kill (Lowe et al., 2021). Without an effective IPC, it is difficult to attain quality healthcare delivery. It affects all aspects of healthcare, including hand hygiene, surgical site infections, injection safety, antimicrobial resistance, and how hospitals operate during and outside of emergencies (Asgedom, 2024). Infection Prevention and Control (IPC) programmes in hospitals are crucial for reducing the risk of HAIs and ensuring patient safety (Costa et al., 2021).In the current study, it was critical to unpack various aspects of IPC, including among others, the importance of IPC, key components of effective IPC programmes, challenges in implementing IPC measures, and strategies for improving IPC practices. These various aspects are briefly discussed in the sections below:

2.1.2 Importance of IPC

The literature emphasises the importance of IPC in preventing HAIs, which can lead to increased morbidity, mortality, and healthcare costs (Assiri et al., 2014). Effective IPC programmes are essential for protecting both patients and healthcare workers from infections. IPC is of paramount importance in healthcare settings to protect patients, healthcare workers, and the community from HAIs (Alert et al., 2011). Below is an overview of why IPC is crucial in healthcare facilities.

- *Patient Safety*

IPC measures are essential for ensuring patient safety by reducing the risk of HAIs (Assiri et al., 2014). HAIs can lead to increased morbidity, mortality, and prolonged hospital stays, adding to the burden on healthcare systems and affecting patient outcomes. WHO Global IPC Impact shows that effective IPC programmes reduce HAIs and improve patient safety across healthcare systems. For example, WHO emphasises that IPC is essential in preventing infections such as surgical site infections and bloodstream infections, especially in resource-limited settings. IPC measures have been proven to reduce HAIs by more than 30%, significantly improving patient outcomes globally.

(Taylor et al., 2024), revealed that IPC strategies, particularly contact precautions and hand hygiene, are central to patient safety. The study highlights the importance of tailoring IPC programmes to the specific needs of healthcare facilities, which ensures that patient outcomes are not compromised by HAIs. In a U.S. study, CDC and National Healthcare Safety Network (NHSN) findings revealed that healthcare facilities implementing rigorous IPC measures, including surveillance and diagnostic stewardship, reported significant reductions in catheter-associated infections and C. difficile infections, both of which are major contributors to patient morbidity and mortality

- *Healthcare Worker Safety*

IPC also protects healthcare workers from exposure to infectious agents. By implementing practices such as hand hygiene, use of PPE, and safe handling of sharps, healthcare workers can reduce their risk of acquiring infections at work. Studies have shown that compliance with IPC protocols during pandemics, such as COVID-19, has been critical in protecting healthcare workers. For example, a study found that proper use of PPE and regular training significantly improved safety outcomes during the COVID-19 pandemic (Salwa et al., 2022). Another study emphasised the importance of continuous reminders and easy access to PPE and hand hygiene resources to ensure compliance, which protects both healthcare workers and patients (Tchouaket et al., 2022). Furthermore, research on laboratory staff highlighted the vital role of disinfection and safe handling of sharps in reducing infection risks in healthcare settings (Tchouaket et al., 2022).

- *Prevention of Antimicrobial Resistance*

Effective IPC programmes help prevent the spread of antimicrobial-resistant organisms, which is a growing global health concern (Majumder et al., 2020). By reducing the need for antimicrobial therapy through infection prevention measures, IPC programmes contribute to the fight against antimicrobial resistance (Salwa et al., 2022). Effective IPC programmes play a key role in combating antimicrobial resistance (AMR) by preventing the spread of resistant organisms and reducing the need for antimicrobial treatments. A large proportion of HAIs, many of which are antimicrobial-resistant, can be prevented through strong IPC measures such as hand hygiene, environmental sanitation, and proper use of personal protective equipment (Allegranzi et al., 2013).

It has been shown that IPC programmes can significantly reduce the incidence of AMR infections. For example, a WHO report emphasised that IPC measures such as hand hygiene, cohorting of patients, and antimicrobial stewardship effectively limit the spread of resistant organisms in healthcare settings (OpenWHO, 2022). Additionally, research from acute care settings has demonstrated that hospitals with dedicated IPC programmes are able to reduce both HAIs and AMR infections (Springer, 2021). These findings underline the critical role of IPC in curbing the global AMR crisis.

- *Cost-effectiveness*

Investing in IPC programmes is cost-effective in the long run (Azak, Sertcelik et al., 2023). By preventing HAIs, healthcare facilities can reduce the financial burden associated with treating these infections, including the cost of additional medical care, prolonged hospital stays, and antibiotic therapy (Asgedom, 2024; Almalki 2016). A study conducted in Québec assessed the costs of healthcare-associated infection (HAI) prevention in medical and surgical wards. It found that effective IPC interventions, including hand hygiene and sanitation, led to significant reductions in HAI rates, ultimately saving costs associated with longer hospital stays, additional

treatments, and antimicrobial therapies. By preventing these infections, hospitals were able to reduce the overall financial burden (Tchouaket et al., 2022).

Regarding the cost-effectiveness of IPC programmes, research highlights that IPC programmes are proven to be cost-effective in preventing infections that require costly treatments and prolonged hospitalisations. For instance, one study found that hospitals with strong IPC programmes saved significant costs by avoiding excess healthcare expenditures tied to HAIs and antimicrobial resistance (Gilbert and Kerridge, 2020). One study on long-term care facilities evaluated the economic impact of IPC programmes. The study concluded that by implementing small sets of evidence-based interventions, such as hand hygiene and the proper use of personal protective equipment (PPE), healthcare facilities can save on both direct and indirect costs related to HAI treatments and hospital readmissions (Luangasanatip et al., 2018).

- *Legal and regulatory compliance*

Compliance with IPC guidelines and regulations is mandatory in many healthcare settings (Chitimwango, 2017). Failure to adhere to these standards can result in legal issues and penalties, as well as damage to the reputation of healthcare facilities. Compliance with IPC regulations is essential for healthcare facilities to avoid legal consequences, financial penalties, and damage to their reputation. Studies have shown that non-compliance can result in increased rates of HAIs, legal issues, and institutional challenges. For example, a study examining IPC practices in Australian hospitals highlighted the challenges of ensuring compliance, particularly when there are gaps in leadership and engagement with IPC protocols (Kabego et al., 2023).

In a review of healthcare facilities in Georgia, the lack of formal IPC training for staff, inadequate auditing processes, and insufficient legal frameworks were key barriers to compliance with WHO core components. The study found that most hospitals lacked regular documentation of IPC committee meetings and had poor monitoring of IPC practices, exposing them to potential legal and regulatory risks (Kabego et al., 2023). These findings underscore the importance of having a robust IPC infrastructure that not only meets national and international guidelines, but also adheres to legal obligations to ensure both patient and healthcare worker safety.

- *Public health impact*

HAIs not only affect individual patients and healthcare facilities, but also have broader public health implications (Cissé et al., 2023). Controlling the spread of infections in healthcare settings is essential for preventing outbreaks and protecting the health of the wider community. According to a 2022 report by WHO, effective IPC programmes can reduce HAIs by up to 70%. This significantly impacts public health by preventing the spread of infections within healthcare facilities, reducing mortality rates, and minimising the potential for community outbreaks (Tomczyk et al., 2022). The report emphasises the critical role of IPC in reducing both patient and healthcare worker infections, which in turn safeguards the broader community by preventing the transmission of infections from healthcare settings to the general public (Kabego et al., 2023).

A study conducted in healthcare facilities during the COVID-19 pandemic in the African region demonstrated that strong IPC programmes, including hand hygiene and proper use of PPE, contributed to lowering infection rates within healthcare settings. By controlling the spread of COVID-19 in hospitals, these measures prevented the wider transmission of the virus to the public, showcasing the importance of IPC in protecting the health of the broader community (Kabego et al., 2023). Evidence suggests that sustainable IPC programmes that include proper waste management, safe disposal of medical materials, and sanitation practices contribute to public health by reducing environmental contamination. This is particularly relevant in resource-limited settings, where lack of infrastructure can lead to improper waste disposal and subsequent community health risks (Kabego et al., 2023).

2.1.3 The WHO IPC's core components

Studies highlight several key components of effective IPC programmes, including adherence to standard precautions (such as hand hygiene, and the use of personal protective equipment), surveillance for HAIs, environmental cleaning and disinfection, and education and training of healthcare workers (Chitimwango, 2017; Tomczyk et al.,

2020a). These components are critical for reducing the transmission of infections in healthcare settings and improving overall patient safety. The eight WHO core components for IPC are the foundation for establishing or strengthening effective programmes at levels of care (Cissé et al., 2023). As these core components will improve the capacity to develop and implement effective technical and behaviour-modifying interventions, they are therefore considered to be equally important for the implementation and sustainability of strong IPC programmes.

There are, however, two important basics, an established and functioning IPC programme and sufficiently maintained built environment (including) appropriate workload and bed occupancy, adequate human resources (staffing levels) as well as the necessary infrastructure, materials, and equipment for IPC practices that must be in place for implementation of all other core components and the achievement of safe practices (Cissé et al., 2023). When placed together, these crucial components provide for the effective implementation of IPC guidelines, training and education, monitoring, audit, feedback, and surveillance. Implementation achievement in each of these areas also is based on the implementation of a multimodal approach (Dyer, 2022). WHO's core components are based on systematic reviews and robust evidence gleaned mainly from high-income countries, these core components apply equally to low to middle-income countries including South Africa (Alert et al., 2011). WHO defines eight core components for IPC, the first six are specifically aimed at national-level IPC programmes and the last two are health facility-level specific. The WHO identified

these eight core components of IPC programmes as follows:

Figure 1: World Health Organisation 8 Core Components (Alert et al., 2011)

2.1.4 IPC programme coordination

The WHO's core component on IPC programmes emphasises the necessity for established and effective IPC programmes within healthcare facilities (Storr et al., 2017).These programmes should be supported by dedicated budgets and staff, ensuring that they are adequately resourced to manage infection risks effectively (Storr et al., 2017). Studies have shown that comprehensive IPC programmes are crucial in reducing HAIs and improving patient outcomes (Alqahtani et al., 2020; Ershova et al., 2018; Kopsidas et al., 2021). For example, (Deryabina et al., 2023) argue that effective IPC programmes, especially in low-resource settings, lead to significant reductions in HAIs when implemented with proper support and oversight.

2.1.5 IPC guidelines

The development and implementation of standardised IPC guidelines are essential for ensuring consistent and effective infection prevention practices across healthcare settings (Allegranzi et al., 2011a; Tartari et al., 2021; Tomczyk et al., 2021a). WHO recommends that these guidelines be evidence-based, regularly updated, and tailored

to the local context (Aghdassi et al., 2020). Research indicates that adherence to these guidelines reduces the incidence of HAIs and improves overall healthcare quality (Allegranzi et al., 2013).

2.1.6 IPC education and training

Regular education and training of healthcare workers (HCWs) are critical for maintaining high standards of infection prevention (Alhumaid et al., 2021). Studies highlight the effectiveness of continuous IPC training programmes in reinforcing best practices and improving compliance with IPC measures (Alhumaid et al., 2021; Wong et al., 2021).The WHO stresses that education and training should be ongoing and adapted to the specific needs of healthcare workers at all levels (Wood et al., 2024).

2.1.7 HAI surveillance

HAI surveillance systems are essential for monitoring infection rates, identifying outbreaks, and evaluating the effectiveness of IPC interventions (Harun et al., 2022; Storr et al., 2017). WHO recommends establishing robust surveillance systems as a core component of IPC programmes. Research supports the role of surveillance in reducing HAIs by enabling timely interventions and fostering accountability within healthcare facilities (Dhar et al., 2021; Fernando et al., 2017).

2.1.8 Multimodal strategies (MMIS)

The WHO advocates for the use of multimodal strategies to enhance the implementation of IPC measures (Kimani et al., 2022).These strategies involve combining different interventions, such as training, monitoring, and feedback, to achieve better outcomes. Studies have demonstrated that multimodal approaches are more effective in changing healthcare workers' behaviour and reducing infection rates compared to single-intervention strategies (Allegranzi et al., 2013). These approaches often include hand hygiene compliance, use of personal protective equipment, and regular training sessions, which together produce more sustained improvements in infection prevention. The multimodal strategy typically includes several key elements:

- System change

This involves implementing changes in the healthcare system to support IPC practices (Storr et al., 2017; Zingg et al., 2015).This may include establishing clear policies and procedures, allocating resources for IPC activities, and providing leadership and support for IPC initiatives (Tomczyk et al., 2021). In Bangladesh, the implementation of the electronic emergency commodities management system (eLMIS) ensured real-time tracking of IPC materials, preventing stock-outs during critical times (Alzeyara, 2022). In Cameroon, the Minister of Health mandated all healthcare facilities to establish IPC committees to monitor and improve IPC standards, leading to sustained compliance at the facility level (Tomczyk et al., 2021). Thailand integrated IPC into its national antimicrobial resistance (AMR) surveillance system, emphasising the importance of IPC in combating AMR (Salwa et al., 2022). Similarly, Côte d'Ivoire enhanced COVID-19-specific IPC measures in 39 hospitals through continuous training and supervision, embedding long-term improvements in IPC compliance (Weldetinsae et al., 2023).

- Education and training

Providing education and training to healthcare workers on IPC practices. This may include training on the proper use of personal protective equipment (PPE), hand hygiene techniques, and environmental cleaning practices. Providing education and training to healthcare workers on IPC practices is essential to reduce the risk of HAIs. Many countries have implemented structured IPC training programmes to ensure that healthcare professionals are equipped with the necessary skills and knowledge. For instance, Germany requires a 60-month postgraduate training programme for IPC specialists, which covers topics such as outbreak management, diagnostic techniques, and environmental hygiene (Salwa et al., 2022).France offers postgraduate university degrees to healthcare professionals, ensuring that those involved in IPC are well-educated in microbiology, infection prevention, and safety protocols (Kabego et al., 2023; Salwa et al., 2022).

In the Eastern Mediterranean Region, a mapping of IPC education and training revealed that while many countries offer IPC training, there is a need for more standardised and accessible programmes, particularly in resource-limited settings.

Most countries provide IPC training through national guidelines, with an emphasis on behaviour change and active learning methods to ensure long-term compliance with IPC standards (Kabego et al., 2023; Salwa et al., 2022).

- Monitoring and feedback

Monitoring compliance with IPC practices and providing feedback to healthcare workers are critical to infection prevention. In the United States, the CDC's National Healthcare Safety Network (NHSN) tracks infection rates and provides feedback to hospitals to improve hand hygiene and PPE use (Garcia et al., 2022). Similarly, the United Kingdom's NHS conducts regular IPC audits, focusing on surgical site infections and hand hygiene compliance, providing feedback to healthcare staff to enhance adherence (Wolford et al., 2025a).

- Reminders in the workplace

Using reminders in the workplace is an effective method to encourage compliance with IPC practices. This can include placing posters, signs, or electronic reminders to prompt healthcare workers to adhere to hand hygiene and PPE protocols. In Georgia, hospitals implemented visual reminders, such as posters, at hand hygiene stations to promote regular compliance. However, only 46% of hospitals displayed these reminders at all stations, highlighting the need for consistent implementation across facilities (Wolford et al., 2025a). Similarly, a study conducted in Guinea found that healthcare workers responded positively to reminders in healthcare facilities, especially during the COVID-19 pandemic. These reminders, combined with training, improved hand hygiene compliance and PPE usage among healthcare workers, contributing to a reduction in HAIs (Wolford et al., 2025a). In the UK, NHS facilities use a multimodal approach that includes visual reminders, alongside regular audits and feedback, to reinforce IPC practices. These methods help to keep IPC standards at the forefront of healthcare workers' daily routines (Storr et al., 2017).

- Creating a safety climate

Creating a safety climate in healthcare facilities is essential for emphasising the importance of IPC practices. This involves promoting open communication, encouraging the reporting of errors or near misses, and rewarding compliance with IPC standards. Studies demonstrate that a positive safety climate is strongly linked to better patient and occupational health outcomes (Hessels et al., 2023).. For example, research in the U.S. found that units with a strong safety climate had lower rates of HAIs and occupational injuries, such as sharps-related incidents (Hessels et al., 2023).

A systematic review further highlights that healthcare facilities with robust safety cultures, where healthcare workers feel encouraged to report errors and near misses, tend to have better compliance with IPC practices, leading to improved patient safety outcomes (Alhumaid et al., 2021). Additionally, promoting leadership involvement and open communication is crucial for sustaining a strong safety climate, which in turn positively impacts healthcare worker behaviour and reduces HAIs (Alhumaid et al., 2021).

The multimodal strategy recognises that improving compliance with IPC practices requires a multifaceted approach that addresses various aspects of healthcare delivery (Abraao et al., 2022). By implementing a combination of interventions, healthcare facilities can improve compliance with IPC practices and reduce the risk of HAIs. The multimodal strategy recognises that improving compliance with IPC practices requires a multifaceted approach that addresses various aspects of healthcare delivery (Abraao et al., 2022). By implementing a combination of interventions, healthcare facilities can improve compliance with IPC practices and reduce the risk of HAIs.

2.1.9 Monitoring/audits of IPC practices and feedback

Monitoring and audits are integral components of IPC programmes, helping healthcare facilities ensure compliance with standards and identify areas for improvement (Assiri et al., 2014). Other countries have implemented structured monitoring, audit systems, and feedback loops as part of their IPC strategies. In Georgia, facilities have incorporated IPC audits that include the continuous assessment of hand hygiene

compliance, use of PPE, and waste management practices. These audits are conducted both internally and externally, with regular feedback provided to staff to improve adherence to IPC guidelines (Wolford et al., 2025b). Germany also emphasises continuous monitoring with a strong focus on regular IPC audits, combined with structured feedback, particularly in intensive care units where the risk of HAIs is higher (Aghdassi et al., 2020). In the UK, the NHS conducts extensive IPC audits and provides detailed feedback to healthcare workers, enabling them to refine their practices in real time. These audits focus on areas such as environmental cleanliness, PPE compliance, and surgical site infection prevention. Regular feedback to staff members has been found to improve IPC compliance and reduce infection rates (Alhumaid et al., 2021).

- Monitoring

Monitoring involves ongoing observation and data collection to assess compliance with IPC practices (Chitimwango, 2017). This may include monitoring hand hygiene practices, use of PPE, environmental cleaning, and adherence to isolation precautions. Monitoring can be conducted through direct observation, electronic monitoring systems, or checklists.

- Audit

Audits are systematic evaluations of IPC practices against established standards or guidelines. They help identify areas of non-compliance and highlight opportunities for improvement (Chitimwango, 2017). In countries like the U.S. and the UK, regular IPC audits are conducted to ensure compliance with national infection control policies. In the UK, the NHS conducts annual IPC audits using standardised tools to assess compliance with hand hygiene and environmental cleaning protocols, ensuring continuous improvements (Wolford et al., 2025b). Similarly, hospitals in South Africa use audit tools to monitor IPC performance, allowing healthcare facilities to identify gaps and reduce the risk of HAIs (Cloete, 2016).

- Audit: Internal and external auditors

Audits, both internal and external, are essential for evaluating IPC practices and identifying areas of non-compliance. Internal audits, conducted by in-house teams, provide continuous oversight and help maintain operational efficiency by quickly addressing immediate concerns. External audits, on the other hand, offer an impartial, third-party perspective, which can lead to deeper insights and highlight broader vulnerabilities that internal teams may overlook (Chitimwango, 2017).

Importance of external auditors

External auditors play a key role by providing an objective and independent review of IPC practices. Their detached perspective allows for more thorough scrutiny, free from internal bias, and adds credibility to the audit findings. External auditors often identify areas where internal controls might be improved and suggest actions that are crucial for maintaining regulatory compliance and infection control standards. In addition, external audits can improve the internal auditing process through benchmarking and recommendations for future improvement (Christ et al., 2021).

External audits offer a critical, unbiased assessment of IPC practices. Their role is particularly important in identifying gaps that internal teams might overlook due to familiarity or operational limitations. External auditors bring fresh perspectives and ensure that facilities adhere to national and international standards, adding a layer of accountability that drives continuous improvement in infection prevention. Their impartial feedback often leads to significant reforms in IPC policies and practices (Wolford et al., 2025b). These activities involve regular assessment of compliance with IPC guidelines and practices, and providing feedback to healthcare workers.

- Feedback

Feedback is an essential part of the monitoring and audit processes within IPC programmes. It helps healthcare workers understand their performance, highlighting areas where they comply with standards and areas that need improvement (Azak et al., 2023). In various countries, feedback has been integrated into multimodal IPC strategies to boost compliance and improve patient safety. In the UK, for instance,

regular feedback loops are part of NHS infection prevention programmes. After audits, healthcare workers receive structured feedback to enhance their compliance with hand hygiene, PPE usage, and environmental cleaning protocols.

This has resulted in improved IPC practices across NHS hospitals (Wolford et al., 2025a). Similarly, in Canada, healthcare facilities emphasise the importance of immediate feedback to clinicians following IPC audits, particularly regarding hand hygiene compliance. This feedback helps to quickly correct non-compliant behaviours and fosters a culture of accountability (MacKenzie, 2024).

In the U.S., many hospitals use automated systems that monitor compliance and provide real-time feedback to staff, further reinforcing adherence to IPC protocols. Feedback can be provided through written reports, meetings, or one-on-one discussions. By regularly monitoring and auditing IPC practices and providing feedback to healthcare workers, healthcare facilities can identify and address gaps in IPC practices, ultimately reducing the risk of HAIs (Chitimwango, 2017).

2.1.10 Workload, staffing and bed occupancy

Workload, staffing, and bed occupancy are important factors that can impact IPC practices in healthcare settings:

- *Workload*

A high workload can contribute to lapses in IPC practices, as healthcare workers may feel rushed or overwhelmed. This can lead to improper hand hygiene, inadequate cleaning of equipment and surfaces, and other lapses in IPC (Abraao et al., 2022). Adequate staffing levels and workload management strategies are essential to ensure that healthcare workers can adhere to IPC guidelines.

- *Staffing*

Proper staffing levels are crucial for maintaining effective IPC practices. Understaffing can lead to increased workloads and fatigue, which can compromise IPC efforts (Abraao et al., 2022). Adequate staffing allows for the proper implementation of IPC

measures, including patient screening, isolation precautions, and environmental cleaning.

- *Bed Occupancy*

High bed occupancy rates can increase the risk of HAIs by leading to overcrowding, which can make it difficult to maintain adequate spacing between patients and ensure proper cleaning and disinfection of patient areas. Monitoring and managing bed occupancy rates are important for reducing the risk of HAIs. Addressing workload, staffing, and bed occupancy issues is essential for maintaining effective IPC practices and reducing the risk of HAIs in healthcare settings (Chitimwango, 2017). This may involve implementing workload management strategies, ensuring adequate staffing levels, and monitoring and managing bed occupancy rates.

2.1.11 Built environment

The built environment in healthcare facilities plays a crucial role in infection prevention and control (IPC) (Assiri et al., 2014).It encompasses the physical design, layout, and infrastructure of healthcare facilities, including patient rooms, operating rooms, waiting areas, and common spaces. Key aspects of the built environment that impact IPC include:

Room design

The design of patient rooms can affect the spread of infections. Features such as single-patient rooms, adequate spacing between beds, and proper ventilation can help reduce the risk of airborne and contact infections.

- Hand hygiene facilities: Access to hand hygiene facilities, such as sinks with running water, soap, and hand sanitiser, is essential for promoting hand hygiene among healthcare workers, patients, and visitors.
- Environmental cleaning: The layout of healthcare facilities should facilitate effective environmental cleaning and disinfection. This includes easy access to cleaning supplies, adequate storage for clean and dirty equipment, and clear protocols for cleaning and disinfection.

- Isolation facilities: Properly designed isolation rooms are essential for preventing the spread of infectious diseases. These rooms should have negative-pressure ventilation systems and separate entrances to minimise the risk of transmission.
- Waste management: Adequate facilities for the segregation, storage, and disposal of medical waste are essential for preventing the spread of infections.
- Patient flow: The layout of healthcare facilities should promote efficient patient flow to minimise crowding and reduce the risk of transmission in waiting areas and corridors.
- Accessibility: The built environment should be accessible to all individuals, including those with mobility impairments, to ensure that IPC measures can be effectively implemented for all patients.
- Maintenance: Regular maintenance of the built environment is essential to ensure that facilities remain clean, safe, and conducive to IPC practices.

The built environment plays a critical role in supporting effective IPC practices in healthcare facilities (Chitimwango, 2017). By designing and maintaining healthcare facilities with IPC principles in mind, healthcare organisations can help reduce the risk of HAIs and promote patient safety.

2.1.12 The global perspective of IPC

It is reported that significant progress has been observed in reducing HAI in many parts of the world, several emerging events have highlighted the need to support countries in the development and strengthening of IPC to achieve strong health systems, both at the national and facility levels (Storr et al., 2017). In recent years, global public health emergencies of international concern, such as the Middle East respiratory syndrome coronavirus and the Ebola virus disease outbreaks, revealed gaps in IPC measures applied by the countries concerned (Storr et al., 2017). Furthermore, the current review of the International Health Regulations and the Global Action Plan to combat antimicrobial resistance (AMR) called for strengthening IPC across nations.

The development and strengthening of IPC will also contribute to achieving strategic goal 5 of the WHO Framework on integrated people-centred health services and the United Nations Sustainable Development Goals - in particular, those related to

universal access to Water Sanitation and Hygiene (WASH), quality health service delivery in the context of universal health coverage, and the reduction of neonatal and maternal mortality . It has been documented that the IPC approaches in developing and developed countries differ extensively, although the standards of infection prevention and control are similar globally (Hafiz et al., 2024).

The limited availability of resources, particularly in developing countries has always been a challenge. Enormous variations in the compliance with infection-control guidelines and recommendations internationally has been recorded. Although there was often good knowledge and high compliance with infection-control guidelines in developed countries, the lack of knowledge and compliance with infection-control guidelines in developing countries is low and exceptionally alarming (Oosthuysen et al., 2014).

2.1.13 IPC in Africa

In Africa, the scope of the studies is limited since most were conducted in single hospitals or single wards. It is of importance to note that perhaps more studies may have been conducted, but for some reason, they were not published (Aghdassi et al., 2020). Even though there are some barriers, there are promising indications that the significance of HAI has started to be acknowledged in Africa, through the introduction of the IPC programme, and measures put in place to measure and control them (Aghdassi et al., 2020). An Algerian study documents how the introduction of a prevention programme at the facility level in 2001 was able to reduce the whole prevalence of HAI over five consecutive years (Aghdassi et al., 2020). In Uganda, the implementation of a standardised protocol for surgical wound management has intensely reduced surgical site infections after caesarean section (Manchanda et al., 2018).These, however, demonstrate that authorities and policy-makers now consider HAI a very significant challenge and that simple, low-cost interventions can be successfully implemented in Africa, despite the continent’s fragmented political and financial situation (Aghdassi et al., 2020).

2.1.14 IPC in South Africa

At a national level, the Joint External Evaluation (JEE) of IHR Core Capacities of the Republic of South Africa was organised in 2017. The results of the evaluation

emphasised that the country has accomplished high scores for the majority of the technical areas (Talisuna et al., 2019). However, some areas scored disappointingly, including the indicator for HAI prevention and control programmes, which obtained a score of one (no capacity) out of five (sustainable capacity) (Talisuna et al., 2019). It was recommended that HAI programmes be strengthened by implementing a strong IPC national plan encompassing all areas of activity that would be consulted on communicated, implemented, and monitored nationally and within each province as outlined in the WHO Core Component Guidelines (Garcia et al., 2022).

Hand hygiene (HH) is regarded as the single most effective modality to prevent the spread of infection in healthcare, although it is one of the most difficult quality measures to monitor (Luangasanatip et al., 2018). In South Africa, as part of the intervention to strengthen the implementation of the IPC programme for the prevention of HAIs, a recent Cochrane review concluded that one of the most effective methods to strengthen the IPC programme is to improve hand hygiene compliance (Brink et al., 2020). The AMR Strategic Framework needs IPC interventions to prevent and control the spread of resistant microbes in humans and health institutions. Since 2016, South Africa has been a part of the Global Antimicrobial Resistance Surveillance System (GLASS), which is being developed based on the WHO Global Action Plan on AMR (Organization, 2022).

2.1.15 IPC in South Africa, Limpopo Province

The Infection Prevention and Control (IPC) program in Limpopo's public hospitals was initiated around 1994, with activation at the provincial and district offices occurring in 1998. It has always been challenging to design, implement, and monitor the functioning of a programme, particularly since Limpopo Province has limited resources. According to the National IPC Strategic Framework, the IPC Programme should be structured at all levels (Tahir et al., 2023).

2.1.16 The WHO's IPCAF

The WHO's IPCAF is a tool recommended when establishing the baseline assessment to understand the current situation, which includes the strengths and challenges, to guide the improvement plan for the IPC programme, and assess the effectiveness of the improvement plan implored (Ehsan et al., 2024). The tool provides a general overview of the status of IPC activities according to the guideline recommendations, rather than focusing on specific IPC practices/risk factors related to individual patients or specific healthcare settings (Park, 2023).

The WHO's guidelines on the essential elements of IPC programmes at the acute care institution level are implemented with the assistance of the IPCAF. The IPCAF tool covers the contents of interim practical manual supporting the implementation of the IPC core components at the facility level. With repeated administration, the IPCAF is a methodical instrument that can offer both a baseline assessment of the IPC programme and activities inside a healthcare facility as well as continuing evaluations to track development over time and promote improvement.

The IPCAF tool is designed to support the implementation of the WHO Guidelines on core components of IPC programmes at the facility level. This tool provides a structured approach to assess the baseline status of an IPC programme and its activities within a healthcare facility. Through repeated use, IPCAF enables ongoing evaluations to monitor progress over time and promote continuous improvement. Specifically, it helps facilities align with the IPC core components by offering a practical manual for implementing these guidelines effectively, thus ensuring that improvements are tracked and sustained (Abraao et al., 2022).

The objective of the IPCAF is to assess a healthcare facility's current IPC situation by evaluating its resources and activities. This assessment identifies both gaps and strengths, which can guide future planning and help facilities align with international standards and regulations. IPCAF serves as a diagnostic tool, enabling facilities to pinpoint pertinent issues or deficiencies that need to be addressed (Rüther et al., 2024).

The tool provides a score that reflects the level of IPC implementation and improvement. These scores are valuable for creating actionable plans, often using resources like the Interim Practical Manual, to implement IPC core components more effectively at the facility level. This structured approach helps to reinforce existing measures and encourages facilities to enhance their efforts where necessary. By consistently using IPCAF, facilities can track their progress over time, facilitating ongoing improvement.

2.1.17 Development and validation of IPCAF

The development and validation of IPCAF are essential steps in ensuring that the tool is effective, reliable, and applicable for assessing IPC programmes in healthcare setting (Abraao et al., 2022).

- **Development process**

The development of the IPCAF was a collaborative effort involving a multidisciplinary team of experts from fields such as infection prevention and control, epidemiology, and healthcare quality improvement (Abraao et al., 2022). The process began with a comprehensive literature review to identify existing IPC assessment tools, guidelines, and best practices (Tomczyk et al., 2021b). Drawing on this review and the expertise of the team, a draft framework was created that incorporated key components essential to IPC programmes, including programme structure, guidelines, education and training; surveillance, audits, staff workload, and the built environment (Abraao et al., 2022). The draft framework underwent refinement through iterative processes, including pilot testing and gathering feedback from stakeholders such as frontline healthcare workers, IPC practitioners, and healthcare facility administrators, ensuring that it was both practical and evidence-based (Abraao et al., 2022).

- **Validation Process**

The validation of IPCAF involved assessing its reliability, validity, and feasibility in real-world healthcare settings (Abraao et al., 2022). Reliability refers to the consistency of the tool in producing similar results under consistent conditions (Abraao et al., 2022). This was assessed through test-retest reliability or inter-rater reliability. Validity refers

to the extent to which the tool measures what it intends to measure. This was assessed through content validity, construct validity, and criterion validity. Feasibility refers to the practicality of using the tool in healthcare settings, considering factors such as time, resources, and ease of use. Validation studies involved administering the IPCAF tool to a sample of healthcare facilities and comparing the results with other established measures of IPC programme performance or outcomes. The validation process also included gathering feedback from users regarding the tool's usability, clarity, and relevance to their practice.

2.1.18 IPCAF objectives and key components

The objectives of the IPCAF are typically centred on evaluating the effectiveness and efficiency of IPC programmes in healthcare facilities (Deryabina et al., 2023).Some common objectives of IPCAF include:

- **Assessing IPC programme performance:** Evaluate the overall performance of IPC programmes in healthcare facilities based on standardised criteria and benchmarks.
- **Identifying strengths and weaknesses:** Identify areas of strength and weakness within IPC programmes, including areas for improvement and resource allocation.
- **Ensuring compliance:** Ensure compliance with national and international IPC guidelines, standards, and best practices.
- **Enhancing patient safety:** Improve patient safety by reducing the risk of HAIs through effective IPC measures.
- **Facilitating quality improvement:** Provide a framework for ongoing quality improvement efforts in IPC programmes.
- **Supporting decision-making:** Provide data and insights to support informed decision-making by healthcare administrators and policymakers.

- **Promoting education and training:** Highlight the importance of education and training in IPC and identify areas where additional training may be needed.
- **Encouraging collaboration:** Foster collaboration among healthcare workers, IPC practitioners, and other stakeholders involved in IPC efforts.
- **Ensuring sustainability:** Ensure that IPC programmes are sustainable in the long term by identifying strategies for maintaining and improving programme effectiveness.
- **Benchmarking progress:** Provide a benchmark for measuring progress over time and comparing IPC programme performance across different healthcare facilities or regions.

2.1.19 How each component is assessed and scored using the IPCAF tool

The assessment and scoring of each component using the IPCAF tool typically involve a systematic process of evaluation based on predefined criteria (Deryabina et al., 2021).

- **Preparation**: This involves familiarising the assessors with the IPCAF tool and its criteria. It may also include gathering relevant documentation and data related to the IPC programme.
- **Data collection**: Assessors collect data by observing practices, reviewing documents, and interviewing staff. They assess each component based on predefined criteria outlined in the IPCAF tool.
- **Scoring**: Each component is scored based on the level of implementation or compliance with the predefined criteria. Scores are usually on a scale (e.g., 0-4), with higher scores indicating better implementation.
- **Analysis**: Once all components have been assessed and scored, the data is analysed to identify strengths, weaknesses, and areas for improvement in the IPC programme.
- **Reporting**: A report is typically generated to summarise the findings of the assessment, including scores for each component and recommendations for improvement.

- **Action planning**: Based on the findings, an action plan is developed to address areas needing improvement. This plan may include specific interventions, timelines, and responsibilities.

2.2 Studies that have used the IPCAF tool to assess IPC programmes in healthcare facilities

Several studies have used the IPCAF tool to assess IPC programmes in healthcare facilities. Here are a few examples:

2.2.1 Assessment of IPC in surgical units

A study by (Allegranzi et al., 2013), used IPCAF to assess IPC programmes in surgical units across multiple countries. The study found significant variations in IPC programme quality and highlighted the need for standardised IPC practices in surgical care.

- **Evaluation of IPC programmes in long-term care facilities**

A study by (Stone et al., 2009) used IPCAF to evaluate IPC programmes in long-term care facilities. The study identified areas for improvement in IPC practices, such as hand hygiene and environmental cleaning, and recommended targeted interventions to enhance IPC programme effectiveness.

- **IPCAF tool validation study**

A study by (Tomczyk et al., 2020b), focused on validating the IPCAF tool in a healthcare setting. The study found that IPCAF was a reliable and valid tool for assessing IPC programmes and recommended its use for routine IPC programme evaluation.

- **Assessment of IPC Programmes in Developing Countries:**

A study by (R. Khan et al., 2017) used IPCAF to assess IPC programmes in healthcare facilities in developing countries. The study identified several challenges in IPC programme implementation, including limited resources and infrastructure, and recommended strategies for improving IPC practices in these settings.

2.2.2 Assessment of IPC programmes in public hospitals in Ethiopia

A cross-sectional study used IPCAF to assess IPC programmes in public hospitals in Ethiopia. It evaluated various components of IPC programmes, including infrastructure, education and training, surveillance, practices and procedures, patient and healthcare worker safety, audit and feedback, communication, collaboration, documentation, and programme evaluation. These studies demonstrate the utility and effectiveness of the IPCAF tool in assessing IPC programmes in a variety of healthcare settings and contexts.

2.2.3 IPCAF Assessments in Europe

A study conducted in 2021 in Turkey evaluated the implementation of the WHO's IPC core components in Turkish healthcare facilities using the WHO's IPCAF. The study included 68 healthcare facilities from seven regions in Turkey and the Turkish Republic of Northern Cyprus, with 85% of them being tertiary care hospitals (Deryabina et al., 2021). Results showed that 50 (73.5%) of the facilities had advanced IPC levels, while 16 (23.5%) had intermediate IPC levels. The median IPCAF score for the hospitals was 668.8 (IQR 125.0) points.

The study identified workload, staffing, and occupancy (CC7; median 70 points) and multimodal strategies (CC5; median 75 points) as areas with the lowest scores. The limited number of nurses was highlighted as a significant problem. Hospitals with over 1000 beds had higher rates of healthcare-associated infections (HAIs) (Desta et al., 2018). Having certified IPC specialists, receiving frequent feedback, and having enough nurses were found to reduce HAIs.

In summation, most healthcare facilities in the study had an advanced level of IPC implementation, with staffing being a key driver. To further improve care quality and

ensure access to safe care for everyone, it is essential to have an adequate number of staff, certified IPC specialists, and regular feedback (Desta et al., 2018). Although there has been a significant decrease in HAI rates compared to previous years, rates are still high, and antimicrobial resistance (AMR) remains a significant problem. Increasing the number of nurses and reducing workload can help prevent HAIs and AMR (Desta et al., 2018) The study recommends initiating a nationwide “Antibiotic Stewardship Programme” to address these issues.

2.2.4 IPCAF assessments in Africa

In 2018, the General Directorate of Health in Abidjan, Ivory Coast, conducted an evaluation of the implementation of IPC in 30 healthcare facilities using the WHO’s IPCAF (Deryabina et al., 2021). The goal was to integrate hygiene activities into healthcare. The results showed that the overall median IPCAF score was 242.5/800, indicating an inadequate overall level. None of the facilities reached the “advanced” level, 5 (17%) reached the “intermediate” level, 10 (33%) were at the “basic” level, and 15 (50%) were rated as “inadequate”. Baseline institutions had higher scores than first-contact institutions.

The study concluded that IPC activities were inadequate and fragmented in under-resourced health facilities at the time of the assessment (Deryabina et al., 2021). It was suggested that providing adequate resources and developing expertise in IPC through strong political will and leadership could improve the situation and contribute to achieving universal health insurance objectives. However, the study noted some limitations. Multimodal strategies were not developed due to being relatively new concepts that posed problems of understanding for stakeholders and were difficult to implement in a limited-income country context. Additionally, the IPCAF was perceived as potentially compromising by the evaluated institutions and their managers, as it collects sensitive information on financial resources, overall functioning of services, and the accountability of health workers (Deryabina et al., 2021).

2.2.5 IPCAF assessments in Sub-Saharan Africa

The study aimed to describe the initial implementation experience of the WHO's core components of an IPC programme in two Sub-Saharan African acute healthcare facilities (Desta et al., 2018). Both facilities expressed interest in developing an IPC programme. The first facility, Saint Luc Hospital of Kisantu in the Kisantu Health Zone of DRC's Kongo Central Province, is a general reference hospital with 340 beds serving a population of 190,800. The second facility, Centre University Hospital of Souro Sanou (referred to as 'Facility B'), is a national referral hospital in Bobo-Dioulasso, Burkina Faso, with 650 beds serving several regions with a combined population of over six million.

The study used a mixed-methods approach. A knowledge, attitude, and practice (KAP) survey showed that participants demonstrated a high understanding of standard precautions, the importance of HAI surveillance, practical IPC training, and monitoring the implementation of IPC guidelines and standards for staffing and bed occupancy at both time points (Gupta et al., 2020). There was a significant increase in understanding from baseline to follow-up regarding the necessity of a dedicated IPC focal person, at least annual evaluations of IPC training, and healthcare waste segregation standards (Gupta et al., 2020).

The overall IPCAF score at Facility A was 392.5/800 points, corresponding to a 'Basic' IPC level, indicating that some aspects of the IPC core components are in place but not sufficiently implemented, requiring further improvement. The lowest ranked component was IPC programmes (10/100), and the highest ranked component was HAIs surveillance (97.5/100). Facility B had an IPCAF score of 415/800 points, corresponding to an 'Intermediate' IPC level, indicating that most aspects of the IPC core components are appropriately implemented. The facility should focus on improving the scope and quality of implementation and develop long-term plans to sustain and further promote existing IPC programme activities.

2.2.6 IPCAF assessment in South Africa

To evaluate the existing status of IPC practices at private and public hospitals in South Africa, the results from the 2019 WHO's IPCAF at the facility level were analysed (Gupta et al., 2020). The IPCAF consists of eight WHO IPC core components (CC) with 81 indicators. A total of 456 hospitals in South Africa completed the IPCAF, with 313 representing public hospitals and 143 representing private hospitals. According to The National Infection Prevention & Control Strategic Framework (2020), the overall national average IPCAF score was 612.5 out of a maximum of 800, indicating an intermediate level of IPC practices. Private hospitals scored higher, with an average of 722.5, reaching an advanced level, compared to public hospitals, which scored an average of 567.5, indicating an intermediate level. Each core component was allocated a maximum of 100 points, with private hospitals scoring between 85 and 100 per core component, while public hospitals scored between 60 and 85.

2.2.7 IPCAF assessment in Limpopo Province

While the development and application of the IPCAF have been extensively documented in various international contexts, there is a notable absence of specific references or studies that detail its use or adaptation within the Limpopo Province. The framework, developed by a multidisciplinary team of experts, has primarily been discussed in literature focusing on global or national implementations (Abrahão et al., 2022; WHO, 2013). This absence of localised studies presents an opportunity for future research and the potential adaptation of the IPCAF tool to better suit the specific needs and conditions of healthcare facilities in Limpopo.

Table 1: Example of IPCAF tool and scoring method (WHO, 2013)

Core component 1: Infection Prevention and Control (IPC) programme		
Question	**Answer**	**Score**
1. Do you have an IPC programme?[3] Choose one answer	☐ No	0
	☐ Yes, without clearly defined objectives	5
	☐ Yes, with clearly defined objectives and annual activity plan	10
2. Is the IPC programme supported by an IPC team comprising of IPC professionals?[4] Choose one answer	☐ No	0
	☐ Not a team, *only* an IPC focal person	5
	☐ Yes	10
3. Does the IPC team have at least one full-time IPC professional or equivalent (nurse or doctor working 100% in IPC) available? Choose one answer	☐ No IPC professional available	0
	☐ No, *only* a part-time IPC professional available	2.5
	☐ Yes, one per > 250 beds	5
	☐ Yes, one per ≤ 250 beds	10
4. Does the IPC team or focal person have dedicated time for IPC activities?	☐ No	0
	☐ Yes	10
5. Does the IPC team include both doctors and nurses?	☐ No	0
	☐ Yes	10
6. Do you have an IPC committee[5] **actively supporting the IPC team?**	☐ No	0
	☐ Yes	10

2.2.8 The strengths and weaknesses of IPC programmes identified through the use of the IPCAF tool

The use of the IPCAF has highlighted several strengths and weaknesses in IPC programmes across various healthcare facilities. Some key findings include:

2.2.8.1 Strengths

- **Infrastructure:** The establishment of robust IPC infrastructure, including the development of policies, guidelines, and dedicated personnel, is fundamental to the effectiveness of IPC programmes. Studies have shown that well-defined structures are crucial for the consistent implementation of IPC measures across healthcare settings (Allegranzi et al., 2013).
- **Education and training:** Regular education and training are integral to fostering adherence to IPC protocols among healthcare workers (Storr et al., 2017).
- Evidence suggests that continuous IPC education significantly improves compliance with IPC practices, such as hand hygiene and the use of PPE (Storr et al., 2017).

- **Surveillance:** Robust surveillance systems are key components of IPC programmes, enabling the monitoring and timely intervention of HAIs (Rashed et al., 2024; Tomczyk et al., 2021b). Effective surveillance has been linked to reductions in HAI rates and improved patient outcomes (Rashed et al., 2024).
- **Practices and procedures:** The implementation of standard IPC practices and procedures, such as hand hygiene and environmental cleaning, is well-documented as a cornerstone of infection prevention (Boyce and Pittet, 2002). Studies have consistently demonstrated that adherence to these practices reduces the incidence of HAIs (Boyce and Pittet, 2002).
- **Collaboration:** Effective IPC programmes often benefit from strong interdisciplinary collaboration, which enhances the overall effectiveness of IPC interventions (Sax et al., 2005). Collaboration between IPC teams and other departments, such as clinical services and facility management, is essential for comprehensive infection control (Sax et al., 2007).
- **Documentation:** Maintaining comprehensive and accurate documentation is critical for monitoring and evaluating IPC activities. Proper documentation facilitates ongoing assessment of IPC programmes, enabling continuous improvement and adherence to best practices (Stone et al., 2009).

2.2.8.2 Weaknesses

- **Staffing and workload:** One of the significant challenges in IPC programmes is the issue of staffing and workload. Inadequate staffing can lead to increased workload, which negatively impacts the implementation of IPC measures and compromises patient safety (Lowe et al., 2021)
- **Non-compliance:** Non-compliance with IPC guidelines, particularly regarding hand hygiene and PPE usage, remains a persistent issue. Non-compliance is often attributed to factors such as lack of time, insufficient resources, and inadequate training (Abalkhail and Alslamah, 2022b).
- **Challenges in reporting:** Reporting challenges, including incomplete or delayed HAI reporting, can undermine the effectiveness of surveillance systems and hinder timely interventions (Magill et al., 2014). This gap is often due to inconsistent reporting practices and lack of standardised data collection methods (Lowe et al., 2021).

- **Resource constraints:** Limited resources, including funding, staffing, and supplies, are common constraints in IPC programme implementation. Resource constraints can hinder the establishment and maintenance of essential IPC infrastructure and activities (Lowe et al., 2021).
- **Communication:** Communication gaps between IPC teams and other healthcare workers or departments can impede the effectiveness of IPC efforts (Sangster-Gormley, 2013). Poor communication can lead to misunderstandings and inconsistent application of IPC protocols (Lowe et al., 2021).
- **Programme evaluation:** While regular evaluation is essential for IPC programme success, some programmes lack systematic evaluation processes. This deficiency limits the ability to assess programme effectiveness and identify areas for improvement (Tomczyk et al., 2021b)
- The findings suggest that while many IPC programmes have strengths in key areas, there are also several areas for improvement. Addressing these weaknesses can help enhance the overall effectiveness of IPC programmes and reduce the burden of healthcare-associated infections in healthcare settings.

2.3 Impact of IPCAF on IPC programmes

The impact of using the IPCAF tool on IPC programmes, such as improvements in programme effectiveness, identification of areas for enhancement, and resource allocation. Studies indicated that the use of the Infection Prevention and Control Assessment Framework (IPCAF) has had a significant impact on IPC programmes in healthcare facilities.

2.3.1 Some of the key impacts include:

- **Improved programme effectiveness:** IPCAF has helped to improve the effectiveness of IPC programmes by providing a structured framework for assessing programme components. By identifying strengths and weaknesses, healthcare facilities can make targeted improvements to enhance overall programme effectiveness (Tomczyk et al., 2022).

- **Identification of areas for enhancement:** IPCAF has enabled healthcare facilities to identify specific areas for enhancement within their IPC programmes (Zingg et al., 2015). This includes areas such as infrastructure, education and training, surveillance, practices and procedures, safety, audit and feedback, communication, collaboration, documentation, and programme evaluation. By pinpointing areas that need improvement, facilities can implement targeted interventions to strengthen their IPC programmes (Zingg et al., 2015).
- **Resource allocation:** A study by Haustein argues that IPCAF has also influenced resource allocation within healthcare facilities. By highlighting areas that require additional resources, such as staffing, funding, or training, facilities can allocate resources more effectively to improve IPC programme performance (Harun et al., 2022).
- **Standardisation of practices:** Storr also agrees that IPCAF has contributed to the standardisation of IPC practices across healthcare facilities. By providing a common framework for assessment, IPCAF has helped to ensure that IPC programmes adhere to established guidelines and best practices (Storr et al., 2017).
- **Enhanced patient safety:** Ultimately, the use of IPCAF has led to enhanced patient safety. By improving IPC programme effectiveness and identifying areas for enhancement, healthcare facilities can reduce the risk of healthcare-associated infections (HAIs) and improve overall patient outcomes (Harun et al., 2022).

Based on the studies above, the use of IPCAF has had a positive impact on IPC programmes, leading to improvements in programme effectiveness, identification of areas for enhancement, and more efficient resource allocation.

2.3.2 Challenges and limitations of IPCAF

While the IPCAF is a valuable tool for assessing IPC programmes, some studies advised that it is not without its challenges and limitations. Some of the key challenges associated with the use of IPCAF include:

- Resource requirements: Conducting an IPCAF assessment requires significant resources, including time, personnel, and funding. Some healthcare facilities, particularly in low-resource settings, may struggle to allocate these resources, making it difficult to conduct comprehensive assessments (Storr et al., 2017).
- Complexity of assessment: The IPCAF tool assesses multiple components of IPC programmes, making the process complex and time-consuming. Facilities may find it challenging to navigate the various components and collect necessary data, which can hinder the effectiveness of the assessment (Zingg et al., 2015).
- Interpretation of results: Interpreting IPCAF assessment results can be challenging, especially for facilities new to the tool. Understanding how to prioritise areas for improvement based on assessment outcomes requires expertise in IPC, which may not always be available in all healthcare settings (Storr et al., 2017).
- Standardisation and Consistency: Ensuring standardisation and consistency in IPCAF usage across different healthcare facilities is challenging. Variations in how the tool is applied and interpreted can impact the reliability and comparability of results, potentially limiting the tool's overall effectiveness (Tomczyk et al., 2022).
- Training and education: Healthcare facilities may need to invest in training and education to ensure that staff involved in IPCAF assessments have the necessary knowledge and skills. This requirement can be a significant challenge, especially in settings with limited training resources (Zingg et al., 2015).
- Integration with existing systems: Integrating IPCAF assessments with existing IPC systems and processes can be complex. Facilities may need to modify their existing systems to accommodate the use of IPCAF, which can be resource-intensive and time-consuming (Storr et al., 2017).
- Sustainability: Sustaining the use of IPCAF over time presents a challenge. Facilities may struggle to maintain the momentum of IPCAF assessments and ensure that the improvements identified through the assessment process are implemented and sustained in the long term (Zingg et al., 2015).

While IPCAF is a valuable tool for assessing IPC programmes, the above studies indicated that healthcare facilities need to be aware of the challenges and limitations associated with its use and take steps to mitigate these challenges to ensure a successful assessment process.

2.4 knowledge, attitudes and practices (kap) survey

2.4.1 Knowledge in IPC

According to the WHO, the KAP survey is an essential tool used to gather information on healthcare workers' understanding, beliefs, and behaviours related to IPC (WHO, 2009). In the context of IPC, a KAP survey can be employed to assess healthcare workers' knowledge of IPC practices, their attitudes towards IPC, and their actual practices concerning IPC measures (Ranoto et al., 2025). Such surveys typically encompass questions related to:

- Knowledge: Questions focus on healthcare workers' understanding of standard precautions, transmission-based precautions, hand hygiene, and the use of PPE, among other IPC practices (Aldhamy et al., 2023).
- Attitudes: This section assesses healthcare workers' beliefs and attitudes towards IPC measures, such as their perception of the importance of IPC, confidence in implementing IPC practices, and any barriers they perceive to practicing IPC (Alhumaid et al., 2021).
- Practices: These questions evaluate the actual behaviours of healthcare workers related to IPC, including the frequency of hand hygiene, proper use of PPE, adherence to IPC guidelines, and participation in IPC training programmes (Alhumaid et al., 2021).

The results of a KAP survey can provide valuable insights into the strengths and weaknesses of IPC practices within a healthcare facility. This information can then be used to develop targeted interventions to improve IPC knowledge, attitudes, and practices among healthcare workers, ultimately leading to better infection control outcomes.

According to (Olowookere et al., 2015), a study assessing the preparedness of health workers in the control and management of Ebola Viral Disease (EVD) revealed a significant knowledge gap and poor infection control preparedness among respondents. This gap underscores the need for further research and targeted interventions to improve the knowledge and practices of health workers regarding EVD. However, the urgency of addressing this gap in 2015 was not sufficiently emphasized, potentially missing an opportunity to strengthen subsequent improvement efforts.

The WHO Update (2014) emphasises the importance of effective infection control practices in healthcare, citing fatal infections such as severe acute respiratory syndrome (SARS) and viral haemorrhagic fevers (e.g., EVD) as examples. Failure to implement infection control measures can result in the transmission of infections, and healthcare settings can become amplifiers of disease during outbreaks, impacting both hospital and public health. Adequate knowledge in IPC is crucial.

Knowledge encompasses the information, understanding, and skills gained through education and experience, particularly in the context of IPC (Zhao et al., 2024). Effective surveillance of HAIs is essential for IPC. For example, a study by (Razine et al., 2012) assessed the prevalence of HAIs across all institutions within Rabat University Medical Centre in Morocco, revealing a notably high prevalence rate (Razine et al., 2012). They recommended future control measures focus on patients who stay longer in the hospital, patients with invasive devices, and the rational use of antibiotics.

Similarly, (Mong et al., 2022) recommended education and training programmes for nurses after finding that their knowledge level was unsatisfactory. Lack of knowledge among nurses can increase the rate of HAIs (Lowe et al., 2021). This was supported by a study in Zimbabwe by (Tirivanhu et al., 2014), which determined barriers to IPC practices among nurses at Bindura Provincial Hospital. The study revealed that the majority of nurses lacked knowledge of infection control principles and did not utilise infection control manuals.In another study, (Hayeh and Esena, 2013) assessed IPC practices among health workers at Ridge Regional Hospital in Accra, Ghana, showing

that knowledge in IPC practices among healthcare workers was moderate, with availability and access to materials for IPC practices at the facility being 58%, and overall compliance with IPC guidelines at 54%.Regarding nursing students, (Ghalya and Ibrahim, 2014) assessed their knowledge, attitudes, and sources of information towards infection control and standard precautions. Results showed that the overall knowledge scores were acceptable, with the highest score in the hand hygiene domain and the lowest score in sharps disposal and sharps injuries. The main source of information for students was the curriculum.

- **Inadequate knowledge of infection prevention and control**

Failure to implement infection control procedures can lead to the transmission of pathogens, and healthcare settings can become amplifiers of disease during epidemics, affecting both hospital and public health (Tomczyk et al., 2020a). Despite the accumulation of knowledge over the past decades, there is a significant gap in the implementation of infection control practices, particularly in poor-resource settings, with devastating consequences. Breaches in infection control measures can negate any progress and investment in healthcare (Tomczyk et al., 2020a). Critical care nurses have a responsibility to protect critically ill patients from infections. A study by (Sobeh et al., 2023) assessed critical care nurses' knowledge and practice regarding infection control standard precautions, finding that two-thirds of the sample had unsatisfactory knowledge levels. Recommendations included updating knowledge and performance of critical care nurses through continuing in-service educational programmes.

The application of standard precautions by nurses in a dialysis unit was evaluated, focusing on hand hygiene and the use of personal protective equipment (Shimokura et al., 2006). Less than half of the nurses correctly knew that they had to wash their hands before and after caring for a patient (Shimokura et al., 2006). Chitimwango, (2017), assessed the knowledge, attitudes, and practices (KAP) regarding disinfection procedures among nurses in Italian hospitals, highlighting areas requiring improvement to enhance infection prevention efforts. The study found that the level of knowledge, particularly regarding the most common HAIs, was unsatisfactory, and

only a small percentage of nurses reported appropriately performing disinfection in their work. They recommended HAIs control and training programmes to address these shortcomings and improve knowledge and adherence to procedures for patient safety. Similarly, Hong and Xu, (2024) examined KAP related to infection control practices among healthcare workers in Pakistan, identifying critical gaps in adherence to standard protocols. The results showed a significant gap between knowledge about fomites as vectors in pathogen spread and actual practices to minimise this spread.

- **Attitude towards IPC**

Oxford Dictionary defines attitude as the way individuals think, feel, and behave about something (Allport, 1933). Despite the knowledge that dirty hands play a significant role in spreading healthcare-related pathogens, and that hand hygiene (HH) reduces the spread of these organisms, healthcare workers' adherence to HH is poor (Musu et al., 2017). In addition, compliance with HH was influenced by role modelling, balancing HH with other factors, and the drive for self-protection and personal cues (Musu et al., 2017).

Lemass et al. (2013) stated that the hands of practice staff are the most important vehicles of cross-infection, and the hands of patients can also carry microbes to other body sites, equipment, and staff. Hand hygiene is one of the most effective means of preventing nosocomial infections (Lemass et al., 2013a). There is clear evidence that strict adherence to hand hygiene reduces the risk of cross-transmission of infection (Musu et al., 2017). In settings with limited financial and human resources, lack of time is a significant observed and self-reported barrier to hand hygiene (Lowe et al., 2021).

Standard precautions are a set of practices that should be used in the care and treatment of all patients, regardless of whether they are known or suspected to be infected with a transmissible organism (Lemass et al., 2013). The purpose of standard precautions is to break the chain of infection (Lemass et al., 2013). Sarani et al. (2015:193-198) assessed the KAP of nurses about standard precautions for HAIs in Teaching Hospitals. The results showed that 43% of nurses had a poor attitude, 37%

had an average attitude, and 33% had a good attitude towards standard precautions. Implementation of Standard Precautions is vital in preventing transmission of infection to patients and staff (Lemass et al., 2013).

Hu et al., (2012) examined the knowledge, attitudes, self-reported behaviour, and barriers to compliance with the use of PPE among ICU healthcare workers during the pandemic influenza. The study showed that only 55% of Chinese critical care clinicians reported compliance with PPE use during pandemic influenza, putting HCWs and their patients at risk. Both attitudes toward PPE use and perceived organisational norms have been recognised as predictors of compliance. Hand hygiene is the single most important intervention to prevent transmission of infection and should be a quality standard in all health institutions.

Nair et al., (2014), assessed the KAP of hand hygiene among medical and nursing students at a tertiary healthcare centre in India, revealing that the majority of students had poor knowledge regarding hand hygiene. The transmission of blood-borne viruses and other microbial pathogens to patients during routine healthcare procedures continues to occur due to unsafe and incorrect injection practices (Simonsen et al., 1999). Despite advances in healthcare systems, nosocomial infections remain a preventable disease threatening public health (PIDAC, 2015). Chitimwango, (2017), assessed the awareness and attitudes of healthcare workers in LAUTECH Teaching Hospital Osogbo towards nosocomial infections, showing a need to raise awareness of nosocomial infections and preventive measures among healthcare workers. Preventive practices towards nosocomial infections were favourable for hand washing but unfavourable for self-reporting to the staff clinic when sick. There was no significant ($p>0.05$) association between ever reported or willingness to report nosocomial infections and awareness of hospital policy or the presence of an infection control committee in the hospital (Chitimwango, 2017).

- **Negative attitude towards IPC**

A negative attitude towards IPC can contribute to the transmission of infections. Nursing students, often witness a negative approach towards IPC from qualified staff, viewing IPC as an added job load rather than a central feature of patient safety and excellent care (Ward, 2012). Surgical operations, in particular, present opportunities for the transmission of infection between patients and healthcare workers (HCWs) and between patients. This risk may be higher in underdeveloped and developing countries due to low compliance with infection control policies and precautions (Abalkhail and Alslamah, 2022a). Abalkhail and Alslamah, (2022), investigated HCWs' attitudes and compliance with infection control practices in the operating department of a Jamaican teaching hospital, aiming to gather data for designing evidence-based interventions. The study found that HCWs had sub-optimal levels of compliance with standard infection control guidelines, with only 17% of all participants compliant with all seven infection control policies.

- **Positive attitude towards infection prevention and control**

A positive attitude towards IPC can help reduce the rate of HAIs. Chitimwango, (2017) conducted a study to assess the knowledge and attitudes of HCWs and patients on HAIs at the Central Regional Hospital in Ghana. The study indicated that attitudinal change is the best means of prevention. There was an increase in the number of subjects in each category scoring good and excellent in the post-education questionnaire, suggesting a positive impact of education on attitudes towards IPC. Sessa et al., (2011) assessed the level of KAP regarding disinfection procedures among nurses in Italian hospitals. The study revealed an extremely positive attitude towards the utility of guidelines and protocols for disinfection procedures, indicating a strong belief in the importance of following established guidelines for IPC.

2.4.2 Practices of nurses in IPC

According to the Oxford Dictionary (2010), practicing is the act of doing something regularly as part of your normal behaviour, such as IPC practices. It is crucial for all healthcare workers to strictly adhere to infection control guidelines, especially nurses, as they spend more time with patients. Indwelling urinary catheters (IUCs) are commonly used in hospitalized elderly patients. Catheter-associated urinary tract

infections (CAUTIs) account for a significant proportion of healthcare-associated infections (HAIs) in the United States, leading to additional health issues and increased healthcare costs. Recent guidelines emphasize evidence-based strategies for preventing CAUTIs, including minimizing unnecessary catheter use, ensuring proper insertion techniques, maintaining closed drainage systems, and promptly removing catheters when no longer needed (Tamma et al., 2024). Despite these recommendations, adherence to best practices varies across healthcare settings, indicating ongoing opportunities for improvement in CAUTI prevention efforts.

A safe injection is one that does not cause pain to the recipient, does not pose any preventable risks to the provider, and does not harm the community when disposed of. Unsafe injection practices can lead to the transmission of blood-borne pathogens and their associated diseases (Gyawali et al., 2013). Safe injection practices are standard precautions aimed at maintaining basic levels of patient safety and provider protection. The Ambulatory Surgical Center (ASC) Quality Collaboration (2016) states that diseases such as HIV, hepatitis C virus, and hepatitis B virus can spread from patient to patient when safe injection practices are not used.

- **Good practices in IPC**

Good hand hygiene is paramount in reducing the transmission of infectious agents and HAIspandemics (Guest et al., 2019).. Respiratory hygiene or cough etiquette has been incorporated into standard infection control precautions due to recent global influenza pandemics (Guest et al., 2019). Additionally, general good practices include ensuring that all staff's occupational immunisations and clearances are up to date. All staff must dispose of clinical waste according to local policy, with sharps disposed of in assembled sharp containers. PPE includes a range of barriers and respirators used alone or in combination to protect mucous membranes, airways, skin, and clothing from contact with infectious agents (Lemass et al., 2013b). Practice staff should conduct a risk assessment of planned procedures or actions and select PPE based on the nature of the procedure, the risk of exposure to blood, body fluids, mucous membranes, and non-intact skin, as well as the risk of contamination. Moreover, glove use does not eliminate the need for hand hygiene. Hands should be washed before

putting on gloves and hand hygiene should be performed immediately after glove removal.

The tuberculosis (TB) epidemic in South Africa is characterised by one of the highest levels of TB/HIV co-infection and growing multidrug-resistant TB worldwide (Sissolak et al., 2011). Sissolak et al. (2011) investigated nurses' experiences of factors influencing TB IPC practices to identify risks associated with potential nosocomial transmission. The study recommended the implementation and evaluation of a comprehensive, contextually appropriate TB-IPC policy with the setting and auditing of standards for IPC provision and practice, adequate TB training for both staff and patients, and the establishment of a cross-cultural communication strategy, including rapid access to interpreters (Sissolak et al., 2011).

Assessing knowledge, attitudes, and sources of information among nursing students towards infection control and standard precautions, Ghalya and Ibrahim, (2014) found that the overall knowledge scores for nursing students were acceptable. Students achieved the highest score in the hand hygiene domain and the lowest score in sharps disposal and sharps injuries. Good practices of nurses in infection prevention and control reduce the potential for nosocomial infections, promoting patient safety. However, patient safety can be compromised if nurses intentionally fail to comply with implemented infection control measures, leading to negligence or malpractice. Lemass et al. (2013) indicate that immunisation should be viewed as one part of a wider policy to prevent the transmission of infection to health workers and their patients. Therefore, vaccination should ideally take place before employment, and routine review of general immunisation status may also be appropriate.

- **Patient safety in IPC**

Patient safety has emerged as a fundamental aspect of healthcare, with the prevention of HAIs remaining a key priority (Haque et al., 2020). According to the CDC (2016), HAIs represent a significant yet preventable threat to patient safety. Even otherwise healthy individuals can be susceptible to HAIs, particularly when undergoing invasive

procedures or using medical devices. For instance, indwelling urinary catheters are a common cause of urinary tract infections, while bloodstream infections often stem from vascular access (Haque et al., 2020). Preventing the transmission of microorganisms between patients is not just a patient safety concern, but also an occupational health and safety issue for healthcare staff (Haque et al., 2020).

Nurses play a pivotal role in the healthcare team and have the potential to turn patients' negative experiences into positive healthcare experiences (Benson and Powers, 2011). Moreover, nurses can significantly influence the likelihood of patients contracting nosocomial infections. Infectious diseases can be transmitted to patients by healthcare workers who are unwell themselves. Therefore, healthcare workers bear the responsibility of maintaining their own health to avoid compromising patient safety (Benson & Powers, 2011).

- **Negligence**

Negligence is defined as the failure to exercise the level of care that a reasonable and cautious person would under similar circumstances. When a professional, such as a physician or nurse, is negligent while performing their professional duties, it is termed medical negligence or malpractice (Pandit and Pandit, 2009). According to Chan et al., (2020), liability for HAIs hinges on whether the hospital has implemented best practice infection control measures. The hospital may also be held vicariously liable if patients are harmed due to the negligent or intentional failure of staff to comply with these measures (Chan et al., 2020).

Personal hand hygiene for patients is crucial but often overlooked (Anderson et al., 2018). Providing alcohol-based hand rub for patients and visitors can help reduce the risk of environmental contamination. Adhering to the WHO 5 moments of hand hygiene is vital in reducing the risk of cross-infection. Handling contaminated linen without proper protection can lead to nosocomial infections, and nurses can be considered negligent if they fail to use personal protective equipment in such situations (Chitimwango, 2017). Injection safety practices are critical to prevent infections. Improper disposal of needles, such as sticking them into mattresses, is not safe. Onyemocho et al., (2013).assessed the knowledge and practice of injection safety

among healthcare workers in a Nigerian prison service health facility. Their findings indicated that only a portion of health workers demonstrated good knowledge and practice of key injection safety practices (Onyemocho et al., 2013).

2.4.3 Strategies to improve IPC in health facilities

Improving IPC in health facilities is crucial for reducing the risk of HAIs and ensuring patient safety (Tahir et al., 2023). There are some strategies which have been considered to improve IPC in health facilities (Ehsan et al., 2024) and these are discussed below:

- **Education and training**: Provide regular training and education programmes for healthcare workers (HCWs) on IPC practices, including hand hygiene, use of PPE, and environmental cleaning.
- **Implementation of guidelines**: Ensure that national and international IPC guidelines are implemented and adhered to in all healthcare settings.
- **Surveillance and monitoring**: Establish a robust surveillance system to monitor HAIs, identify trends, and implement targeted interventions.
- **Resource Allocation**: Allocate sufficient resources for IPC, including staffing, PPE, and cleaning materials.
- **Leadership and accountability**: Ensure that there is strong leadership support for IPC and clear accountability for IPC practices at all levels of the healthcare system.
- **Communication and collaboration**: Foster a culture of open communication and collaboration among HCWs, patients, and families to promote IPC practices.
- **Environmental hygiene**: Ensure that healthcare facilities are clean and hygienic, with regular cleaning and disinfection of surfaces and equipment.
- **Antimicrobial stewardship**: Implement antimicrobial stewardship programmes to promote the appropriate use of antimicrobials and reduce the development of antimicrobial resistance.

- **Patient safety culture**: Promote a culture of patient safety that prioritises IPC practices and encourages reporting of HAIs and near misses.
- **Research and innovation**: Support research and innovation in IPC to develop new strategies and technologies for preventing HAIs.

Below is an overview of where these strategies have been used and their observed impact:

- **Education and training**

Regular education and training programmes for HCWs on IPC practices have shown significant improvements in compliance with hand hygiene and the use of PPE. For example, a study in Bangladesh found that implementing education and training as part of their IPC strategy helped improve KPAs among HCWs, which was associated with a reduction in HAIs (Talukder et al., 2023).

- **Implementation of guidelines**

Adopting and adhering to national and international IPC guidelines in healthcare settings, such as the WHO guidelines, have proven crucial in controlling infections. Countries that have implemented these guidelines report improved IPC practices, which are essential for reducing HAIs and ensuring patient safety. The WHO advocates the development, dissemination, and monitoring of evidence-based guidelines, which have been shown to reduce HAI rates when effectively implemented. In Thailand, the strict adherence to IPC guidelines has led to improvements in overall infection control (Haque et al., 2020).

- **Surveillance and monitoring**

Establishing robust surveillance systems has effectively monitored HAIs and implemented targeted interventions. For instance, in settings where electronic surveillance systems were introduced, there was a noticeable reduction in infection rates due to timely detection and response to outbreaks. Surveillance, when linked with national programmes, helps in early outbreak detection and response. This

approach has been successful in several countries, including the Netherlands, where comprehensive surveillance has contributed to a decrease in HAIs and improved patient outcomes.

- **Resource allocation**

Sufficient resource allocation, including adequate staffing, PPE, and cleaning supplies, is vital for the success of IPC programmes. Inadequate resources have been identified as a major challenge, and addressing this has led to improved IPC compliance and outcomes. A lack of resources can hinder the implementation of IPC measures, leading to higher infection rates. Studies have shown that hospitals with better resource allocation have lower rates of HAIs, as they can maintain essential IPC practices consistently.

- **Leadership and accountability**

Strong leadership and clear accountability structures have been shown to enhance the implementation of IPC practices. Facilities with dedicated IPC teams and strong leadership support reported better adherence to IPC protocols, leading to lower infection rates. For example, in Ghana, strong leadership and a strategic national approach have led to improved IPC outcomes (Garcia et al., 2022).

- **Communication and collaboration**

Promoting open communication and collaboration among HCWs, patients, and families is essential for effective IPC practices. Programmes that foster a collaborative environment have seen improved adherence to IPC measures and better patient outcomes (Steinecker, 2025).

- **Environmental hygiene**

Ensuring clean and hygienic healthcare environments through regular cleaning and disinfection has been linked to reduced transmission of infections. Studies have shown

that environmental hygiene is critical in preventing the spread of HAIs, particularly in high-risk areas (Kim, 2024).

- **Antimicrobial stewardship**

The WHO highlights that the implementation of antimicrobial stewardship programmes is crucial in combating antimicrobial resistance. It further suggests that these programmes have been effective in reducing unnecessary antibiotic use, thereby minimising the risk of resistance development. Countries such as the Netherlands have successfully implemented these programmes, leading to a decline in AMR and improved overall patient outcomes (Martínez et al., 2025).

- **Patient safety culture**

Promoting a culture of patient safety that prioritises IPC practices encourages the reporting of HAIs and near misses. This culture shift has been associated with improved IPC outcomes and a reduction in HAIs (Burrell, 2025).

- **Research and innovation**

Supporting research and innovation in IPC has led to the development of new strategies and technologies for preventing HAIs. Ongoing research efforts continue to provide insights that help refine IPC practices and improve patient safety (Birgand et al., 2022). The studies above confirm that these strategies, when effectively implemented, have shown positive impacts on reducing HAIs, enhancing healthcare safety, and combating antimicrobial resistance.

2.5 Implementing the WHO's Multimodal Strategy to improve IPC programmes

2.5.1 Introduction

The WHO developed a multimodal strategy for IPC to address the persistent challenge of HAIs (Bert, Giacomelli et al., 2019). This strategy emphasises the integration of

multiple components to create a comprehensive and sustainable approach to IPC (Allegranzi et al., 2011a). This literature review explores the effectiveness of the WHO multimodal strategy in improving IPC programmes, identifying the key components, challenges, and outcomes associated with its implementation (Kabego et al., 2023).

2.5.2 WHO's Multimodal Strategy for IPC

The WHO's multimodal strategy for IPC consists of five key components namely:

- System change (Build it): This involves enhancing the infrastructure and ensuring the availability of essential supplies and equipment to support IPC practices. According to WHO (2016), creating an environment that facilitates safe practices is fundamental to effective IPC programmes. System changes are crucial in building the foundation for sustainable infection prevention measures (Gašpert, 2025a).
- Training and education (Teach it): Continuous education and training of healthcare workers on IPC practices are vital for maintaining high standards of infection prevention. Research has shown that regular training can significantly improve compliance with IPC protocols (Amavasi and Zimmerman, 2024). Education initiatives should be ongoing to address emerging challenges and reinforce best practices (Amavasi and Zimmerman, 2024).
- Monitoring and feedback (Check it): Regular monitoring and feedback mechanisms are essential for improving adherence to IPC practices. This approach involves tracking the implementation of IPC measures and providing healthcare workers with feedback to enhance compliance(Dixon-Woods et al., 2016). A study by Dixon-Woods et al. (2016) highlighted the effectiveness of monitoring and feedback in reducing hospital-acquired infections
- Reminders in the workplace (Sell it): Visual aids such as posters, checklists, and reminders play a crucial role in reinforcing IPC practices among healthcare workers. These tools have been shown to improve adherence to guidelines, particularly in high-pressure environments (Lindgreen et al., 2016). They serve as constant cues to encourage the consistent application of IPC measures (Lindgreen et al., 2016).

- Institutional safety climate (Live it): Fostering a culture of safety where IPC is prioritized at all levels of the healthcare organisation is essential for the successful implementation of IPC programmes. A positive safety climate has been associated with better IPC outcomes, as it encourages healthcare workers to adhere to safety protocols and take ownership of infection prevention efforts (Gershon et al., 2000).

2.5.3 Effectiveness of the WHO's Multimodal Strategy

Research indicates that the WHO's multimodal strategy significantly improves IPC practices and reduces HAIs. Key studies include:

- Allegranzi et al., (2011): This study demonstrated a significant reduction in HAIs and improved compliance with hand hygiene practices in hospitals that implemented the WHO's multimodal strategy. The success was attributed to comprehensive system changes, regular training, and continuous monitoring.
- Zingg et al., (2015): Implementing the multimodal strategy in a resource-limited setting showed improved IPC practices, although challenges related to infrastructure and resources were highlighted.
- Schwappach and Richard, (2018): The study highlighted the importance of fostering an institutional safety climate and how leadership commitment is crucial for the successful implementation of IPC strategies.

2.6 Challenges in implementation

Despite its proven effectiveness, the implementation of the WHO's multimodal strategy faces several challenges namely:

- Resource constraints: Resource limitations, particularly in low- and middle-income countries, significantly hinder the implementation of effective IPC measures. These constraints affect the availability of essential materials and infrastructure needed to maintain high standards of IPC (Lowe et al., 2021). Studies highlight the challenges faced by healthcare facilities in ensuring consistent supplies and the impact this has on IPC outcomes (Allegranzi et al., 2011).

- Sustainability: Maintaining the sustainability of IPC improvements is resource-intensive, requiring continuous training, monitoring, and the allocation of adequate resources. Sustainability is a major concern, as short-term gains can be lost without ongoing support and commitment from healthcare institutions (Storr et al., 2017). Long-term sustainability also depends on the integration of IPC into broader health system strategies (Storr et al., 2017).
- Behavioural change: Achieving and sustaining behavioural change among healthcare workers is one of the most challenging aspects of IPC implementation. Continuous education and a strong institutional commitment are necessary to maintain high levels of compliance with IPC practices (Gašpert, 2025b). Studies have shown that behavioural interventions must be carefully designed to be culturally sensitive and contextually relevant (Ting and Garnett, 2021; Tomczyk et al., 2020a).
- Cultural barriers: Cultural attitudes towards IPC practices can vary widely across different healthcare settings, impacting the adoption and implementation of multimodal strategies. Effective IPC programmes must consider these cultural differences and work to address potential barriers to compliance (Tan et al., 2020). Cultural competence is crucial for the successful implementation of IPC guidelines (Tan et al., 2020).

2.7 Strategies to overcome challenges

To address these challenges, several strategies have been proposed (Shen, Wang et al., 2017) and they are:

- Enhanced leadership and governance: Strong leadership and governance are essential for the effective implementation of IPC strategies. Leadership commitment at all levels ensures that IPC measures are prioritized, adequately resourced, and integrated into the overall healthcare system (Tomczyk et al., 2021a). Studies show that successful IPC programmes often have strong leadership support, which drives adherence to guidelines and fosters a culture of safety (Allegranzi et al., 2017).
- Adaptation to local contexts: Tailoring IPC strategies to fit the specific needs and local contexts of healthcare facilities can significantly improve their

effectiveness. Customising interventions based on the local epidemiology, available resources, and cultural factors ensures greater relevance and acceptance (Storr et al., 2017). The importance of context-specific adaptation has been highlighted in various settings, showing improved outcomes when interventions are aligned with local circumstances (Allegranzi et al., 2011b).

- Leveraging Technology: Utilising technology in IPC programmes can help address resource limitations and enhance training, monitoring, and feedback mechanisms. Technology-based solutions, such as electronic surveillance systems and e-learning platforms, have been shown to improve the efficiency and reach of IPC interventions, particularly in resource-constrained settings (Kruk et al., 2018). The integration of technology in IPC efforts has proven effective in improving compliance and monitoring outcomes (Storr et al., 2017).
- Engaging healthcare workers: Involving healthcare workers in the design and implementation of IPC strategies is critical for increasing their commitment and compliance. Engaging frontline staff in IPC planning ensures that interventions are practical and relevant to their daily work, leading to better adherence and outcomes (Pittet et al., 2006). The active participation of healthcare workers has been identified as a key factor in the success of IPC programmes, fostering a sense of ownership and accountability (Alhumaid et al., 2021).

2.8 Challenges in implementing IPC measures

The literature identifies various challenges in implementing IPC measures, including inadequate resources (such as staffing and equipment), lack of compliance with IPC guidelines, and organisational barriers (such as competing priorities and lack of leadership support) (Chitimwango, 2017). Implementing IPC measures in healthcare settings is fraught with various challenges. Literature identifies several barriers that impede the successful implementation of IPC practices:

- **Inadequate Resources**: A significant challenge is the lack of sufficient resources, including staffing, equipment, and financial support. Many healthcare facilities struggle to allocate the necessary resources to maintain effective IPC programmes. This scarcity often leads to compromised infection control measures, which increases the risk of HAIs (Wong et al., 2021).

- **Lack of Compliance**: Compliance with IPC guidelines among healthcare workers is often inconsistent. Factors contributing to non-compliance include inadequate training, insufficient knowledge of IPC protocols, and the perception that these guidelines are burdensome or impractical. This non-compliance directly undermines the effectiveness of IPC programmes and poses a significant challenge to infection control efforts (Storr et al., 2017).
- **Organisational barriers**: Organisational challenges such as competing priorities within healthcare facilities, lack of leadership support, and poor communication can hinder the implementation of IPC measures. When IPC is not prioritised, or when leadership fails to actively support IPC initiatives, the overall effectiveness of infection prevention efforts is significantly diminished (Penner, 2021).

2.9 Strategies for improving IPC practices

Several strategies for improving IPC practices, includes enhancing education and training programmes, improving communication and collaboration among healthcare workers, implementing electronic surveillance systems for HAIs, and ensuring access to adequate resources for IPC . In response to these challenges, various strategies have been employed to enhance IPC practices:

- **Enhancing education and training programmes**: Providing ongoing education and training for healthcare workers is crucial in improving compliance with IPC measures. Tailored training programmes that address specific gaps in knowledge and practice can lead to better adherence to guidelines and a stronger understanding of the importance of IPC (Alhumaid et al., 2021).
- **Improving communication and collaboration**: Strengthening communication and collaboration among healthcare workers can foster a culture of safety and accountability. Multidisciplinary team meetings, regular feedback, and clear communication channels are essential in promoting a unified approach to infection prevention (Shimbre and Tanga, 2024).
- **Implementing electronic surveillance systems**: Electronic surveillance systems for monitoring HAIs are effective in identifying infection trends, tracking outbreaks, and providing timely data to inform IPC strategies. These systems

enable healthcare facilities to respond rapidly to potential infection threats and to adjust IPC measures accordingly (Habboush et al., 2018).

- **Ensuring access to adequate resources**: Securing adequate resources for IPC is critical. This includes not only financial resources but also ensuring the availability of essential supplies such as personal protective equipment (PPE), hand hygiene products, and sterilisation equipment. Advocacy for sustained investment in IPC infrastructure is necessary to maintain the effectiveness of infection prevention efforts (Dramowski et al., 2022).

2.10 Identifying gaps and filling them with the current study's findings

Despite these strategies, gaps in IPC implementation persist. The current study's findings aim to address these gaps by providing insights into the specific challenges and facilitators within the healthcare settings under investigation. By identifying context-specific barriers and evaluating the effectiveness of existing IPC strategies, the study sought to offer evidence-based recommendations that can enhance the overall efficacy of IPC programmes. These findings will contribute to bridging the gap between policy and practice, ensuring that IPC measures are not only implemented but are also sustainable and adaptable to the unique needs of different healthcare environments.

2.11 Conclusion

Practices that inform IPC implementation are important in preserving a safe environment for everyone by reducing the risk of the potential spread of disease (Opollo et al., 2021). These practices are intended to decrease the risk of HAIs and to guarantee a protected and healthy hospital environment for our patients, healthcare providers, and visitors. The programmes that are aimed at supporting IPC are more relevant in low- and middle-income countries, because healthcare delivery and hygiene matters are negatively affected by secondary infections (Lowe et al., 2021)

CHAPTER THREE: THEORETICAL FRAMEWORK

3.1 Introduction

The theoretical framework is the “blueprint” for the entire dissertation inquiry, and it serves as the guide on which to build and support a research study, and therefore provides the structure to define how the study was philosophically, epistemologically, methodologically, and analytically approached (Grant and Osanloo, 2014). The theoretical framework consists of the selected theory (or theories) that undergird(s) the thinking with regard to how the understanding and planning of the research topic, as well as the concepts and definitions from that theory that are relevant to the topic.

A theoretical framework has been defined as an overview of foundational theories that acts as a guide for building arguments during the research process and during a literature review (Kivunja, 2018). It is important to highlight that the study’s significance, problem description, and reasoning are all supported by the theoretical framework. Bingham et al., (2024) emphasises that the theoretical framework, which places the links examined in the study into the framework of creating or testing formal theories, is a component of the conceptual framework.

3.2 Theoretical Framework

The current study used the Theoretical Framework of Acceptability (TFA), which is a framework that focuses on the assessment of acceptability from the perspectives of intervention deliverers and recipients, prospectively and retrospectively. The acceptability of healthcare interventions to intervention deliverers and recipients is an important issue to consider in the development, evaluation and implementation phases of healthcare interventions (Sekhon et al., 2017).The TFA consists of seven component constructs: affective attitude, burden, perceived effectiveness, ethicality, intervention coherence, opportunity costs, and self-efficacy, as presented in Figure 1 below.

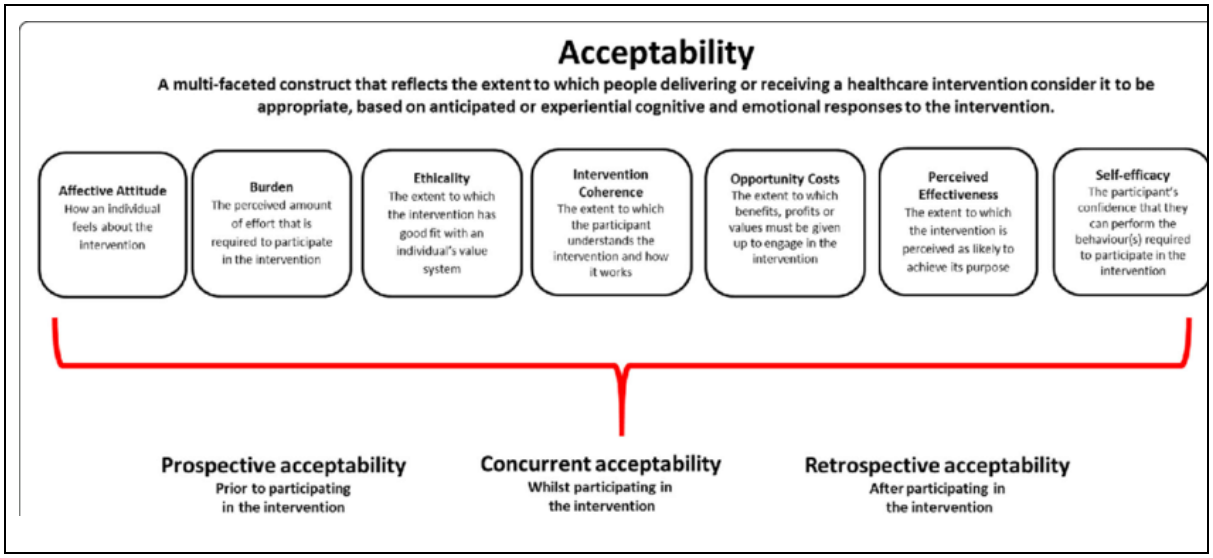

Figure 1: The theoretical framework of acceptability (Sekhon, Cartwright & Francis, 2017).

3.3 Application of the framework in the study

The multi-faceted construct that reflects the extent to which healthcare workers delivering IPC as a public health intervention investigated following the seven TFA component construct as follows:

3.3.1 Affective attitude

Understanding healthcare workers' affective attitudes towards participating in the IPC programme is important because it can impact their motivation, engagement, and ultimately, their adherence to IPC practices. This concept relates to experience in years. Thus, working in the IPC programme can influence affective attitude. IPC nurses with positive experiences, such as seeing the positive impact of IPC practices on patient outcomes or feeling supported and valued in their role, have a more positive affective attitude towards the programme. Conversely, negative experiences, such as lack of resources, inadequate training, or ineffective leadership, can lead to a negative affective attitude.

3.3.2 The burden

The burden of IPC programmes and HAIs highlighted the importance of effective infection prevention and control strategies to minimise the impact of HAIs on patients and healthcare systems. This includes the various tasks and responsibilities involved in preventing and controlling HAIs, such as conducting surveillance, implementing and monitoring infection control measures, providing education and training to healthcare staff, and ensuring compliance with IPC guidelines and protocols. Additionally, the burden also encompassed the impact of healthcare-associated infections on patients, healthcare workers, and healthcare facilities. HAIs can lead to increased morbidity and mortality, prolonged hospital stays, additional healthcare costs, and a higher risk of complications for patients.

3.3.3 Ethicality

Ethicality concerning the level of support for the IPC programme from management and other disciplines requires a commitment to fairness, transparency, and ethical decision-making, with a focus on promoting patient safety and well-being. From an ethical standpoint, management and other disciplines should provide consistent and adequate support for the IPC programme, regardless of personal relationships, biases, or other factors. This support should be based on the ethical principles of beneficence (promoting the well-being of others), non-maleficence (avoiding harm), and justice (fairness and equity). It is also important that support for the IPC programme is not influenced by conflicts of interest or personal gain. Decisions regarding support should be made with the best interests of patients and healthcare workers in mind, and should be guided by evidence-based practices and guidelines. Furthermore, ethicality in support of the IPC programme includes respecting the autonomy of healthcare workers involved in IPC activities. This means allowing them to voice their opinions, concerns, and suggestions, and incorporating their input into decision-making processes.

3.3.4 Intervention coherence

This concept assisted in determining that intervention coherence in management supporting the IPC programme is essential for ensuring that IPC efforts are effective, sustainable, and aligned with the overarching goals of patient safety and quality care.

It also meant that supporting the IPC programme entails fostering a culture of safety, where IPC is prioritised and integrated into all aspects of healthcare delivery and providing the necessary resources, such as funding, staffing, and equipment, to effectively implement IPC measures. This can involve promoting open communication, collaboration, and teamwork among healthcare staff, as well as providing education and training on IPC practices.

3.3.5 Opportunity costs

This concept highlighted that understanding the opportunity cost of implementing activities to improve the IPC programme and training of personnel is important for healthcare facilities to make informed decisions about resource allocation and prioritise investments based on their impact on patient safety and overall healthcare outcomes. The opportunity cost of activities needed to be implemented to improve the functionality of the IPC programme and training of personnel refers to the value of the next best alternative that is forgone as a result of choosing to invest resources (such as time, money, and effort) in these activities (Drummond et al., 2014).

The opportunity cost of implementing these activities may also include the time and effort required by healthcare workers and management to plan, coordinate, and execute these initiatives (Gold et al., 1996).

3.3.6 Perceived effectiveness

The concept helped in realising that understanding healthcare workers' perceived effectiveness of certain practices or factors in contributing to HCAIs can help healthcare facilities tailor their infection prevention and control strategies. By addressing these perceptions and promoting practices that are perceived to be effective, healthcare facilities can improve overall compliance with infection prevention measures and reduce the risk of HCAIs. For example, if healthcare workers perceive

improper hand hygiene to be a significant factor in the transmission of infections, they may be more diligent in practicing proper hand hygiene, thereby reducing the risk of HCAIs. Similarly, if they perceive inadequate environmental cleaning to be a common predisposing factor, they may prioritise thorough cleaning and disinfection of patient care areas.

3.3.7 Self-efficacy

Self-efficacy as a concept, in the context of collaboration with other health practitioners, screening practices in IPC, and adherence to policy documents or guidelines, refers to healthcare workers' belief in their ability to successfully engage in these activities and adhere to relevant protocols. This involves:

- **Collaboration with other health practitioners:** If healthcare workers have high self-efficacy in collaboration, they are more likely to actively engage with other healthcare professionals, share information, and work together effectively to prevent and control infections. This can lead to improved communication, coordination of care, and overall effectiveness of IPC efforts.
- **Screening practices in IPC:** Self-efficacy in screening practices relates to healthcare workers' confidence in their ability to conduct screenings accurately and effectively. High self-efficacy in this area can lead to more thorough and consistent screening practices, which are essential for early detection and prevention of infections.
- **Policy documents or guidelines:** Self-efficacy in adhering to policy documents or guidelines involves healthcare workers' confidence in their ability to understand and apply the recommendations outlined in these documents. High self-efficacy in this area can lead to better compliance with IPC protocols and guidelines, which are critical for maintaining a safe healthcare environment.

Overall, enhancing self-efficacy in these areas through training, support, and feedback can contribute to more effective IPC practices and ultimately improve patient safety and outcomes. In the current study, the WHO's multimodal strategy was proposed, as it provides a comprehensive framework for improving IPC programmes and reducing

HAIs. Its success depends on effective implementation, continuous monitoring, and fostering a culture of safety within healthcare institutions. Addressing the challenges associated with resource constraints, sustainability, behavioural change, and cultural barriers is essential for maximising the strategy's impact. Further research and tailored interventions are necessary to adapt the strategy to various healthcare settings, ensuring its broad applicability and effectiveness.

3.4 Conclusion

This chapter concludes that the theoretical framework concepts outlined above highlight the importance of various factors in influencing healthcare workers' behaviours and practices related to IPC.

Self-efficacy, or the belief in one's ability to perform certain tasks, plays a crucial role in determining how healthcare workers approach collaboration with other health practitioners, screening practices, and adherence to policy documents or guidelines. Higher levels of self-efficacy are likely to result in more effective IPC practices, as healthcare workers feel more confident in their abilities to perform these tasks accurately and consistently.

Perceived effectiveness, or how healthcare workers perceive certain practices or factors to contribute to HAIs, also influences behaviour. If healthcare workers believe that certain practices, such as hand hygiene or environmental cleaning, are effective in preventing HAIs, they are more likely to adhere to these practices and reduce the risk of infections. By understanding and addressing these factors, healthcare facilities can improve their IPC programmes and ultimately enhance patient safety. This may involve providing training and support to boost healthcare workers' self-efficacy, as well as ensuring that IPC practices are based on evidence and perceived as effective by healthcare workers. Additionally, promoting a culture of collaboration and communication among healthcare workers can help reinforce IPC practices and reduce the risk of HAIs.

CHAPTER FOUR: METHODOLOGY

4.1 Introduction

According to Van Nguyen et al., (2023), the research technique is an all-encompassing strategy to conducting research that is connected to the literature, theoretical framework, paradigm, and ethical standards. In agreement, Ugwu et al., (2021) defines research methodology as a broad term that includes the research philosophy approach, design, method, and procedures used to investigate data gathering, participant selection, instrument use, data analysis, as well as assumptions and study limitations and how they are mitigated. One of the elements of the research paradigm that addresses how the researcher approached determining the answer to the research question is research methodology.

Kamal, (2019), suggests that the key inquiry about technique is how a researcher might approach the task of attempting to ascertain as much as possible about reality. It is the process of learning more about the phenomenon that is being studied. The research methodology, research paradigm, research design, sampling, population, sample size, data collecting, measuring tools, inclusion and exclusion criteria, data analysis, validity and reliability, dependability, and ethical considerations in this study are all described in this chapter. To achieve the goals of this study, a research paradigm that guided the research design and methodology was selected.

4.2 Research paradigm

The term “research paradigm” describes the underlying philosophical beliefs of researchers about reality and truth in general, as well as the specific study question at hand (Dawadi et al., 2021). According to Kivunja, (2018), a researcher’s worldview, or philosophical perspective impacts what should be examined, how it should be studied, and how the study’s conclusions should be perceived. This is further defined as the research paradigm. Similarly, the purpose and driving force of the research are disclosed. In this study, a research paradigm was used to conceptualise the

researcher's views on the nature of knowledge and choose relevant research methodologies to answer research questions (Kivunja, 2018).

Pragmatism, which is characterised as a paradigm that accepts mixed methodologies and is thus adaptable to both quantitative and qualitative approaches, was the research paradigm selected for this study as a worldview (Makombe, 2017). The pragmatism paradigm was used for this study because it made it possible to gather and combine both quantitative and qualitative data into a single investigation. The paradigm is based on employing optimal techniques to investigate real-world issues, utilising diverse data and knowledge sources to address research inquiries, and acknowledging the significance of the physical, psychological, and social realms, including culture, language, establishments, and subjective cognitions (Allemang et al., 2022). In addition to using various data sources to investigate real-world issues, pragmatism offers an action-oriented framework for research in which the investigator aims to address practical issues arising from communities by employing pertinent methodologies to address the research question (Hothersall, 2019). Additionally, because knowledge is both produced and grounded in the reality of the world we live in and experience, our study complies with these pragmatist features. In other words, establishing the state of the IPC programme in healthcare facilities and the viewpoints of IPC professional nurses, can help one learn about IPC programmes in the Limpopo Province. Table 4.1 below illustrates the philosophical assumptions that informed the methodological approach, design and methods of data collection and analysis of this study:

Table 4.1: Philosophical assumptions and methodological approach

Ontology	Epistemology	Paradigm	Approach	Design	Methods
One reality and multiple perceptions	Double-faced knowledge	Pragmatism	Mixed method	Exploratory sequential	Semi-structured interviews, WHO data collection tool & SPSS.

Adapted from: (Ugwu et al., 2021b)

4.2.1 Ontological assumptions

While reality is what may be studied, ontology is the study of the nature of existence or reality and offers an understanding of the things that make up reality (Ugwu et al., 2021). According to Ntshauba, (2024),“existence of multiple contexts means the existence of multiple realities,” and “only one reality exists in a particular context.” Reality can change when a context does. Since IPC nurses have varied opinions on the IPC programme in healthcare facilities, the researcher in this study adopted one reality view and utilised a qualitative approach to analyse participants’ attitudes about it. This helped the researcher create variables to be measured in the quantitative phase and enabled for a thorough comprehension of the context creating the reality. Because quantitative research offered a streamlined perspective of reality, qualitative findings were validated by it.

4.2.2 Epistemological assumptions

The term epistemology describes how we arrive at knowledge and what constitutes reality or truth (Nguyen et al., 2020). In line with this, Kamal, (2019) defined epistemology as the process by which the researcher learns about reality, truth, and the relationship between the researcher and the researched. Epistemological position is conceptualized as double-faced knowledge, which refers “to any type of knowledge that can be seen as observable or unobservable based on the ontological position of the researcher not on the nature of knowledge itself,” according to Ntshauba, (2024), who claims that epistemology point of view directly flows from ontological point of view.

Kamal (2019) makes a similar claim, stating that ontological presumptions inform epistemological assumptions. To get unobservable knowledge for this study, the researcher employed a qualitative research approach; for observable knowledge, she employed a quantitative research approach; while a questionnaire was used to address observable knowledge such as work experiences, burden of healthcare-acquired infections, and management support.

4.2.3 Research methodological approach

- *Research approach*

A research methodology is a strategy and process that describes the phases and specific techniques for gathering, analysing, and interpreting data ((Creswell and Clark, 2017; Creswell & Creswell, 2022). This study used a mixed method research (MMR) approach, which is characterised as a strategy that combines qualitative and quantitative methods according to the nature of the research issue and the study's objectives (Taherdoost, 2022). MMR was employed in this study to fully comprehend the research subject by looking at its various facets and gain a comprehensive understanding about the phenomenon understudy(then perhaps add with an article information.

- *Research design*

A structure that matches the research problem with the research questions is referred to as the research design (Chidozie et al., 2023). According to Shiyanbola et al., (2021), an explanatory sequential design is a type of study design where the quantitative phase of data collection and analysis precedes the qualitative phase. This approach allows for the quantitative findings to guide the development of qualitative inquiries, thereby offering a deeper understanding of the results.Using a quantitative approach, the researcher used an explanatory sequential design to help gain insight into the research problem. Using an explanatory sequential mixed methods approach, the researcher first collected and analyzed quantitative data to identify key patterns and relationships related to the research problem. Based on these findings, qualitative data collection and analysis were conducted to provide deeper insights and explanations for the quantitative results. This sequential process ensured a comprehensive understanding of the research problem. The themes that emerged from the quantitative data were then used to inform the development of a qualitative data collection instrument, which allowed the researcher to further explore the research problem.

- *Method of data collection and analysis*

Qualitative and quantitative methodology were used in a sequential manner in this study. The data collection methods used in this study were retrospective peer review data and a questionnaire. Furthermore, data generated was analysed using thematic analysis and SPSS version no 29.0.0.0 (IBM SPSS Statistics, 2022) and Microsoft Excel.

4.3 Research method

Research methods are the procedures used to gather, evaluate, and make generalizations or representations based on data (Okesina, 2021) This study employed an explanatory sequential mixed-methods design as the standard research methodology. This approach involves two distinct phases: the collection and analysis of quantitative data, followed by qualitative data to explain and expand upon the initial quantitative findings. The sequential use of these methods allowed for a comprehensive exploration of the research problem, ensuring that the insights from the qualitative phase provided a deeper understanding of trends and relationships identified in the quantitative phase. (Ugwu et al., 2021).

Beyond what a single research approach can accomplish, the MMR approach offers rich insights and a thorough understanding of the research phenomena; data sets from both quantitative and qualitative sources yield greater confidence in findings and broader application in the conclusion; it also provides additional insight into various phenomena components that may aid in the generation of fundamental theories; and it triangulates data, which is crucial for validating results and inferences (Dawadi et al., 2021). Furthermore, Shuaibu et al., (2024), describes how triangulation, which involves studying the same phenomenon using many approaches to data collecting and analysis, enhances and deepens research findings. Additionally, the MMR approach offers chances to create quantitative measures and conduct qualitative research on contextual aspects, including culture, beliefs, and perceptions (Shiyanbola et al., 2021). A mixed-methods approach's drawback is that it necessitates financing, time, effort, and the expertise and experience of the researcher (Shuaibu et al., 2024).

4.4 Research design

According to Asenahabi, (2019), the research design is a process that converts a research problem into data for analysis to offer pertinent responses to a research question. As previously mentioned, the researcher was able to evaluate the IPC programme concept before verifying it, thanks to the exploratory sequential MMR design, which gives the qualitative approach more flexibility in identifying novel ideas (Gogo and Musonda, 2022). In the quantitative approach, a suitable instrument was created with variables that needed to be included in the second phase and that best fit the study sample. Additionally, information gathered from both stages was combined to inform the development of an evidence-based management model appropriate for the research setting.

The explanatory sequential mixed-methods design was selected for this study as it allowed the researcher to begin with the collection and analysis of quantitative data, which provided an overview of the patterns, relationships, and trends within the IPC programme in Limpopo Province. This quantitative phase informed the subsequent qualitative phase, where in-depth data collection was conducted to explain and expand upon the initial findings. The design was instrumental in obtaining a comprehensive understanding of the studied phenomenon while enabling the discovery of nuanced insights and the development of context-specific recommendations.

According to Heesen et al., (2019), this design strengthens the validity of findings by addressing research questions that require both a broad numerical overview and a detailed, narrative exploration. It is particularly suited for addressing complex, open-ended problems and developing an understanding of human behaviour through an iterative and complementary methodological process.

As previously discussed, the quantitative approach was prioritized initially in this study to establish the scope, provide statistical descriptions, and ensure the generalizability of the findings. Following this, the qualitative phase used an inductive technique to generate deeper meaning and contextual understanding, aligning with the broader

objectives of the study. The combination of these approaches allowed the researcher to draw on the strengths of both methods, ultimately leading to a robust and well-rounded investigation (Heesen et al., 2019).

4.5 Research setting

A location designated for the collection of study data is known as a research setting (Koswara, 2022). The study was conducted in the Limpopo Province, which is named after the Limpopo River which runs at the borders of South Africa with Zimbabwe and Botswana; Limpopo Province is the northernmost province in the country. Limpopo is divided into five districts, namely: Capricorn District, Vhembe District, Waterberg District, Mopani and Sekhukhune Districts (Figure 7.1), and borders with the countries of Botswana to the west, Zimbabwe to the north and Mozambique to the east. The Beit-Bridge border post (going into Zimbabwe) is the largest border in the province, and is considered the gateway to the rest of Africa.

Figure 4.1 Area Map of Research Site Source: www.limpopolgh.gov.za/maps/predined_maps

The province has 1 Provincial Department of Health office, 5 District Health offices, 2 tertiary hospitals, 5 regional hospitals, 4 specialised and 30 district public hospitals, total 41 hospitals. The table below presents the distribution of hospitals in Limpopo

Province by district, detailing the number of hospitals in each district and categorizing them by type, namely, tertiary, regional, and district hospitals.

Table 4.2: Provincial and District Offices and Public hospitals in Limpopo Provincial Department of Health

Provincial Office	Capricorn District	Mopani District	Sekhukhune District	Vhembe District	Waterberg District
	2 Tertiary Hospitals	1 Regional Hospital	2 Regional Hospitals	1 Regional Hospital	1 Regional Hospital
	6 District Hospitals	5 District Hospitals	5 District Hospitals	6 District Hospitals	7 District Hospitals
	1 Specialised Hospital	1 Specialised Hospital	No Specialised Hospital	1 Specialised Hospital	1 Specialised Hospital

Training in IPC must develop from basics to the specialised training. The WHO identifies three groups requiring training. 1) IPC staff; 2) health care professionals; 3) support (non-clinical) health workforce including administrators, sterile services, cleaners, and porters. Table 4.2 below shows the number of IPC nurses trained in Limpopo, from various training institutions.

Table 4.3: Number of IPC Nurses in hospitals and level of training or qualification obtained

Type of Hospital	Number of Hospitals	Number of IPC Nurses	Number of IPC Nurses Trained	Type of Training in IPC
Tertiary Hospitals	2	5	5	Certificate
Regional Hospitals	5	6	1	Certificate
District Hospitals	30	41	11	Certificate
Specialised Hospitals	4	4	1	Certificate
Total	41	56	18	

Training programme is very effective, and it is important that all nurses should be exposed to infection control training, as this will enable them to acquire skills and to be equipped with necessary knowledge with which to fight against the spread of infection in the hospital setting (Farotimi et al., 2018).

4.5.1 Selection of health facilities

The quantitative approach research sites in this study included all 41 hospitals in the Limpopo Province (Tertiary, Regional, District and Specialised). For the qualitative component, 6 acute care hospitals were sampled (2 Tertiary, 2 District and 2 Regional). In this study, multistage sampling was used to sample the study settings. Multistage sampling divides a large population into smaller groups, which assists in ensuring that the sampling process is practical (Guest, 2014). In this study, multistage sampling enabled the researcher to select health facilities in different levels of care in the province, as it was challenging to include all IPC nurses in 41 hospitals.

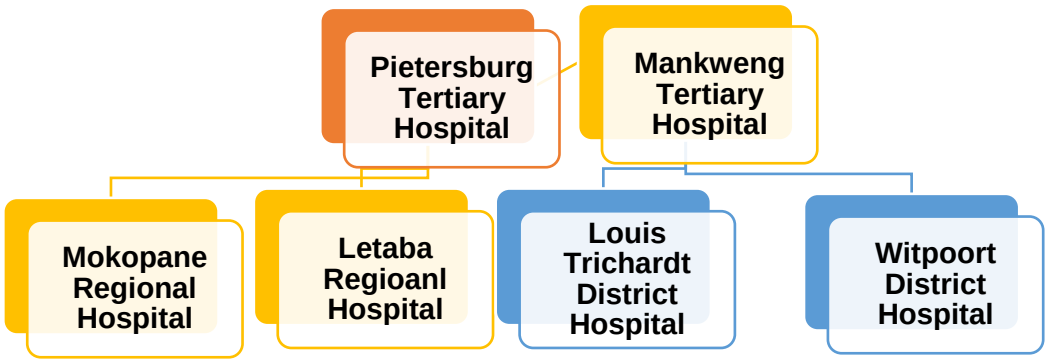

Figure 4.3: Hospitals under study for explanatory sequential mixed-method approach.

4.6 Sampling of participants

The process of choosing a sample from the population is known as sampling (Guest, 2014). Since the researcher lacked the time and money to analyse the complete population, sampling was crucial. Furthermore, compared to researching the complete population, sampling yields faster and more reliable results (Lohr, 2021). The primary drawback of sampling is the possibility of bias (Lohr, 2021). Bias is defined as a departure from the truth; the data collecting section of this study provided an explanation of how bias was minimised. The demographic, sampling, sampling-related ethical concerns, and sample for each research phase were discussed in this section.

4.6.1 Phase 1 – Quantitative approach

The researcher obtained a baseline assessment of the performance of IPC programme at hospital, district and provincial levels, and presented it in numerical data (quantitative). This was achieved by reviewing the existing hospital IPC peer review assessment data and interviews to be conducted with hospital IPC nurses. Therefore, retrospective analysis of secondary peer-review data and prospective data to collection using quantitative methods was conducted. The research questions took the form of yes/no, and rating scale for both IPCAF and IPCAT. This study explored the status of the current IPCP, based on the WHO's core components and administrative level at provincial and district levels, conducting direct interviews with IPC managers or directors utilising the WHO Infection Prevention & Control Assessment Tool (IPCAT) and operational level at hospitals utilising a retrospective data collected using the WHO's IPCAF.

- *Population*

The study population is defined by Eldredge et al., (2014) as a group of individuals taken from the general population who share a common characteristic, such as age, sex, occupation or health condition, and may be studied for different reasons. The population in this study referred to all IPC nurses in 41 hospitals in Limpopo, which include tertiary, regional, district and specialised hospitals.

- *Sampling*

In this study, a Total Population Sampling (TPS) was used, which is a technique where the entire population that meet the criteria (e.g., specific skill set, experience, etc.) is included in the research being conducted (Etikan et al., 2016). TPS was used because the number of health facilities or number of respondents is relatively small. Therefore, all 41 public hospitals, 1 provincial office and 5 district offices in Limpopo Province were included in this study. This sampling method made it possible to get deep insights into the phenomenon, which the researcher was interested in and with such a wide coverage of the population of interest, there was also a reduced risk of missing potential insights from members that are not included.

- Inclusion criteria

Inclusion criteria are defined as key features of the target population that the researcher uses to answer the research question (Rose et al., 2019). In this study, the inclusion criteria included all IPC nurses in the 41 public hospitals of Limpopo Province.

- Exclusion criteria

Exclusion criteria are potential study participants who do not meet the inclusion criteria and might be having potential features that might interfere with outcome of the study (Rose et al., 2019). Private hospitals and Primary Health Care facilities were not part of the study.

4.6.2 Phase 2 – Qualitative approach

- *Population*

A population refers to a group of people on which the research findings are to be applied (Eldredge et al., 2014). Furthermore, the group has variable characteristics which are under study and for which the research findings can be generalised. The population of the study during phase 2 included 6 IPC nurses from 6 hospitals.

- *Sampling*

In phase 2, a purposeful sampling technique was employed to choose important informants. The study's objective guided the selection of the sample in this non-probability sampling technique (Bhardwaj, 2019). Purposive sampling is defined as "the most effective use of limited resources by selecting information-rich cases" by Etikan et al., (2016). The best respondents for this study were found to be the IPC nurses working in district, regional, and tertiary acute hospitals. These nurses were chosen with the understanding that they would contribute rich and distinctive data that would be valuable to the research.

The benefits of this sampling strategy include real-time results since participants comprehend the topic and have the necessary expertise, and the ability to produce the desired results because the researcher speaks with participants directly (Emerson, 2015). This method is also economical and time-efficient. One kind of non-probability sampling is called purposeful sampling, in which a sample is chosen according to the study's goal and the population's characteristics (Emerson, 2015).

- Inclusion criteria

Key informants — IPC nurses representing the three different levels of acute hospitals, tertiary, regional and district.

- Exclusion criteria

In this study, IPC nurses representing the Private Hospitals and Primary Health Care.

- *Ethical issues related to sampling*

Selection bias is frequently produced during participant recruitment or study population selection, and it poses a greater risk to the validity of research since the study population is not representative of the target population (Althubaiti, 2016). Furthermore, this may make it challenging to extrapolate study results to the whole community.

- *Sample*

In this study, six (6) IPC professional nurses were key informants who participated in telephonic interviews and signed the consent electronically.

4.6.3 Phase 3 – Development of evidence-based management model/strategy to improve IPC programme.

IPC is a critical component of healthcare systems worldwide, aimed at preventing the spread of infections within healthcare settings. The WHO has developed a multimodal strategy to enhance IPC programmes, which involves integrating multiple components to create a comprehensive and effective approach.

- **Components of the WHO Multimodal Strategy**

The WHO multimodal strategy consists of five key components:

  - **System change**: Refers to the implementation of infrastructure changes and the provision of necessary supplies to support IPC practices. Studies have shown that system changes, such as the availability of

hand hygiene facilities and proper waste disposal systems, significantly improve IPC compliance (Allegranzi et al., 2011).

- **Training and education**: Continuous training and education of healthcare workers on IPC practices are essential. Evidence indicates that regular training sessions and workshops increase knowledge and adherence to IPC protocols (Alhumaid et al., 2021).
    - **Monitoring and feedback**: Involves the regular assessment of IPC practices and providing feedback to healthcare workers. Research highlights that monitoring and feedback mechanisms lead to sustained improvements in IPC compliance and reduce HAIs (Pittet et al., 2006)
    - **Reminders in the workplace**: The use of visual aids, posters, and reminders in healthcare settings to reinforce IPC practices. Studies suggest that visual reminders are effective in promoting hand hygiene and other IPC measures (Galmarini et al., 2024).
    - **Institutional safety climate**: Fostering a culture of safety within healthcare institutions that prioritises IPC. A positive safety climate is associated with higher compliance with IPC protocols and better patient outcomes (Stone et al., 2009).

- **Implementation of the WHO Multimodal Strategy, challenges and barriers**
    - **Resource limitations**: Implementing the multimodal strategy requires significant resources, including financial investment, infrastructure, and human resources. Low-resource settings often face challenges in securing these necessary resources, which can hinder the effective implementation of the strategy (Lowe et al., 2021).
    - **Staff resistance**: Resistance to change among healthcare workers can be a barrier to implementing new IPC practices. Studies have shown that engaging staff and addressing their concerns through participatory approaches can mitigate resistance (Galmarini et al., 2024).
    - **Sustainability**: Maintaining the improvements achieved through the multimodal strategy can be challenging. Ensuring ongoing training, monitoring, and institutional support is critical for the sustainability of IPC programmes (Penner, 2021).

- **Impact on IPC outcomes**
    - **Reduction in HAIs**: Implementation of the WHO multimodal strategy has been associated with a significant reduction in HAIs. For instance, a study conducted in a tertiary care hospital in India reported a 50% reduction in HAIs following the implementation of the multimodal strategy (Kumari et al., 2018).
    - **Improved compliance**: The strategy has been shown to improve compliance with IPC practices, particularly hand hygiene. A systematic review found that multimodal interventions increased hand hygiene compliance by an average of 30% (Luangasanatip et al., 2015).
    - **Enhanced patient safety**: By reducing HAIs and improving IPC compliance, the multimodal strategy contributes to overall patient safety. Improved IPC practices lead to better clinical outcomes and reduced healthcare costs associated with managing infections (Zingg et al., 2015).

4.7 Data collection

The process of obtaining, evaluating, and interpreting data to address research issues and provide answers to research questions is known as data collection. This section describes the tools utilised for data collecting, the methodology and approach employed in the study, and the steps involved in gathering data.

4.7.1 Data collection approach and method

In this study, data was collected from various multiple sources. Table 4.3 below shows the data collection methods which were undertaken in the study:

Table 4.4: Multiple sources of data

DATA SOURCE	DATA METHOD	ANALYSIS DATA

1. Retrospective Peer-Review data from public hospitals	IPCAF data collection tool. Adapted from World Health Organisation Core Components (Quantitative Semi-structured interview with pregnant women diagnosed with with acquiring Health Care Acquired Infection .	Descriptive statistics were presented as numbers and percentages, mean Audio-tape transcripts.
2. Key Informants **2.1 IPC nurses from tertiary, regional and district hospitals**	Semi-structured interview guide with closed and open-ended questions. (Qualitative approach)	Audio-tape transcripts.

4.7.2 Development and testing of the data collection instrument

An IPCAF questionnaire developed by WHO was used as a data collection instrument in this study. In the IPCAF survey, establishments are given a score based on these eight IPC core components.

4.7.3 Development of a structured interview guide

A semi-structured interview guide for key informants was developed with questions relevant to research objectives. Research supervisors verified the developed interview guide to ensure the reliability of the instrument.

4.7.4 Data collection process

Data collection is a systematic process of gathering data from different sources of data to answer the research question. Below is a graphical representation of the process which was followed in this study:

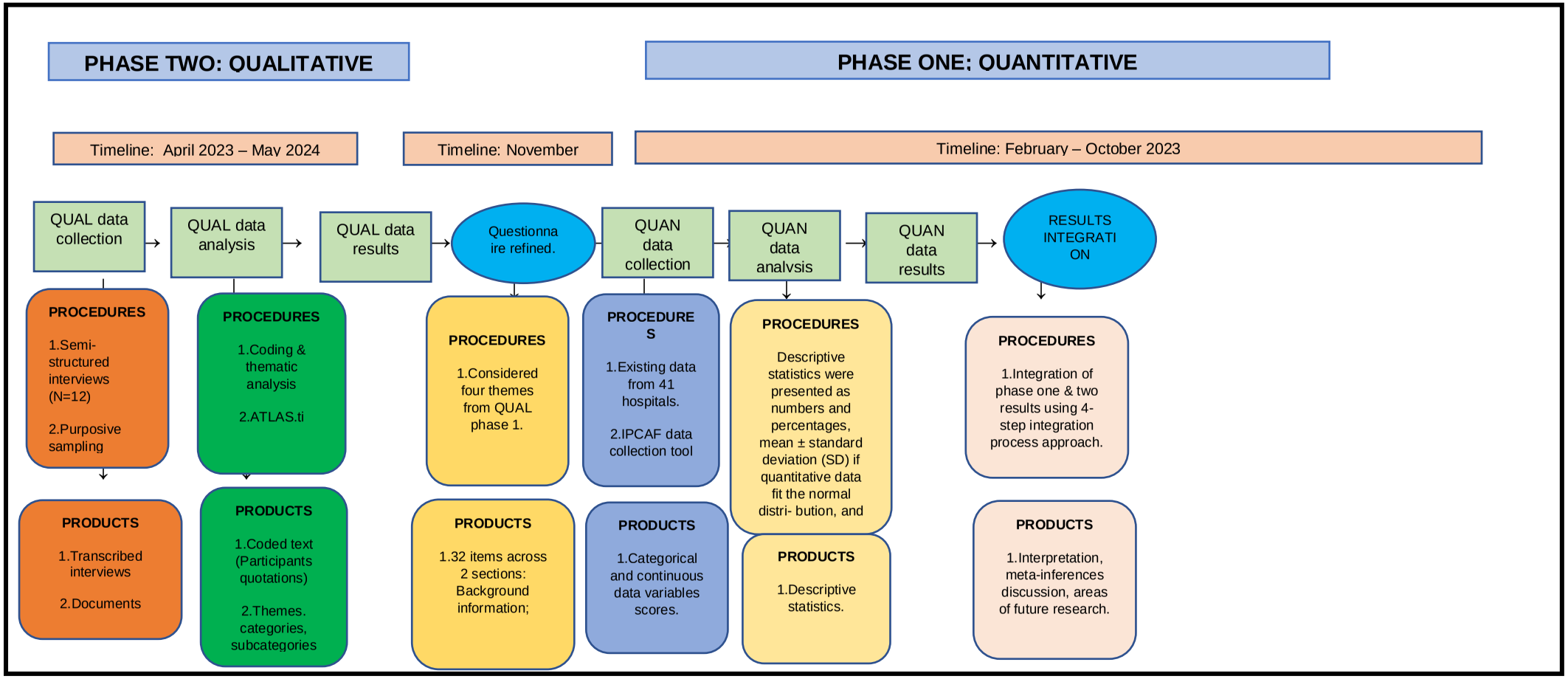

Figure 4.4: Explanatory Sequential Mixed methods research design. Adapted from Berman, E.A. 2017. An Explanatory Sequential Mixed Methods Approach to understanding Researchers' data management practices at UVM: Findings from the Quantitative Phase. *Journal of eScience Librarianship* 6(1): e1098.

The quantitative phase of this research was guided by a questionnaire developed by WHO, the IPCAF questionnaire. The questionnaire was completed by 41 hospital IPC nurses.

A semi-structured interview guide was created for the study's qualitative phase to gather comprehensive data on the state of the IPC programme. The majority of the interview guide's questions dealt with work experience in the IPC programme, the prevalence of HAIs in hospitals, the IPC programme's organisation and reporting, etc. Chapter Five provides a detailed explanation of the theme analysis that was used to analyse the acquired data. The research problem was further explored by refining the quantitative data gathering technique using the themes. Subsequently, an in-depth account of the analysis of both quantitative and qualitative data was provided in Chapter 5. MMR is defined and made valuable by the integration of qualitative and quantitative data. The first happened at the design level of this study, where the qualitative phase two design was constructed using the quantitative phase one results. Second, integration also took place during the interpretation stage, when a four-step integration process technique and joint display were used to integrate phase one quantitative data and phase two qualitative data.

4.7.5 Ethical considerations related to data collection

The following ethics were taken into consideration during data collection:

- Participants completed an informed consent form to participate in the study after the researcher explained the study's aim and purpose; how the data would be collected; how the data would be stored; and who would have access to the data.
- Data was stored in secured places and only researchers and supervisors had access.
- Participants' right to autonomy was respected by informing them that should they wish to withdraw from the study at any time, their decision would be respected.
- The study had no known risks which could expose the participants to harm.

4.8 Data analysis

During research, data analysis is a continuous process that involves utilising software tools or analysis procedures to analyse participant information.

4.8.1 Quantitative phase 1 data analysis

Data was captured in a Microsoft Excel spreadsheet, and then transferred to SPSS version no 29.0.0.0 for analysis. Assistance in analysing the results was sought from a qualified statistician. Descriptive statistics were presented as numbers and percentages, mean ± standard deviation (SD) if quantitative data fit the normal distribution, and median, interquartile range (IQR) if they did not.

4.8.2 Qualitative phase 2 data analysis

Thematic analysis was utilised to find emerging themes, patterns, concepts, and insights. An analytical technique for finding, evaluating, and summarising patterns in data is thematic analysis (Lamprecht and Guetterman, 2019). The researcher followed these qualitative data analysis steps:

- *Becoming familiar with the data:* The researcher transcribed the interview recordings verbatim and listened several times to ensure data is captured correctly.
- *Coding data:* Data were coded using ATLAS.ti software version 23.(Lamprecht and Guetterman, 2019). To identify, analyse and document themes in a data set.
- *Interpretation of data and conclusion:* Participants' direct comments on "segment of meanings in a text – codes" were utilised to support the theme that emerged during the data analysis process and draw conclusions. The summary of the study's research findings in Chapter Five emphasises how the qualitative data was interpreted and concluded.

4.9 Integration of qualitative and quantitative data

In MMR, joint displays—visual displays—are utilised to integrate qualitative and quantitative data throughout the data collection, analysis, and interpretation stages (Guetterman et al., 2021). A method of integrating data that goes beyond the knowledge obtained from distinct quantitative and qualitative results is the joint presentation, which unites data through a visual medium (Creamer, 2024). A four-step approach was used in this study to integrate and understand the qualitative and quantitative data: making a joint display, connecting activities, building relationships, and interpreting and reporting (Skamagki et al., 2024).

4.10 Internal and external validity of the study

“How well the results among the study participants represent true findings among similar individuals outside the study” is the definition of validity, according to Ioannidis, (2005) . Both internal and exterior validity are included in validity. The degree to which the approach of the study may yield objective results is reflected in its internal validity (Frampton, 2025). The degree to which conclusions drawn from the study sample can be generalised to the general population is known as external validity (Frampton, 2025).

4.10.1 Reliability and validity of quantitative data

- *Validity:* The researcher made sure that the study was meticulously designed with a precise research methodology, that appropriate recruitment techniques were established, and that data collection and analysis were done to increase internal validity. A pilot version of the questionnaire was used to find any incorrect questions, spelling, or grammar that would bring bias into the research.

- *Reliability:* Sincerity in the data gathered is what reliability is all about (Ahmed and Ishtiaq, 2021). Reliability was confirmed through a pilot study. The results of the internal consistency test were verified by a reliability assessment.

4.10.2 Trustworthiness of the qualitative data

The validity of qualitative research is measured through trustworthiness and the strategies include credibility, transferability, confirmability and dependability (Graneheim and Lundman, 2004).

4.10.2.1 Credibility

Credibility reflects internal validity and focuses on whether the researcher has demonstrated a certain level of confidence in the findings of the phenomenon under study (Haller et al., 2014). To ensure credibility, member checking; peer debriefing; prolonged engagement and triangulation were used (Haller et al., 2014).

4.10.2.2 Transferability

The degree to which study findings can be transferred to different situations or subjects is known as transferability (Haller et al., 2014). Stated differently, extrapolating the results to a larger population. The method of thick description was employed to guarantee transferability. Providing a detailed account of the people, events, and environment is the strategy. To allow the findings to be utilised in different situations and studies, the researcher included adequate contextual information regarding the study sites and participants.

4.10.2.3 Dependability

Reliability in quantitative research is referred to as dependability, and it emphasises the need for study findings to be unique to a certain location, time, and set of explanations that hold true across data (Haller et al., 2014). The constancy of results across time, in comparable situations, and with participants is implied by dependability. The research approach process was meticulously followed to guarantee reliability, and this allowed readers to gain a comprehensive grasp of the procedures used and their efficacy. This also has to do with the audit trail approach. By outlining the research methodology for both the qualitative and quantitative phases, the researcher made sure that there was uniformity throughout the various components of the study process.

4.10.2.4 Confirmability

Confirmability, according to Haller et al., (2014).“addresses whether the interpretations and findings are from the participants’ lived experiences and do not include the researcher’s biases”. An audit trail was employed to accomplish conformance by making sure that all modifications and study features that differed from the research protocol are recorded. Althubaiti, (2016), states that to lessen bias, the researcher should make use of helpful strategies such as data triangulation. The investigator made certain that the results are precise and pertinent, and interpretations can be made by conferring with research mentors and subject matter experts.

4.11 Minimizing potential bias in the study

Any departure from reality in the gathering, analysing, and interpretation of data is referred to as bias since it has the potential to lead to false findings (Althubaiti, 2016). To guarantee that all participants who fulfil the study’s inclusion criteria are chosen to participate in the study. The participants in the current investigation were chosen at random. By making sure that all hospital peer-review IPCAF data was used, attention bias in the quantitative approach was minimised. The necessary bias principle states that a researcher using a qualitative approach should only display prejudice when it is absolutely necessary to further the investigation and address research issues (Althubaiti, 2016). The researcher’s pre-understanding of IPC programme guided the choice of research question and variables and formed the basis of both the qualitative and quantitative methods. This type of bias is unacceptable, so the researcher did not direct the research findings in a predetermined way. Triangulation of data also assisted in minimising bias in data.

4.12 Ethical considerations

4.12.1 Permission to conduct the study

To ensure ethical consideration in this study, permission to conduct the study was sought from the Turfloop Research Ethics Committee (TREC) under the University of Limpopo and was approved. Permission to conduct study was also sought from the Department of Health Provincial through applying online and a registration number was therefore provided. Thereafter, the Department issued an approval letter.

4.12.2 Respect for persons participating in the study

This principle emphasises that research participants are and should be treated well. In this study, participants were given a choice to choose whether to participate in the study or not. For those who choose to participate, an information letter regarding the study was provided. Thereafter, informed consent was provided for participants to sign to ensure that they understood the nature of the research and agreed to participate. Most importantly, participation was voluntary, and had the participants wanted to withdraw from the study, they were free to do so at any time for any reason.

4.12.3 Measures to protect participants' privacy and confidentiality

To ensure the confidentiality of the information gathered from the participants, a storage system i.e., hard drive, compact disc and file for hard copies was implemented and information was stored in a manner that the participants' identities were not revealed. Only the researcher and supervisors had access to the research data.

4.12.4 Beneficence

Research findings will be sent to the provincial health department, to ensure that IPC programmes benefit from the outcomes of this study. Research should not harm the participants in a study in any way. Risks might be associated with psychological distress. In this study, there were no foreseeable risks associated with participation.

4.12.5 Justice

The principle of justice emphasises fairness in the distribution of research benefits. Compensation relates to money given to participants for participating in the research study that acknowledges their time and effort. In this study, all participants were not compensated i.e., monetary for participating in the study. Instead, they were thanked verbally for their participation. Furthermore, all participants were treated fairly, and no certain number of participants were subjected to high-risk prospects.

4.13 Conclusion

This chapter covered the sampling strategy for the study, the features of the measuring tools that were used, the procedure for gathering data, data management, minimising potential biases, and ethical issues that are critical to both the validity of the research

and the defence of research participants' rights. The presenting of research findings was the main topic of the following chapter.

CHAPTER FIVE: RESEARCH FINDINGS

5.1 Introduction

The study results are presented in this chapter in three phases, according to the data collection procedures that were directed by the study objectives.

5.1.1 Phase I: Situational analysis

- To provide a baseline assessment of the IPC programme and activities within hospitals by using the report generated after analysing the retrospective data collected during the hospital peer review assessment, utilising the IPCAF tool.

5.1.2 Phase II: Knowledge Practice and Attitude Assessment

- To explore and describe the attitude and practice on IPC practices amongst hospital IPC nurses in Limpopo Province.

5.1.3 Phase III: Integration of qualitative and quantitative results

- To develop an evidence-based improvement strategy for the mitigation of gaps identified.

In this chapter, quantitative results from Phase I were presented first followed by qualitative results from Phase II.

5.2. Quantitative research findings phase I

- Evaluation of the status of IPC programme in public hospitals, Limpopo Province

5.2.1 Introduction

This chapter presents the findings of the descriptive quantitative design, which is the first phase of exploratory mixed methods. The objectives of quantitative design in this study were to determine the status of IPC programme and practices. The quantitative data was collected from retrospective database of the peer-review assessment completed by all IPC nurses in the province. Data was collected using the IPCAF

questionnaire, and findings were categorised into eight (8) core components of the IPC programme. The data was captured and analysed using SPSS version no 29.0.0.0. Descriptive statistics were presented as numbers and percentages, mean ± standard deviation (SD) if quantitative data fit the normal distribution, and median, interquartile range (IQR) if they did not.

Measurements

According to the answers given to each question in the IPCAF questionnaire, the scoring specified in the guide was applied, and then a descriptive analysis was performed. It was possible to get a maximum of 100 points for each of the eight CCs of the IPCAF. After adding up the eight CC scores, the maximum IPCAF score was 800. According to the final total score, hospitals were categorised into four different IPC levels: 0–200 points ‘‘insufficient or Inadequate’’, 201–400 points ‘‘basic’’, 401–600 points ‘‘intermediate’’, and 601–800 points ‘‘advanced’’.

5.2.2 Data management and analysis

The researcher obtained retrospective data in a Microsoft Excel spreadsheet. The questionnaires completed by the hospital IPC nurses, in 41 hospitals. SPSS version no 29.0.0.0 was used to analyse data and interpret using descriptive statistics, which were presented as numbers and percentages, mean ± standard deviation (SD), if quantitative data fit the normal distribution, and median, interquartile range (IQR) if they did not. The significance level was accepted as $p < 0.05$ (bi-directional). No imputations were made to replace the missing values.

Characteristics of participating hospitals

Limpopo Province is divided in 5 Districts (Capricorn (9), Mopani (8), Sekhukhune (7), Vhembe (8) and Waterberg (9)) with the Private and Public sectors. The study was conducted in the 41 facilities of the Public Sector. Therefore, the study was carried out at 41 HCFs. The distribution of the Hospital per level was 35 District hospitals (85.4%), 4 Regional hospitals (9.8%) and 2 Tertiary hospitals (4.8%). In total, there are 41 hospitals in Limpopo Province. There are 2 tertiary, 5 regional, 33 district and 3 specialised hospitals.

Table 1: Distribution of Hospitals in the Limpopo Province

	Capricorn District	Mopani District	Sekhukhune District	Vhembe District	Waterberg District
Provincial Office	2 Tertiary Hospitals	1 Regional Hospital	2 Regional Hospitals	1 Regional Hospital	1 Regional Hospital
	6 District Hospitals	5 District Hospitals	5 District Hospitals	6 District Hospitals	7 District Hospitals
	1 Specialised Hospital	1 Specialised Hospital	No Specialised Hospital	1 Specialised Hospital	1 Specialised Hospital

The distribution of hospitals in each district, including the existence of tertiary, regional, district, and specialised hospitals, is briefly shown in this table above. Understanding the healthcare system and how different care levels are accessible throughout the region can benefit from it. The distribution of IPCAF scores

Table 2: Numerical Score per district

District	Score	Result
Capricorn	576,2	Intermediate
Mopani	636,0	Advanced
Sekhukhune	628,6	Advanced
Vhembe	617,4	Advanced
Waterberg	614,9	Intermediate
Province	614,6	Intermediate

Total score (range)	**IPC level**
0–200	Inadequate
201–400	Basic
401–600	Intermediate
601–800	Advanced

The districts are categorised into “Intermediate” and “Advanced” based on their scores, with Mopani and Sekhukhune being classified as “Advanced,” while Capricorn, Vhembe, Waterberg, and the overall province are categorised as “Intermediate.”

Table 3: Distribution of numerical score per district

District * IPC Level Cross-tabulation									
District		IPC Level						Total	
		Basic		Intermediate		Advanced			
		Count	% of Total	Count	% of Total	Count	% of Total	Count	% of Total
	Capricorn	0	0,0%	6	14,6%	3	7,3%	9	22,0%
	Mopani	1	2,4%	0	0,0%	7	17,1%	8	19,5%
	Sekhukhune	0	0,0%	3	7,3%	4	9,8%	7	17,1%
	Vhembe	0	0,0%	3	7,3%	5	12,2%	8	19,5%
	Waterberg	0	0,0%	4	9,8%	5	12,2%	9	22,0%
Total		1	2,4%	16	39,0%	24	58,5%	41	100,0%

- Score: This column indicates the numerical score achieved by each district in the infection prevention and control assessment framework.
- Result per District:
    - Intermediate: Districts categorised as “Intermediate” have achieved a moderate level of performance in infection prevention and control practices. These districts may have areas for improvement but also demonstrate some level of proficiency.
    - Advanced: Districts categorised as “Advanced” have achieved a high level of performance in infection prevention and control practices. These districts demonstrate strong adherence to guidelines and may serve as examples of best practices.
- Mopani, Sekhukhune, and Vhembe: These districts were classified as “Advanced,” indicating that they have performed exceptionally well in infection prevention and control. They likely have robust systems in place and are effectively implementing preventive measures to reduce the risk of infections.
- Capricorn, Waterberg, and Province: (Tomczyk et al., 2021). These districts were categorised as “Intermediate,” suggesting that while they have made progress in infection prevention and control, there may still be room for improvement. These districts may benefit from further training, resources, or support to enhance their practices and achieve a higher level of performance.

The assessment framework provides valuable insights into the performance of different districts in infection prevention and control, helping to identify areas of strength and opportunities for improvement.

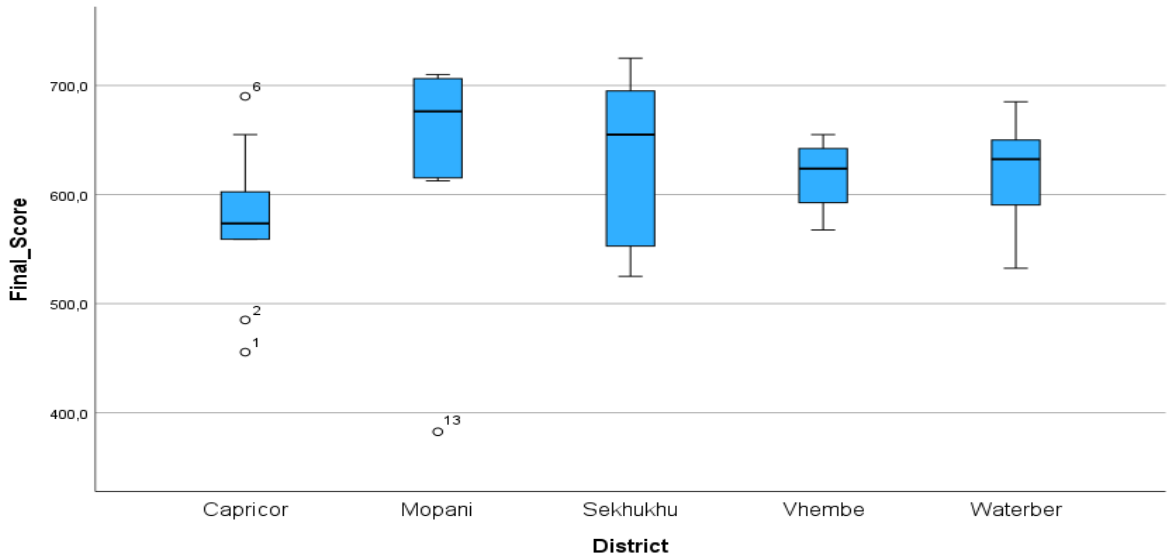

Figure 1: The evaluation of participating hospitals according to IPCAF score results by district Boxplot)

Table 4: Final score and IPC level per Hospital

	Basic	Intermediate	Advanced	Total

Hospital	Count	%	Count	%	Count	%	Count	%
Botlokwa	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Dilokong	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Donald Fraser	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Dr CN Pathudi	0	0,0%	0	0,0%	1	2,4%	1	2,4%
ELIM	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Ellisras	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Evuxakeni	0	0,0%	0	0,0%	1	2,4%	1	2,4%
FH Odendaal	0	0,0%	0	0,0%	1	2,4%	1	2,4%
George	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Groblersdal	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Hayani	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Helen Franz	0	0,0%	1	2,4%	0	0,0%	1	2,4%
June Furse	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Kgapane	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Lebowakgomo	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Letaba	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Louis	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Malamulele	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Mankweng	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Maphuta	1	2,4%	0	0,0%	0	0,0%	1	2,4%
Matlala	0	0,0%	0	0,0%	1	2,4%	1	2,4%
MDR TB	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Meklenberg	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Messina	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Mokopane	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Nkhensani	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Philadelphia	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Pietersburg	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Sekororo	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Seshego	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Siloam	0	0,0%	0	0,0%	1	2,4%	1	2,4%
St Ritas	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Thabamoopo	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Thabazimbi	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Tshilidsini	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Van Velden	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Voortrekker	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Warmbaths	0	0,0%	1	2,4%	0	0,0%	1	2,4%
WF Knobel	0	0,0%	1	2,4%	0	0,0%	1	2,4%
Witpoort	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Zebediela	0	0,0%	0	0,0%	1	2,4%	1	2,4%
Total	1	2,4%	16	39,0%	24	58,5%	41	100,0%

Table 4 above shows that 41 hospitals in total have been evaluated. Of the hospitals, 1 (2.4%) is classified as “Basic.” Of the hospitals, 16 (or 39.0%) are classified as “Intermediate.” Twenty-four hospitals (58.5%) have a “Advanced” rating. An overview of the hospitals’ distribution across all performance levels may be found in the “Total” row. One hospital (2.4%) out of all the hospitals on the list is classified as “Basic,” 24 hospitals (58.5%) are classified as “Advanced,” and 16 hospitals (39.0%) as “Intermediate.” Based on how well each hospital performed in relation to the predetermined criteria, it was assigned a unique category. For instance, the hospital “Botlokwa” has one count (2.4%) in the “Intermediate” category and zero counts in the “Basic” and “Advanced” categories, so it is classified as “Intermediate.”

Table 5. Distribution of Core Components (CC) results of the total IPCAF scores among levels of participating hospitals, Median (IQR)

Components	**Score**			
	District Hospital (n = 35)	**Regional Hospital (n = 4)**	**Tertiary Hospital (n = 2)**	**Total (n = 41)**
CC1	83.0(25.0)	75.2(8.9)	67.5(31.8)	80.0(20.0)
CC2	90.0(17.5)	83.5(28.3)	82.5(24.7)	87.5(19.0)
CC3	80.0(25.0)	82.5(31.0)	62.5(3.5)	80.0(23.0)
CC4	87.5(17.5)	79.0(28.9)	92.5(3.5)	88.0(18.8)
CC5	85.0(30.0)	67.5.0(41.0)	75.0(21.2)	80.0(30.0)
CC6	82.5(22.5)	68.7(23.1)	73.7(12.3)	80.0(21.3)
CC7	65.0(35.0)	60.0(30.0)	57.5(38.8)	60.0(33.0)
CC8	85.0(17.5)	88.7(28.8)	72.5(7.1)	85.0(18.8)
Total	**637.5(105.0)**	**604.2(94.6)**	**583.7()**	**618.0(95.0)**

In the above table, the scores are presented as mean values with standard deviations in parentheses. The scores in the table represent the performance of different types of hospitals (District, Regional; Tertiary) across various components related to infection prevention and control (IPC). Here's a more detailed explanation of each component:

- **CC1:** This component represents the hospital's overall preparedness and capacity to prevent and control infections. District hospitals seem to have the highest score, indicating a higher level of preparedness compared to Regional and Tertiary hospitals.
- **CC2:** This component relates to the hospital's policies and procedures for IPC. Again, District hospitals have the highest score, suggesting that they might have more comprehensive policies and procedures in place.
- **CC3:** This component is related to the implementation of IPC practices. District hospitals and Regional hospitals have similar scores, indicating similar levels of implementation, while Tertiary hospitals seem to have a lower score in this area.
- **CC4:** This component represents the hospital's resources dedicated to infection prevention and control, such as staffing and equipment. Tertiary hospitals have the highest score, indicating that they might have more resources allocated to IPC compared to District and Regional hospitals.
- **CC5:** This component represents the hospital's compliance with infection prevention and control practices. District hospitals have the highest score, suggesting that they might have better compliance compared to Regional and Tertiary hospitals.
- **CC6:** This component relates to the hospital's monitoring and evaluation of infection prevention and control practices. District hospitals again have the highest score, indicating that they might have more robust monitoring and evaluation mechanisms in place.
- **CC7:** This component represents the hospital's education and training programmes for infection prevention and control. District hospitals have the highest score, suggesting that they might have more comprehensive education and training programmes compared to Regional and Tertiary hospitals.
- **CC8:** This component could relate to the hospital's leadership and commitment to IPC. Regional hospitals have the highest score, indicating that they might have stronger leadership and commitment compared to District and Tertiary hospitals.

The scores provide an overview of how different types of hospitals perform in various aspects of IPC, highlighting areas of strength and areas that may require improvement in each hospital type.

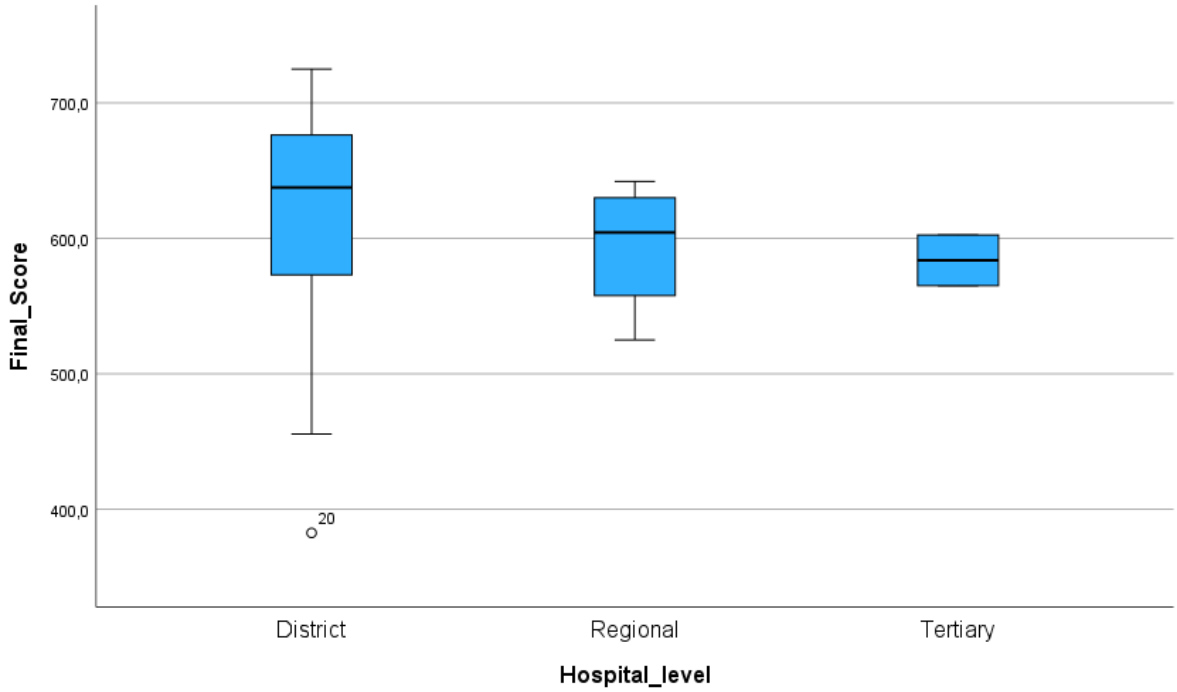

Fig. 2. The evaluation of participating hospitals according to IPCAF score results by hospital level (Boxplot)

IPC core components CC4 had the highest scores (88.0), followed by CC2 (87.5) and CC8 (85.0). The CC7 (60.0) had the lowest scores (Table 4). When analysing the Core Component by levels of participating hospital (Table 5), the District hospital has the highest score (637.5), followed by Regional hospital (604.2) and Tertiary hospital (583.7). Analysing by IPC level (Table 6), the advanced level was the highest one with a median of 655.0 and IQR 50.1 and the intermediate level 566.2(57.1).

Table 6: Case summary of IPCAF scores among participating hospitals, per core component.

Hospital	CC1	CC2	CC3	CC4	CC5	CC6	CC7	CC8
Botlokwa	38,0	47,5	25	60,0	75	80,0	45	85,0
Dilokong	95,0	100,0	95	100,0	85	85,0	65	100,0

Donald Fraser	95,0	70,0	90	100,0	90	90,0	40	80,0
Dr CN Pathudi	90,0	87,5	85	92,5	95	92,5	50	85,0
ELIM	70,0	80,0	70	95,0	85	57,5	35	95,0
Ellisras	95,0	85,0	75	87,5	50	82,5	75	100,0
Evuxakeni	85,0	95,0	85	100,0	100	95,0	80	70,0
FH Odendaal	85,0	97,5	90	92,5	85	75,0	55	70,0
George	75,0	72,5	50	67,5	40	70,0	75	82,5
Groblersdal	83,0	92,5	65	70,0	60	75,0	25	62,5
Hayani	95,0	90,0	90	82,5	70	70,0	35	65,0
Helen Franz	55,0	97,5	65	40,0	50	67,5	45	65,0
June Furse	90,0	100,0	85	92,5	100	90,0	70	85,0
Kgapane	80,0	100,0	75	100,0	95	97,5	70	87,5
Lebowakgomo	95,0	80,0	80	75,0	70	100,0	70	85,0
Letaba	80,0	65,0	85	88,0	75	85,0	45	95,0
Louis	95,0	77,5	100	95,0	90	75,0	25	85,0
Malamulele	60,0	87,5	95	87,5	75	50,0	40	72,5
Mankweng	45,0	65,0	60	90,0	60	82,5	85	77,5
Maphuta	57,5	,0	55	55,0	30	80,0	25	80,0
Matlala	85,0	100,0	65	95,0	85	85,0	65	75,0
MDR TB	80,0	90,0	100	82,5	80	72,5	75	52,5
Meklenberg	85,0	97,5	85	97,5	85	95,0	70	62,5
Messina	95,0	90,0	85	90,0	95	60,0	35	87,5
Mokopane	78,0	87,5	50	70,0	60	70,0	85	90,0
Nkhensani	45,0	90,0	80	82,5	60	87,5	80	87,5
Philadelphia	95,0	90,0	50	67,5	85	62,5	70	52,5
Pietersburg	90,0	100,0	65	95,0	90	65,0	30	67,5
Sekororo	87,5	85,0	95	92,5	95	92,5	30	97,5
Seshego	47,5	55,0	75	78,5	90	82,5	70	75,0
Siloam	60,0	80,0	100	90,0	90	50,0	60	80,0
St Ritas	70,0	100,0	80	62,5	40	55,0	60	57,5
Thabamoopo	70,0	100,0	55	63,0	75	63,0	50	83,0
Thabazimbi	95,0	100,0	65	85,0	75	75,0	60	87,5
Tshilidsini	72,5	79,5	90	95,0	90	67,5	60	87,5
Van Velden	80,0	85,0	85	97,5	95	90,0	80	95,0
Voortrekker	73,0	60,0	75	77,5	50	75,0	85	97,5
Warmbaths	48,0	100,0	65	85,0	40	82,5	70	67,5
WF Knobel	82,5	90,0	55	87,5	50	97,5	50	87,5
Witpoort	90,0	87,5	75	90,0	75	97,5	75	95,0
Zebediela	80,0	70,0	85	100,0	85	100,0	80	90,0

IPC programme

When the IPCAF score for CC1 of all HCFs was evaluated, the median (IQR) CC1 score was 80.0 (20.0) points. CC1 scores were high in Sekhukhune (85.0) and Vhembe (83.7), but low in Capricorn (70.0). According to the level of the hospital, the

highest one was in District hospital (83.0) and the lowest in Tertiary hospital (67.5). According to IPC level, the CC1 advanced was the highest with 86.2(15.0). This suggests that the hospitals have a well-established infection prevention and control programme in place, with clear policies and procedures.

IPC guidelines

When the IPCAF score for CC2 of all HCFs was evaluated, the median (IQR) CC2 score was 87.5 (19.0) points. CC2 scores were high in Sekhukhune (100.0) and Waterberg (87.5). The lowest were in Capricorn and Vhembe (80.0). According to the level of the hospital, the highest one was in District hospital (90.0) and the lowest in Tertiary hospital (82.5). According to IPC level, the CC2 advanced and intermediate level has the same score with 88.7, but the IQR was higher in Intermediate (29.4). With a score of 83.98, this component also achieved an “Advanced” level. This indicates that the hospitals have comprehensive and up-to-date IPC guidelines in place.

Education and training

When the IPCAF score for CC3 of all HCFs was evaluated, the median (IQR) CC3 score was 80.0 (23.0) points. CC3 scores were high in Vhembe (90.0) and Mopani (85.0). The lowest was Capricorn (65.0). According to the level of the hospital, the highest one was in Regional hospital (82.5) and the lowest in Tertiary hospital (62.5). According to IPC level, the CC3 advanced was the highest with 85.0(14.0). This component is rated as “Advanced,” indicating that the hospitals places a high priority on education and training in IPC for healthcare staff.

HCAI Surveillance

When the IPCAF score for CC4 of all HCFs was evaluated, the median (IQR) CC4 score was 88.0 (18.8) points. CC4 scores were high in Sekhukhune, Vhembe and Mopani (92.5). The lowest was Capricorn (78.5). According to the level of the hospital, the highest one was in Tertiary hospital (92.5) and the lowest in Regional hospital (79.0). According to IPC level, the CC4 advanced was the highest with 92.5(9.0), indicating an “Advanced” level of performance. This suggests that the facilities have effective systems in place for surveillance of HAIs.

Multimodal

When the IPCAF score for CC5 of all HCFs was evaluated, the median (IQR) CC5 score was 80.0 (30.0) points. CC5 scores were high in Mopani (95.0), followed by Vhembe (90.0). The lowest was Waterberg (60.0). According to the level of the hospital, the highest one was in District hospital (85.0) and the lowest in Regional hospital (67.5). According to IPC level, the CC5 advanced was the highest with 87.5(19.0). This component is rated as “Advanced,” indicating that the hospitals employs a variety of strategies (multimodal approach) IPC.

Audits

When the IPCAF score for CC6 of all HCFs was evaluated, the median (IQR) CC6 score was 80.0 (21.3) points. CC6 scores were high in Mopani (91.2), followed by Sekhukhune (85.0). The lowest was Vhembe (63.7). According to the level of the hospital, the highest one was in District hospital (82.5) and the lowest in Regional hospital (68.7). According to IPC level, the CC6 advanced was the highest with 86.2(19.4). This suggests that the hospitals regularly conducts audits to assess the effectiveness of their IPC measures.

Staff and workload

When the IPCAF score for CC7 of all HCFs was evaluated, the median (IQR) CC7 score was 60.0 (33.0) points. CC7 scores were high in Waterberg (75.0), followed by Sekhukhune (65.0). The lowest was Vhembe (37.5). According to the level of the hospital, the highest one was in District hospital (65.0) and the lowest in Tertiary hospital (57.5). According to IPC level, the CC7 advanced was the highest with 65.0(29.0). This component is rated as “Intermediate,” suggesting that there may be room for improvement in staffing levels and workload management related to IPC.

Built environment

When the IPCAF score for CC8 of all HCFs was evaluated, the median (IQR) CC8 score was 85.0 (18.8) points. CC8 scores were high in Mopani and Waterberg (87.5). The lowest was Sekhukhune (62.5). According to the level of the hospital, the highest

one was in Regional hospital (88.7) and the lowest in Tertiary hospital (72.5). It is rated as “Intermediate,” indicating that there may be some improvements needed in the physical environment to enhance IPC practices. Overall, the hospitals has performed well in most components assessed, achieving an “Advanced” level in the majority of areas. However, there are some areas, such as staff and workload management, and education and training, where improvement may be needed to enhance IPC practices further.

Table 7. Capricorn District Performance per Core Component, per hospital.

Hospital	CC1	CC2	CC3	CC4	CC5	CC6	CC7	CC8
Botlokwa	Basic	Basic	Insufficient	Intermediate	Intermediate	Advanced	Basic	Advanced
Helen Franz	Inmediate	Advanced	Intermediate	Basic	Basic	Intermediate	Basic	Intermediate
Lebowakgomo	Advanced	Advanced	Advanced	Intermediate	Intermediate	Advanced	Intermediate	Advanced
Mankweng	Basic	Intermediate	Intermediate	Advanced	Intermediate	Advanced	Advanced	Advanced
Pietersburg	Advanced	Advanced	Intermediate	Advanced	Advanced	Intermediate	Basic	Intermediate
Seshego	Basic	Intermediate	Intermediate	Advanced	Advanced	Advanced	Intermediate	Intermediate
Thabamoopo	Intermediate	Advanced	Intermediate	Intermediate	Intermediate	Intermediate	Basic	Advanced
WF Knobel	Advanced	Advanced	Intermediate	Advanced	Basic	Advanced	Basic	Advanced
Zebediela	Advanced	Intermediate	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced

Table 7 above indicates that Botlokwa's scores varied across categories, with some aspects rated as "Insufficient" and others as "Intermediate" or "Advanced."

Helen Franz: Scores are generally balanced across categories, with a mix of "Intermediate" and "Advanced" ratings.

Lebowakgomo: Consistently rated as "Advanced" across all categories.

Mankweng: Shows a progression from "Basic" to "Advanced" in different categories.

Pietersburg: Varied ratings, with some categories rated as "Advanced" and others as "Intermediate" or "Basic."

Seshego: Scores are generally in the "Intermediate" to "Advanced" range, with some categories rated as "Basic."

Thabamoopo: Scores were mostly in the "Intermediate" range, with a few "Advanced" and "Basic" ratings.

WF Knobel: Generally rated as "Advanced" across categories, with some exceptions.

Zebediela: Rated as "Advanced" in most categories, with a few exceptions.

Table 8: Mopani District Performance per Core Componet, per hospital.

Hospital	**CC1**	**CC2**	**CC3**	**CC4**	**CC5**	**CC6**	**CC7**	**CC8**
Dr CN Pathudi	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Basic	Advanced
Evuxakeni	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Intermediate
Kgapane	Advanced	Advanced	Intermediate	Advanced	Advanced	Advanced	Intermediate	Advanced
Letaba	Advanced	Intermediate	Advanced	Advanced	Intermediate	Advanced	Basic	Advanced
Maphuta	Intermediate	Insufficient	Intermediate	Intrmediate	Basic	Advanced	Insufficient	Advanced
Nkhensani	Basic	Advanced	Advanced	Advanced	Intmediate	Advanced	Advanced	Advanced
Sekororo	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Basic	Advanced
Van Velden	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced

In Mopani District, **Dr CN Pathudi**: Rated as “Advanced” across most categories, with one category rated as “Basic.”

• Evexakeni: Overall performance was excellent, receiving ratings of “Advanced” or “Intermediate” in every category.

The majority of the categories in Kgapane are classed as “Advanced,” although one is categorised as “Intermediate.”

• Letaba: In most areas, it is categorised as “Advanced” or “Intermediate,” with one category being classed as “Basic.”

• Maphuta: Displays a range of ratings, with certain categories designated as “Basic,” “Insufficient,” or “Intermediate,” denoting regions in need of development.

• Nkhensani: Most categories are ranked as “Advanced,” although one is categorised as “Basic” and another as “Intermediate.”

In Sekororo, most categories are ranked as “Advanced,” but one is categorised as “Basic.”

Van Velden performed exceptionally well overall, receiving an “Advanced” rating in every category.

Table 9: Sekhukhune District Performance per Core Component, per hospital.

Hospital	**CC1**	**CC2**	**CC3**	**CC4**	**CC5**	**CC6**	**CC7**	**CC8**
Dilokong	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Intermediate	Advanced
Groblersdal	Advanced	Advanced	Intermediate	Intermediate	Intermediate	Intermediate	Insufficient	Intermediate
June Furse	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Intermediate	Advanced
Matlala	Advanced	Advanced	Intermediate	Advanced	Advanced	Advanced	Intermediate	Intermediate
Meklenberg	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Intermediate	Intermediate
Philadelphia	Advanced	Advanced	Basic	Intermediate	Advanced	Intermediate	Intermediate	Intermediate
St Ritas	Intermediate	Advanced	Advanced	Intermediate	Basic	Intermediate	Intermediate	Intermediate

Dilokong is ranked “Advanced” in the majority of categories, with the exception of one, which is rated “Intermediate.”
Groblersdal: Displays a mixed ranking system, with some categories carrying the labels “Advanced,” “Intermediate,” or “Insufficient,” signifying regions in need of development.
June Furse: In most areas, she received an “Advanced” rating; in one, she received an “Intermediate.”
Matlala: two categories classified as “Intermediate,” with the majority of categories ranked as “Advanced.”
Meklenberg: Showing excellent performance all around, this rating of “Advanced” is given to it in every category.

Philadelphia: Displays an uneven distribution of ratings, with certain categories assigned “Advanced,” “Intermediate,” or “Basic,” signifying areas in need of development.

St Ritas: Some categories are graded as “Advanced,” “Intermediate,” or “Basic,” indicating areas that need development. The ratings are mixed.

Table 10: Vhembe District Performance per Core Component, per hospital.

Hospital	CC1	CC2	CC3	CC4	CC5	CC6	CC7	CC8
Donald Fraser	Advanced	Intermediate	Advanced	Advanced	Advanced	Advanced	Basic	Advanced
ELIM	Intermediate	Advanced	Intermediate	Advanced	Advanced	Intermediate	Basic	Advanced
Hayani	Advanced	Advanced	Advanced	Advanced	Intermediate	Intermediate	Basic	Intermediate
LouisTrichardt	Advanced	Advanced	Advanced	Advanced	Advanced	Intermediate	Insufficient	Advanced
Malamulele	Intermediate	Advanced	Advanced	Advanced	Intermediate	Basic	Basic	Intermediate
Messina	Advanced	Advanced	Advanced	Advanced	Advanced	Intermediate	Basic	Advanced
Siloam	Intermediate	Advanced	Advanced	Advanced	Advanced	Basic	Intermediate	Advanced
Tshilidsini	Intermediate	Advanced	Advanced	Advanced	Advanced	Intermediate	Intermediate	Advanced

In Vhembe district, Donald Fraser: Averaging a rating of “Advanced,” with one category receiving an “Intermediate” rating and another a “Basic.”

ELIM: Displays a mixed rating system, with some categories graded as “Basic,” “Advanced,” or “Intermediate,” signifying areas that require work.

Hayani: Has two categories categorised as “Intermediate,” but is ranked as “Advanced” overall.

Louis Trichardt: A majority of the categories are evaluated as “Advanced,” with one being classified as “Intermediate” and another as “Insufficient.”

Malamulele: Displays a mixed rating scheme, with certain categories graded as “Basic,” “Advanced,” or “Intermediate,” signifying areas that require work.

Messina: Most categories are ranked as “Advanced,” but two are classed as “Basic” and “Intermediate.”

With some categories graded as “Advanced,” “Intermediate,” or “Basic,” Siloam displays a mixed ranking system, suggesting areas in need of improvement.

Tshilidzini: Displays a range of ratings, with some groups receiving “Advanced” and “Intermediate” ratings.

Table 11: Waterberg District Performance per Core Component, per hospital.

Hospital	CC1	CC2	CC3	CC4	CC5	CC6	CC7	CC8
Ellisras	Advanced	Advanced	Intermediate	Advanced	Basic	Advanced	Intermediate	Advanced
FH Odendaal	Advanced	Advanced	Advanced	Advanced	Advanced	Intermediate	Intermediate	Intermediate
George Masebe	Intermediate	Intermediate	Basic	Intermediate	Basic	Intermediate	Intermediate	Advanced
MDR TB	Advanced	Advanced	Advanced	Advanced	Advanced	Intermediate	Intermediate	Intermediate
Mokopane	Advanced	Advanced	Basic	Intermediate	Intermediate	Intermediate	Advanced	Advanced
Thabazimbi	Advanced	Advanced	Intermediate	Advanced	Intermediate	Intermediate	Intermediate	Advanced
Voortrekker	Intermediate	Intermediate	Intermediate	Advanced	Basic	Intermediate	Advanced	Advanced
Warmbaths	Basic	Advanced	Intermediate	Advanced	Basic	Advanced	Intermediate	Intermediate
Witpoort	Advanced	Advanced	Intermediate	Advanced	Intermediate	Advanced	Intermediate	Advanced

Waterberg District performance shows Ellisras: Mostly rated "Advanced," with two categories classified as "Intermediate" and one as "Basic."

For the most part, FH Odendaal is graded as "Advanced," with three areas receiving an "Intermediate."

George Masebe: Displays a range of ratings, with some categories designated as "Basic," "Advanced," or "Intermediate," signifying areas in need of development.

Majority of MDR TB categories are classed as "Advanced," while three are rated as "Intermediate."

With some categories graded as "Advanced," "Intermediate," or "Basic," Mokopane: Displays a mixed rating system that highlights areas in need of improvement.

Most of Thabazimbi's ratings are "Advanced," with two categories receiving "Intermediate" ratings.

Voortrekker: Displays a variety of ratings, with some categories carrying the labels "Advanced," "Intermediate," or "Basic," signifying areas in need of development.

With some categories graded as "Advanced," "Intermediate," or "Basic," Warmbaths displays a mixed ranking system, showing regions.

Table 12: Performance Distribution by type of hospital

Section or Component	Specialized	District	Regional	Tertiary	Total Score
IPC Programme	82,5	77,1	79,1	67,5	77,8
IPC Guidelines	93,8	85,0	84,4	82,5	84,0
Education & Training	82,5	79,0	71,0	62,5	76,0
HCAI Surveillance	82,0	88,2	76,6	92,5	84,5
Multimodal	81,3	77,4	70,0	75,0	75,3
Audits	75,1	84,1	68,0	73,8	78,6
Staff & Workload	60,0	59,3	64,0	57,5	58,1
Built	67,6	86,4	76,5	72,5	80,3

The above table described the strengths and weaknesses in different components across various types of healthcare facilities. This information can be used to target improvements in specific areas to enhance overall IPC practices.

IPC programme

- The Specialised and District facilities scored relatively high, indicating a strong implementation of infection prevention and control programmes.
- Regional and Tertiary facilities scored slightly lower but still within a reasonable range.
- Overall, the Total Score is 77.8, indicating a good level of implementation across all facility types.

IPC Guidelines

- All facility types scored relatively high, with the Specialised facility scoring the highest.
- The Total Score is 84.0, indicating strong adherence to IPC guidelines across all facility types.

Education and training:

- Specialised facilities scored the highest, followed by District facilities.
- Tertiary facilities scored the lowest, indicating a potential area for improvement in education and training programmes.
- The Total Score is 76.0, suggesting a moderate level of education and training implementation across all facility types.

HCAI surveillance:

- Tertiary facilities scored the highest, indicating robust surveillance systems in place.
- Specialized and District facilities also scored relatively high.
- Regional facilities scored the lowest, indicating a potential area for improvement in surveillance practices.
- The Total Score is 84.5, indicating strong surveillance practices overall.

Multimodal

- Specialised facilities scored the highest, followed by District facilities.

- Regional and Tertiary facilities scored slightly lower but still within a reasonable range.
- The Total Score is 75.3, suggesting a good level of multimodal approach implementation across all facility types.

Audits

- District and Tertiary facilities scored relatively high.
- Specialised facilities scored slightly lower, while Regional facilities scored the lowest.
- The Total Score is 78.6, indicating a good level of audit implementation across all facility types.

Staff and workload:

- Scores are relatively low across all facility types, indicating a potential area for improvement in staffing and workload management.
- The Total Score is 58.1, suggesting a need for improvement in this area across all facility types.

Built environment:

- District and Tertiary facilities scored relatively high.
- Specialised facilities scored slightly lower, while Regional facilities scored the lowest.
- The Total Score is 80.3, indicating a good level of implementation of IPC measures in the built environment across all facility types.

Table 13: Performance Distribution by Health Facilities, per Component

District	Section or Component	IPC Program	IPC Guidelines	Education&Training	HCAI Surveillance	Multimodal	Audits	Staff&Workload	Built	Result
Capricorn	Botlokwa	38	47,5	25	60	75	80	45	85	455,5
	Helen Franz	55	97,5	65	40	50	67,5	45	65	485
	Lebowakgomo	95	80	80	75	70	100	70	85	655
	Pietersburg	90	100	65	95	90	65	30	68	602,5
	Thabamoopo	70	100	55	63	75	63	50	83	559
	Zebediela	80	70	85	100	85	100	80	90	690
	Mankweng	45	65	60	90	60	82,5	85	78	565
	Seshego	47,5	55	75	78,5	90	82,5	70	75	573,5
	WF Knobel	82,5	90	55	87,5	50	97,5	50	88	600
	Subtotal	**67,0**	**78,3**	**62,8**	**76,6**	**71,7**	**82,0**	**58,3**	**79,5**	**576,2**
Mopani	Dr CN Pathudi	90	87,5	85	92,5	95	92,5	50	85	677,5
	Kgapane	80	100	75	100	95	97,5	70	88	705
	Letaba	80	65	85	88	75	85	45	95	618
	Maphuta	57,5	0	55	55	30	80	25	80	382,5
	Nkhensani	45	90	80	82,5	60	87,5	80	88	612,5
	Van Velden	80	85	85	97,5	95	90	80	95	707,5
	Sekororo	87,5	85	95	92,5	95	92,5	30	98	675
	Evuxakeni	85	95	85	100	100	95	80	70	710
	Subtotal	**75,6**	**75,9**	**80,6**	**88,5**	**80,6**	**90,0**	**57,5**	**87,2**	**636,0**
Sekhukhune	Dilokong	95	100	95	100	85	85	65	100	725
	Groblersdal	83	92,5	65	70	60	75	25	63	533
	June Furse	90	100	85	92,5	100	90	70	85	712,5
	Matlala	85	100	65	95	85	85	65	75	655
	Meklenberg	85	97,5	85	97,5	85	95	70	63	677,5
	Philadelphia	95	90	50	67,5	85	62,5	70	53	572,5
	St Ritas	70	100	80	62,5	40	55	60	58	525
	Subtotal	**86,1**	**97,1**	**75,0**	**83,6**	**77,1**	**78,2**	**60,7**	**70,7**	**628,6**
Vhembe	Donald Fraser	95	70	90	100	90	90	40	80	655
	ELIM	70	80	70	95	85	57,5	35	95	587,5
	Hayani	95	90	90	82,5	70	70	35	65	597,5
	Louis Trichardt	95	77,5	100	95	90	75	25	85	642,5
	Malamulele	60	87,5	95	87,5	75	50	40	73	567,5
	Messina	95	90	85	90	95	60	35	88	637,5
	Siloam	60	80	100	90	90	50	60	80	610
	Tshilidsini	72,5	79,5	90	95	90	67,5	60	88	642
	Subtotal	**80,3**	**81,8**	**90,0**	**91,9**	**85,6**	**65,0**	**41,3**	**81,6**	**617,4**
Waterberg	Ellisras	95	85	75	87,5	50	82,5	75	100	650
	FH Odendaal	85	97,5	90	92,5	85	75	55	70	650
	George Masebe	75	72,5	50	67,5	40	70	75	83	532,5
	MDR TB	80	90	100	82,5	80	72,5	75	53	632,5
	Mokopane	78	87,5	50	70	60	70	85	90	590,5
	Thabazimbi	95	100	65	85	75	75	60	88	642,5
	Voortrekker	73	60	75	77,5	50	75	85	98	593
	Warmbaths	48	100	65	85	40	82,5	70	68	558
	Witpoort	90	87,5	75	90	75	97,5	75	95	685
	Subtotal	**79,9**	**86,7**	**71,7**	**81,9**	**61,7**	**77,8**	**72,8**	**82,5**	**614,9**
PROVINCE	**AVERAGE**	**77,8**	**84,0**	**76,0**	**84,5**	**75,3**	**78,6**	**58,1**	**80,3**	**614,6**

5.3 Qualitative findings phase II

Exploring the perception of IPC nurses on the IPC programme

5.3.1 Introduction

The qualitative results for the second phase of the explanaratory mixed-methods design are presented in this section. A convenience sample was employed to choose participants. The interviewees were asked to participate based on the following criteria: (1) long-term work experience in the IPC programme and (2) demonstrated IPC expert competencies such as certification and collaboration with provincial IPC committee. Six nurses working at district, regional, and tertiary hospitals provided the data (Tomczyk et al. 2021). The researcher performed unstructured interviews, which were transcribed verbatim afterward. A qualitative inductive thematic analysis was used to assess the results of the semi-structured interviews and identify patterns within the data. Themes, categories, and subcategories were identified. Direct quotes and a table format were used to display the data.

5.3.2 Data management and analysis

Semi-structured interviews were used to gather data to investigate patient attitudes of healthcare professionals. Following the recording of material, interviews were verbatim transcribed and saved on hard and soft drives. The researcher used thematic analysis to group codes into subcategories, and then subcategories into categories. This process led to the emergence of themes, which are participant accounts that describe perceptions and/or experiences that the researcher deemed pertinent to address the research question.

Research results

The table below presents the distribution of the sample interviewed in Limpopo in 2024 by selected variables, including the type of hospital, gender, age, position category, years in the programme, and qualification.

Table 1 Distribution of the sample interviewed by selected variables, Limpopo 2024.

	No	%
Regional	2	33.3
District	2	33.3
Tertiary	2	33.3
Gender		
Male	2	33.3
Female	4	66.7
Age		
30 - 40	1	16.7
41 - 50	1	16.7
51 - 60	3	50.0
NA	1	16.7
Position category		
Registered nurse	6	100.0
Years in the programme		
Since 2005	1	16.7
Since 2011	1	16.7
11	1	16.7
13	1	16.7
Since 2016	1	16.7
Since 2019	1	16.7
Qualification		
Certificate	2	33.3
Diploma	2	33.3
NA	2	33.3

- **Type of Hospital:** The sample includes an equal distribution of respondents from regional, district, and tertiary hospitals, with each category comprising 33.3% of the sample.
- **Gender:** The majority of respondents were female, accounting for 66.7% of the sample, while male respondents made up 33.3%.
- **Age:** Respondents are distributed across different age groups, with the highest percentage (50.0%) in the 51-60 age group, followed by 30-40 (16.7%) and 41-50 (16.7%). One respondent's age is not available.
- **Position category:** All respondents are registered nurses, making up 100% of the sample.

- **Years in the programme:** Respondents had varying years of experience in the programme, with 16.7% starting in 2005, 2011, 2016, and 2019, and one respondent each with 11 and 13 years in the programme.
- **Qualification:** The sample includes respondents with different qualifications, including certificates (33.3%), diplomas (33.3%), and some respondents with qualifications not available (33.3%).

This distribution provides a snapshot of the characteristics of the sample interviewed in Limpopo in 2024, offering insights into the demographics and professional backgrounds of the respondents. From the qualitative analysis, seven (7) themes, 13 categories and sub-categories emerged from the data collected through thematic analysis as outlined in figure 5.1 below.

Theme 1	Categories	Sub Categories
1. Affective attitude	1.1. Experience in IPC	1.1.1 More than 10 years
		1.1.1 Working for almost 4 years
		1.1.1 I have 11 years of experience
		1.1.1 Have 15 years of experience
		1.1.1 Have been working since 2005
	1.2. Reported directly the CEO or nurse manager	1.2.1 Reported directly to the CEO or meeting manager
	1.3. Staff/visitors attitude	1.3.1 Lack of disciplinary measures for non-adherence among staff
		1.3.2 Doctors not following IPC guidelines
		1.3.3 Staff attitude
		1.3.4 Training and in-service education to prevent non-adherence.

Theme 2	Categories	Sub Categories
2. Opportunity Costs	2.1 Implementing clear guidelines and enforcing discipline for non-compliance	2.1.1 Has a certificate in IPC
		2.1.2 Not have a specific IPC qualification
	2.2 Emphasised the need for frequent formal regular rotation of staff	2.2.1 Has received a certificate
		2.2.2 Obtained a certificate in IPC
	2.3 Staff to understand the importance of IPC	2.3.1 Need for further training
		2.3.2 A course certificate in infection control

Theme 3	Categories	Sub Categories
3. Intervention Coherence	3.1 Education & Training	3.1 Improving education & training among all staff
	3.2 Filing vacancy positions	3.2 Filling vacant positions
	3.3 Allocating dedicated staff for IPC	3.3 Allocating dedicated staff for IPC
	3.4 Management support	3.4 Management support.
	3.5 Centralised cleaning material procurement	3.5 The need for centralised cleaning material procurement

Theme 4	Categories	Sub Categories
4. The Burden	4.1 Incidence and Prevalence of HAIs	4.1.1 Rates of different types of HAIs (e.g., surgical site infections, urinary tract infections)
		4.1.1 Trends over time are increasing
		4.2.1 Severity of HAIs, sometimes mild, moderate to severe
	4.2 Impact on Patients	4.2.2 Complications and outcomes include increased length of hospital stay, morbidity, mortality
		4.3.1 Concerns regarding the risk of increasing rates of occupational exposure to infectious diseases
	4.3 Healthcare Worker Safety	4.3.2 Impact on healthcare worker health and safety

Theme 5

5. Perceived Effectiveness

Categories

5.1 Adherence to Guidelines

5.2 Communication and Education

5.3 Resource Allocation

5.4 Staffing and Training

5.5 Reporting and Surveillance

Sub Categories

5.1.1 Compliance with infection control guidelines and protocols
5.1.2 Awareness of and adherence to standard precautions
5.2.1 Effectiveness of communication strategies for infection control
5.2.2 Availability of resources (e.g., PPE, cleaning supplies)
5.3.1 Perception of adequacy of resources for infection control
5.3.2 Perception of educational programmes on infection prevention
5.4.1 Perception of staffing levels for infection control
5.4.2 Effectiveness of training programmes for healthcare workers
5.5.1 Perception of the reporting system for HAIs

Theme 6

6. Self-Efficacy

Categories

6.1 Hand Hygiene
6.2 Personal Protective Equipment (PPE) Use
6.3 Environmental Cleaning:
6.4 Respiratory Hygiene:
6.5 Isolation Precautions:
6.6 Infection Control Education:
6.7 Managing Infectious Patients
6.8 Problem-Solving Skills

Sub Categories

6.1.1 Confidence in performing hand hygiene correctly and consistently
6.1.2 Belief in the importance of hand hygiene for preventing infections
6.2.1 Confidence in selecting and using appropriate PPE
6.2.2 Belief in the effectiveness of PPE for protecting against infections
6.3.1 Confidence in cleaning and disinfection procedures
6.3.2 Belief in the importance of environmental cleaning for reducing the spread of infections
6.4.1 Confidence in practicing respiratory hygiene (e.g., covering coughs and sneezes)
6.4.2 Belief in the effectiveness of respiratory hygiene for preventing respiratory infections
6.5.1 Confidence in implementing isolation precautions for infectious patients
6.5.2 Belief in the importance of isolation precautions for preventing the spread of infections
6.6.1 Confidence in understanding infection control guidelines and protocols
6.6.2 Belief in the ability to apply infection control principles in practice
6.7.1 Confidence in managing patients with infectious diseases
6.7.2 Belief in the ability to prevent the spread of infections while caring for patients
6.8.1 Confidence in identifying and addressing infection control challenges
6.8.2 Belief in the ability to find solutions to improve infection control practices

Theme 7	Categories	Sub Categories
7. Ethicality	7.1 Equity and Fairness 7.2 Resource Allocation 7.3 Transparency 7.4 Professional Integrity 7.5 Patient Advocacy	7.1.1 Ensuring that infection control measures are applied equitably and fairly across all patients and staff 7.1.2 Avoiding discrimination in the implementation of infection control practice 7.2.1 Ethical allocation of resources for infection control, considering the needs of all patients and staff 7.2.2 Avoiding wastage or misuse of resources in infection control practices 7.3.1 Ensuring transparency in communication about infection control measures and their rationale 7.3.2 Providing clear information to patients and staff about infection control policies and procedures 7.4.1 Upholding professional standards and integrity in the implementation of infection control practices 7.4.2 Avoiding conflicts of interest in decision-making related to infection control 7.5.1 Advocating for patients' rights and well-being in the context of infection control 7.5.2 Ensuring that infection control measures do not compromise patients

THEME 1: EFFECTIVE ATTITUDE

Affective Attitude refers to the emotional or affective component of attitudes towards IPC practices. In the context of the opinions of IPC nurses, this theme focused on understanding the affective attitudes of IPC nurses (Sekhon et al., 2017). Understanding the affective attitudes of IPC nurses can provide valuable insights into their motivations, job satisfaction, and emotional responses to the challenges of IPC work. This understanding can inform strategies to enhance job satisfaction, support emotional well-being, and improve IPC practice on their feelings, emotions, and sentiments regarding various aspects of IPC.

The IPC nurses provided valuable insights into the challenges faced by hospitals regarding infection control practices. They emphasised the importance of education, training, and recognition of IPC as a specialty to enhance the IPC programme's functionality. Their suggestions aimed to address gaps in understanding and support for IPC among healthcare workers and management, with a focus on improving patient outcomes and reducing HAIs.

The theme was supported by the following categories:

Experience in IPC

From what they have shared, it seems to mention a progression of years starting from 2019, which is nearly five years ago, and then referring to it being the 13th year from 2005. There was also a mention of an IPC programme recommendation and facing challenges. Additionally, it notes the speakers have been somewhere since 2011 for 11 years, about to be 12.

Quotations

"Since 2019 is almost. It's almost five years. Yeah, four years in Letaba Regional Hospital"

(Regional Hospital IPC Nurse)

"This year it will be the. 13 years Louis Trichardt District Hospital"

(District Hospital IPC nurse)

"*I highly recommend that because from 2005 I have been in the IPC programme."*

(Tertiary Hospital IPC Nurse)

Reported directly the CEO or nurse manager

Reporting to the hospital CEO or Nursing Manager can present both challenges and highlights for IPC nurses. Most of the challenges raised by IPC nurses are ineffectively communicating with hospital executives, especially if there is a lack of understanding of IPC practices or if communication channels are not well-established. Limited resources and lack of allocated budget for IPC programmes are a challenge, and IPC nurses struggle to secure necessary resources or support from hospital leadership. During the interview, it was highlighted that IPC is not always a top priority for hospital executives, leading to challenges in obtaining support and resources for IPC initiatives. Reporting to hospital executives can provide IPC nurses with visibility and recognition for their work, highlighting the importance of IPC in improving patient safety and outcomes.

Quotations

"So with us we report both to the next to deputy nursing manager and in other areas it is hard to manage."

(IPC Nurse District Hospital)

"No. We report directly to the CEO or the nursing manager and we do have challenges when addressing IPC issues, as they are not prioritised"

(IPC Nurse Regional Hospital)

'OK. In our hospital, as I'm waiting as a junior registered professional… The liner of IPC is from myself to the operational manager, from the operational manager to nursing manager. IPC cuts across most units, units that are not under nursing supervision is difficult to manage"

(District Hospital IPC Nurse)

OK. Yeah. I I'm reporting to the clinician, and the nurse manager as well."

(Tertiary Hospital IPC Nurse)

Staff Attitude

It was clear that the IPC nurses feel that ensuring adherence to IPC policies and guidelines throughout the hospital can be challenging, especially if there is resistance or lack of buy-in from hospital leadership.

THEME 2: OPPORTUNITY COST

Implementing clear guidelines and enforcing discipline for non-compliance

During the interview, the IPC nurses expressed IPC nurses may express concerns about the opportunity cost of allocating resources such as time, manpower, and financial resource to enforce discipline for non-compliance. They highlighted that these resources could be used for other important aspects of IPC, such as training, surveillance, or improving infrastructure.

Implementing clear guidelines and enforcing discipline for non-compliance

Quotations

"Shortage of staff. Because if the person that we have been given to screen on daily basis not is not available or she is on leave, there is no replacement. So it's a challenge and then the other thing is the non-compliance. If you don't comply with the standard precautions, there is nothing that can be done"

(District IPC Nurse)

"Our healthcare workers, they, they, they, they, they, they neglect. IPC, actually they don't practice according to how their principles are supposed to be practiced in in IPC".

(Regional Hospital IPC)

"I highly recommend the training because from the Infection Control programme. It's not anybody who can do it ready to face the challenges we encounter."

(Tertiary Hospital IPC Nurse)

Emphasised the need for frequent formal regular rotation of staff

Quotations

"I think on the training or on the employees, if for example, if let's say they are training the students, whether the healthcare providers, whether irrespective of category, they should also include the IPC programme in their training".

(Tertiary Hospital IPC Nuse)

I think they will come and do a proper implementation and then people will see what we are doing and we are taking.

(Tertiary Hospital IPC)

"Yeah, it's very important because I think it will also develop the person who's going for training. And once the person is developed, obviously the person will be able to implement whatever infection control practice. As you know that knowledge is power. Obviously the person will be empowered and obviously the person will be able to impact every of them information to other colleague".

(District Hospital IPC Nurse)

Staff to understand the importance of IPC

'Yes, we do. We do, you know, with COVID, it assisted us. That was the thing that we were requiring since long, but it was very difficult, but during cause it at least even if they are not doing everything.'

(District Hospital IPC Nuse)

"Do the IPC presentation. In our IPC meeting identified topics are done. But in every meeting we talk about the healthcare. That we can do."

(Tertiary Hospital IPC Nurse)

"So once people got any information, they are able to use it and they are able to even if you are not paying that, they are able to implement it for example. Two days ago, I was giving them in-service with regard to acute flaccid paralysis, which they thought it was not meant for them so, so, so now they've got that information even if we know how to collect specimen."

(Regional Hospital IPC Nurse)

THEME 3: INTERVENTION COHERENCE

Intervention coherence refers to the extent to which an intervention makes sense to those involved, including stakeholders, implementers, and recipients (Sekhon et al., 2017). In the context of IPC programmes, intervention coherence is crucial for ensuring that the strategies and actions implemented are logical, understandable, and perceived as effective by those involved. By ensuring intervention coherence, IPC programmes can increase the likelihood of successful implementation and ultimately improve infection prevention and control practices and outcomes.

Filling Vacant Positions

Quotations

"A shortage that we're experiencing now is really very, very, very difficult."

(District Hospital IPC Nurse)

"I think maybe the challenge is that that is not recognized as one of the specialties. If maybe that then maybe if it can be recognized as a speciality, maybe that's the way maybe healthcare professional health and also management can take the IPC into consideration."

(Regional Hospital IPC)

Allocating dedicated staff for IPC

"Shouldn't allocate one person to the Infection Control programme. The programme is highly demanding. On a daily basis, you need to go to the ward round, and look at the size of our hospital."

(Tertiary Hospital IPC Nurse)

"The issue of filling the vacant post because currently, the problem is with shortage of staff and shortage of staff is one of the things that will will, will, will will compromise infection control."

(District Hospital IPC Nurse)

Management support

"Yeah, it's still a challenge. Still a very big challenge to us because we don't receive support from management and other disciplines."

(Regional Hospital IPC)

"Yes, it helps support because like in our infection control team, we, have got clinical manager who's the chairperson of the Infection Control Committee and the manager is also part of it. And then. Finance manager and also the technical manager. And I like to manage. So yeah, together with unit manager."

(District Hospital IPC Nurse)

"Yes, I can say and then I can say. And support because the understanding and understanding. The minimal support that those that are there. And then they give you support and there are some those that they don't understand. That's why they end up, you know, they just think IPC is just my own thing"

(Regional Hospital IPC)

Centralised cleaning material procurement

"Yeah, firstly I would I would, I would start with the the issue of cleaning materials. I think the issue of the material needs to be centralised procurement. The reason why I'm saying so is because I think that is that that is the one source that will also keep the environment clean. Remember, if it is not centralised, obviously each and every institution will continue, you know, buying cleaning products even if the products that are not effective for killing off microorganisms."

(District Hospital IPC Nuse)

"Newly employed once we got them, we do a training for cleaning."

(Regional Hospital IPC)

THEME 4: THE BURDEN

The interview response from the hospital IPC nurses generally highlighted that they often carry a significant workload, including conducting surveillance, implementing control measures, providing education, and ensuring compliance with protocols. This workload can be exacerbated during outbreaks or high-demand periods. It was also clear from their responses that these nurses bear a considerable responsibility for preventing HAIs and protecting both patients and healthcare workers. This responsibility can be stressful, especially when faced with challenges such as limited resources or staff resistance.

Incidence and prevalence of HAIs

Quotations

"Because most almost every month we do have the healthcare acquired infections, most specially the surgical site infections. That's the most challenging that we are having."

"I would say the minimum is 2 and the maximum can be visible 5 or 6 every month."

(Regional Hospital IPC Nurse)

"I think in the burden is very huge because most of our patients we don't manage them in our institution and we do not complete their management. Our hospital is very small. So it's a District Hospital, we usually see the patient and transfer them to other institutions"

(District Hospital IPC Nurse)

"It's very difficult because with healthcare associated infection. To pick them up, everyone in the institution must take part. We need to go to the ward to check each and every patient"

(District Hospital IPC Nurse)

"The healthcare acquired infections in our facility are plus minus 8 cases each month."

(Tertiary Hospital IPC Nurse)

"Most patient come already acquired from their referral institution. So at the end of the day you find that even if they try to say we are doing this this week will be fine, but we find that the other week somebody from somewhere come up with infections."

(Regional Hospital IPC Nuse)

"And we are even we are even experiencing higher number higher numbers of CRP. We are seeing a lot of hospital acquired infections."

(Tertiary Hospital IPC Nurse)

Impact on patients

"When the patients are discharged, they go to primary healthcare, sometimes the patients don't do the follow-up. They consult the local area clinics, and when they come for check-up at the hospital, that's when sometimes we discover that developed infection."

(District Hospital IPC Nurse)

"The history is not being taken properly. That is the thing that we are fighting with that they need to take proper history. About the past medical history of the patient, where is it? Where were you at? Take previously so that they know possibility of that patient having developed infection."

(District Hospital IPC Nurse)

"So most of them will find that we are managing them without knowing that they are having hospital acquired infection because we didn't take that history. So you find that the patients are having a long stay in the ward. And they are not detecting what is it that is causing the problem."

(Regional Hospital IPC Nurse)

"For, for C-section, for operation theatre, you'll find that there is a lot of contamination of which a risk of developing the the patient can be developing infection is very high."

(Tertiary Hospital IPC Nurse)

Healthcare worker safety

"*The safety technique when doing the when tracing the wound is another common challenge that we have observed in our facility."*

(Regional Hospital IPC Nurse)

"Even when they take culture, you can't even see the person who was taking culture. You need to go to the laboratory yourself to get the culture."

(District Hospital IPC Nurse)

"So usually when I go there you will find that one person is delivering and not being assisted or doing procedure and not being assisted. So for maintaining the sterility, it's very difficult"

(District Hospital IPC Nurse)

"To comply with the IPC practices is the only challenge that we have observed. That doctors are no longer like the doctors we knew before, without chasing them".

(Tertiary Hospital IPC Nurse)

"For example Neonatal units, their doctors, they know that they have to sanitise when they get in the ward and when they move from one patient. But some them find that when you do some sport checks, they do not do it."

(Regional Hospital IPC Nurse)

THEME 5: PERCEIVED EFFECTIVENESS

The responses of hospital IPC nurses regarding the theme provided valuable insights into their perceptions of effectiveness, highlighting areas that require improvement. These perceptions are crucial for identifying gaps and enhancing the overall efficacy of IPC programs.

Adherence to Guidelines

Quotations

"So it's a challenge and then the other thing is if you don't comply with the standard precautions, there is nothing that can be done. IPC nurse will just sing and sing, but there are no measures taken to say you didn't adhere with the standard precaution.

So this time if we are doing, maybe something like a disciplinary measure from higher authority."

(District Hospital IPC Nurse)

"Mainly the incorrect use of PPE and the non compliance to hand washing and hand hygiene activities"

(Tertiary Hospital IPC nurse)

"We can minimize the infection transmission in the health care settings through the implementation of the all all the standard precautions. For example, the implementation of hand hygiene. When healthcare workers are implementing the five moments of hygiene according to their area of of the the settings of their work and the other thing, the use of PPE, implementing all the rules of the of the use of the PPE"

(Regional Hospital IPC Nurse)

Communication and education

'If they've got any problem related to IPC equipment, they must ensure that they liaise with you quickly, not waiting for you to come."

(Regional IPC Nurse)

"Must keep on contacting you so that you're able to give them the necessary support."

(District IPC Nurse)

"They received the report, the report on monthly basis on weekly basis of non-adherence but nothing is being done so it leads to staff not complying. That's why we are going to get maybe high incidence of infection rate."

(District IPC)

"We do have monthly meetings. Every hospital unit or ward is represented.

(Tertiary IPC)

"It should be done because it's equipped them with necessary knowledge that will be used rather than sitting at the corner there. So once people get any information, they are able to use it."

(Regional IPC)

"You know, I heard another person saying I was attending another workshop in other country when they are, they are saying that there is a high incident of infection and they are not compliant. They started to say if you are not complying with the standard precaution we. Are going to charge you. They were going to take their salary for that month immediately they started. There was 100% of compliance. It means we need also the discipline and people must know that"

(District IPC)

Resource allocation

"And again, still in the kitchen. As IPC, we are supposed to monitor or check resources received from the area from procurement. For example, the batch numbers, expiry dates. You monitor that looking into the freshness, looking at the cleanliness of the vehicles that transporting them as well."

(Regional IPC)

"Say, say on a on a three month basis, maybe people should rotate to come to come and really taste being in IPC"

(Tertiary IPC)

Staffing and Training

"Are doing the postmortem and ensure that we give them the necessary advice necessary health education and cleaning after the procedure."

(Regional IPC)

"To me, to me, ~~to be~~ everybody to be infection control trained, you know, like for instance in our training, basically as health care workers, we are infection control trainers."

(Tertiary IPC)

"We really need resources, cellphones, if ~~if~~ you don't have a a Wi-Fi. as infection control, is a challenge."

(Tertiary IPC)

"We have shortage of staff, and we were assisted during Covid."

"But we have developed an area in the institution close to the main gate wherein all the all the teaching when there are patients. The person delegated on daily basis."

(District IPC)

"Shortage of staff. Because if the person that we has been given to screen on daily basis not is not available or she is on leave, there is no replacement."

(District IPC)

So we need the guidelines and those guidelines must be implemented and even the ITC education and training we need to educate the staff, even the staff that, like the cleaners, we need to educate them to clean. Is it important for you to clean? Why is it important for you to wipe every time the the most touch areas frequently so that they know why are they supposed to do that?"

(District IPC)

THEME 6: SELF-EFFICACY

The response highlighted by the IPC nurses indicates that self-efficacy can influence their actions, decisions, and overall effectiveness in preventing and controlling infections. In their responses, one could determine how confident IPC nurses feel in carrying out IPC practices such as hand hygiene, isolation protocols, and environmental cleaning.

Hand Hygiene

Quotations

"Like now, what we do ~~on~~ daily we are monitoring compliances as far as hand hygiene. And medical concerns"

(Tertiary IPC)

"What I've observed is the issue of people not adhering to proper hygiene practices. Even when hand hygiene facilities are available, there is a tendency for individuals to neglect washing their hands properly."

and again, we do have visitors, remember in our institution. Visitors, sometimes they are not, some they are, they are, they are the. They are giving us problems. We once had a visitor, who is not supposed to sanitize according to her culture, as she is

a traditional healer. But otherwise, we to try to explain so about the importance of sanitizing and otherwise, in the end she managed to sanitize "

(District IPC)

Personal Protective Equipment (PPE) Use

"To comply with the. The only challenge that we have observed. That doctors are not complying."

(Tertiary IPC)

"The use of PPE also sometimes we find that people are are not really supposed to."

(Regional IPC)

Environmental cleaning

"*We are mostly interested in the IPC, So if we keep our environment clean. We are minimising the risk of infection towards our visitors as well*."

(Regional IPC)

"Yeah, firstly I would ~~I would~~, I would start with the the issue of cleaning materials. I think the issue of the material needs to be centralized procurement. The reason why I'm saying so is because I think that is that that is the one source that will also keep the environment clean. Remember, if it is not centralized, obviously each and every institution will continue, you know, buying cleaning products even if the products that are not effective for killing off microorganisms."

(District IPC)

Isolation precautions

The referrals end up in our health facility. An isolation ward is used where any referral patient is placed for approximately three to four days while undergoing evaluation and necessary workup. If they are not really having an infection, because once you put them in a high care, I mean, let's say in ICU for everyone at the end of the day ends up infecting every child.

(Regional IPC)

"Yeah, we are. We are. Screening patients, we are screening patients. At entry points of our hospital. What we are doing, we of course we are with what we are doing TB screening and then yeah and with the previous months we are also doing measles screening because we once had an outbreak of measles in our hospital"

(District IPC)

Infection control education

We do the presentation. In our IPC meeting and we go to the wards, where we identify problems, we do in-service training. But in every meeting. We talk about healthcare acquired infections. That we can do.

(Tertiary IPC)

Usually every Wednesday there is a gathering of nursing staff. So I take this opportunity that opportunity to educate those nursing staff because they are not the same

(Regional IPC)

Managing infectious patients

"Preventing infection. And will be preventing cross infection amongst access healthcare workers towards our clients or our patients."

(Regional IPC)

"They do screening for infectious diseases, especially in the Casualty and Outpatient Department"

(District IPC)

"A patient is admitted to the ward, screening is done on that patient. We will actually know that this patient came with this and this is what the patient has acquired here, and so forth."

(District IPC)

"We haven't yet stopped with COVID currently. We are also doing it, yes."

(District IPC)

Problem-solving skills

"From our executive management, there is support. We don't have a doctor who, when we encounter challenges, can be addressed."

(Tertiary IPC)

"In case of non-adherence, in most cases I'm reporting. Clinical manager and also to the infection control team. And if it really goes to the level of an outbreak response team."

(District IPC)

THEME 7: ETHICALITY

It was highlighted in most of their response that IPC nurses prioritise patient safety and well-being, adhering to ethical principles such as beneficence and non-maleficence. They strive for fair and equitable distribution of resources and access to care, including infection prevention measures.

Resource allocation

Quotations

"Shouldn't allocate one person to the Infection Control programme. The programme is highly demanding."

(Tertiary IPC Nurse)

"The only problem is that they took from us the only doctor who had a public health background, from us, as we speak, we don't have any doctor whom we speak to when we encounter challenges."

(Tertiary IPC Nurse)

"The issue of filling the vacant post because currently, the problem is with a shortage of staff, and a shortage of staff is one of the things that will compromise infection control."

(Regional IPC Nurse)

Transparency

"When staff go and attend IPC training, I think they will come and do a proper implementation, and then people will see what we are doing and we are taking."

(Tertiary IPC Nurse)

Do the presentation. In our IPC meeting identified. But in every meeting. We talk about the healthcare. That we can do.

(Regional IPC Nurse)

Professional integrity

"I highly recommend the training because from the Infection Control programme point of view, it's not anybody who can do it, and ready to face the challenges we encounter."

(District IPC Nurse)

On a daily basis, you need to go to the ward round, and look at the size of our hospital. Do everything that we can on ~~on~~ daily basis.

(Regional IPC)

The only challenge that we have observed is that doctors are no longer like the doctors that we knew.

(Tertiary IPC)

Patient advocacy

"Whereby the doctor will prescribe an antibiotic now, and tomorrow when doing ward rounds, he checks the prescription and see if patient received all doses that he prescribed."

(Tertiary IPC)

CHAPTER SIX: INTEGRATION OF QUALITATIVE AND QUANTITATIVE FINDINGS AND INTERPRETATION OF RESEARCH FINDINGS

6.1 Introduction

It has been suggested that mixed methods research can be especially helpful in the field of healthcare research because only a wider variety of viewpoints can fully capture the intricacy of the phenomena under study (Östlund et al., 2011). An overall or negotiated narrative of the findings can be produced by merging the qualitative and quantitative findings, which is not achievable by employing a sole approach. In order to draw attention to the distinctions and similarities among specific facets of a phenomenon, mixed approaches can also be used. The goal of combining qualitative and quantitative approaches in any mixed methods study should be evident in order to ascertain the relationship between the various analytical techniques and how, if at all, the results should be merged (Östlund et al., 2011).

Various analytical methodologies have been identified, such as parallel data analysis, wherein the two data sets are collected and analysed independently, with the results not being compared or aggregated until the interpretation stage (Rao and Woolcock, 2003). In research studies where qualitative and quantitative methodologies are combined, one approach is typically prioritised over the other. In these situations, whether and how the empirical data are integrated depends on the study's objectives, the justification for using mixed methods, and the relative weights assigned to each approach (Rao and Woolcock, 2003).

This chapter used the merging method to merge the qualitative and quantitative data, and visual joint presentation was used to report the findings. The interpretation and integration of the results were guided by a four-step process that included constructing a collaborative display, connecting activities, forming connections, and interpreting and reporting (Skamagki et al., 2024). Data was shown using graphs, tables, percentages, and direct quotations. The topics were arranged according to a theoretical framework. The discussion of the research findings in respect to the study objectives comes next.

6.2 Data management and analysis

Qualitative data obtained from hospital IPC nurses, was collected using unstructured interviews. In addition, data was captured using recording and later transcribed verbatim and analysed using thematic analysis where themes emerged. Quantitative data was obtained from retrospective peer-review data collected using the IPCAF tool. The tool was used to collect data. Thereafter, data was captured in Microsoft Excel spreadsheet and analysed using SPSS version no 29.0.0.0 programme.

6.3 Results

6.3.1 Integration process

Integration was done using a four-step approach: creating a joint display, linking activity, establishing relationships, and interpreting and reporting. Graphs and tables were used to support the comprehensive description and illustration of the integration process

- Step 1: Creating a joint display

The results of the study were systematically organized using a joint display to integrate and compare findings from both the quantitative and qualitative strands. The quantitative strand, conducted as Phase I, collected statistical data to identify overarching trends and patterns. These findings informed the development of the qualitative strand, conducted as Phase II, which provided deeper insights into the identified trends through the exploration of participants' experiences and perceptions.

In the joint display, presented in Table 6.1, the first column lists the quantitative variables and corresponding statistical data from Phase I. The subsequent columns include qualitative themes, supported by illustrative statements from participants in Phase II. This merging strategy ensured a comprehensive understanding of the research problem by integrating numerical trends with contextual interpretations.

Table 6.1: Themes of Phase 1-by-statistics visual joint display

Theme	IPC Programme	IPC Guidelines	IPC Education & Training	HCAI Surveillance	Multimodal Strategy	Monitoring/audits	Workload/ Staffing & bed occupancy	Built Environment, materials and equipment for IPC
Affective attitude	**Illustrative quotes:** "I highly recommend that because from 2005 I have been in the IPC programme." **Statistical results:** median (IQR) CC1 score was 80.0 (20.0) points					**Illustrative quotes:** OK. In our hospital, as I'm waiting as a junior registered professional… The liner of IPC is from myself to the operational manager, from the operational manager to nursing manager. IPC cuts across most units, units that are not under nursing supervision is difficult to manage"		

						Statistical results: median (IQR) CC1 score was 80.0 (21.3) points		
Opportunity Costs		**Illustrative quotes:** "Our healthcare workers, they, they, they, they, they neglect. IPC, actually they don't practice according to how their principles are supposed to be practiced in in IPC".	**Illustrative quotes:** *"I highly recommend the training because from the Infection Control programme. It's not anybody who can do it ready to face the challenges we encounter."* **Statistical results:** median (IQR) CC1 score was 80.0 (23.0) points				**Illustrative quotes:** *"Shortage of staff. Because if the person that we have been given to screen on daily basis not is not available or she is on leave, there is no replacement. So it's a challenge and then the other thing is the non-compliance. If you don't comply with*	

		Statistical results: median (IQR) CC1 score was 87.5 (19.0) points					*the standard precautions, there is nothing that can be done"* **Statistical results:** median (IQR) CC1 score was 60.0 (33,0) points	
Intervention coherence	**Illustrative quotes:** *Yeah, it's still a challenge. Still a very big challenge to us because we don't receive support from management and other disciplines."* **Statistical results:**		**Illustrative quotes:** *"I think maybe the challenge is that that is not recognized as one of the specialties. If maybe that then maybe if it can be recognized as a speciality, maybe that's the way maybe healthcare professional health and also*				**Illustrative quotes:** "The issue of of filling the vacant post because currently, the problem is with shortage of staff and shortage of staff is one of the things that will will, will, will will compromise	**Illustrative quotes:** "Yeah, firstly I would I would, I would start with the the issue of cleaning materials. I think the issue of the material needs to be centralised procurement. The reason why I'm saying so is because I think that is that that is the one source that will also

	median (IQR) CC1 score was 80.0 (20.0) points		*management can take the IPC into consideration."* **Statistical results:** median (IQR) CC1 score was 80.0 (23.0) points				infection control." **Statistical results:** median (IQR) CC1 score was 60.0 (33,0) points	keep the environment clean. Remember, if it is not centralized, obviously each and every institution will continue, you know, buying cleaning products even if the products that are not effective for killing off microorganisms." **Statistical results:** median (IQR) CC1 score was 85.0 (18,8) points
The burden				**Illustrative quotes:** "Because most almost every month we do have the				

				healthcare acquired infections, most specially the surgical site infections. That's the most challenging that we are having." "I would say the minimum is 2 and the maximum can be visible 5 or 6 every month." **Statistical results:** median (IQR) CC1 score was 88.0 (18,0) points				

Perceived effectiveness		**Illustrative quotes:** *"They received the report, the report on monthly basis on weekly basis of non-adherence but nothing is being done so it leads to staff not complying. That's why we are going to get maybe high incidence of infection rate."* **Statistical results:** median (IQR) CC1 score was			**Illustrative quotes:** "So it's a challenge and then the other thing is if you don't comply with the standard precautions, there is nothing that can be done. IPC nurse will just sing and sing, but there is no measures taken to say you didn't adhere with the standard precaution. So this time if we are doing, maybe			**Illustrative quotes:** "We can minimize the infection transmission in the health care settings through the implementation of the all all the standard precautions. For example, the implementation of hand hygiene. When healthcare workers are implementing the five moments of hygiene according to their area of of the the settings of their work and the other thing, the use of PPE, implementing all the rules of the of the use of the PPE"

		87.5 (19.0) points			something like a disciplinary measure from higher authority." **Statistical results:** median (IQR) CC1 score was 80.0 (30.0) points			**Statistical results:** median (IQR) CC1 score was 85.0 (18,8) points
Self-efficacy	**Illustrative quotes:** *"From our executive management, there is support. We don't have any doctor that when we encounter challenges can be addressed."* **Statistical results:**		**Illustrative quotes:** Usually every Wednesday there is a gathering of nursing staff. So I take this opportunity that opportunity to educate those nursing staff because they are not the same.			**Illustrative quotes:** *"What I've seen, is is the issue of people not observing health hygiene. You know, even if there are hand hygiene facilities that people tend to, to no, to wash their hands.* **Statistical results:**		**Illustrative quotes:** "We are mostly interested in the IPC, So if we keep our environment clean. We are minimizing the risk of infection towards our visitors as well." **Statistical results:** median (IQR) CC1 score was

	median (IQR) CC1 score was 80.0 (20.0) points		**Statistical results:** median (IQR) CC1 score was 80.0 (23.0) points			median (IQR) CC1 score was 80.0 (21.3) points		85.0 (18,8) points
Ethicality	**Illustrative quotes:** *Do the presentation. In our IPC meeting identified. But in every meeting. We talk about the healthcare. That we can do.* **Statistical results:** median (IQR) CC1 score was 80.0 (20.0) points		**Illustrative quotes:** *"When staff go and attend IPC training, I think they will come and do a proper implementation and then people will see what we are doing and we are taking."* **Statistical results:** median (IQR) CC1 score was 80.0 (23.0) points				**Illustrative quotes:** *"Shouldn't allocate one person to the Infection Control programme. The programme is highly demanding."* **Statistical results:** median (IQR) CC1 score was 60.0 (33,0) points	

- Step 2: Linking activity

Making connections between the qualitative and quantitative findings was the next stage of the integration process. Finding points of similarity and difference was accomplished through merging integration.

- Step 3: Establishing relationships

To uncover connections between the qualitative and quantitative data, the researcher searched for contradictions, alignments, or inconsistent results. Furthermore, this improved interpretations. The framework of the interpretation of the "fit" between the results was established using the concepts of convergence, complimentary, expansion, and divergence.

- *Step 4: Interpreting and reporting*

Table 6.2 shows the distribution of participants from the qualitative and quantitative designs of the study.

Table 6.2 shows the distribution of participants

Quantitative Results	Qualitative Results	Merged Results
2 tertiary 5 regional 3 specialized 31 district	2 tertiary hospital IPC nurses 2 regional hospital IPC nurses 2 district hospital nurses	Participants = 47 (quantitative 41 + qualitative 6)
Retrospective data from a total of 41 hospitals:	A total of 6 Infection Prevention & Control Nurses:	Total participants : N=47 (Retrospective data from a total of 41 hospitals + 6 Infection Prevention & Control Nurses)

The study integrated qualitative observations from six IPC nurses obtained through surveys with quantitative data from 41 hospitals' retrospective IPCAF facility performance peer-review data. A thorough grasp of IPC methods, difficulties, and results across various hospital types is provided by this integrated approach. While the qualitative data offer deeper insights into the experiences and difficulties experienced by IPC nurses in various contexts, the quantitative data provide a comprehensive perspective on IPC parameters across various institutions. This

combination improves knowledge about the overall efficacy and application of IPC interventions.

Table 6.3 Background information of IPC nurses

Variable	Quantitative	Qualitative	Merged Results
Age	30 - 40 yrs =1 41 – 50 yrs = 2 51 – 60 yrs = 3	Minority = < 40 years Majority = > 41 years	Minority is 30 – 40 years Majority is 41 – 60 years
Type of hospital	35 District hospitals (85.4%), 4 Regional (9.8%) and 2 Tertiary (4.8%).	Regional = 2 District = 2 Tertiary = 2	35 District hospitals (85.4%), 4 Regional (9.8%) and 2 Tertiary (4.8%).
Position category	41 registered nurses	6 registered nurses	41 registered nurses
Number of years in IPC programme	Since 2005 Since 2011 2011; 2013 Since 2016 Since 2019	Since 2005 Since 2011 2011; 2013 Since 2016 Since 2019	Varied from 2005 to 2019
Qualification in IPC	All HCFs were evaluated, and the median (IQR) CC3 score was 80.0 (23.0) points.	Certificate 2 Diploma 2 Not trained 2	80% IPC nurses received varied qualifications

IPC nurses' positions, experiences, backgrounds, and qualifications were all well understood, thanks to the combined findings of the quantitative and qualitative data. The incorporation of these data sets broadens our understanding of IPC procedures and the varied backgrounds of the research participants.

- **Age**

The majority of participants in both the quantitative and qualitative data were over 41 years old, indicating that older age groups dominated the IPC nurse demographic. IPC nurses in the 41–50 and 51–60 age groups are likely to have more experience in their field. This experience may contribute to greater knowledge and understanding of IPC protocols and challenges. They may have been involved in the development and implementation of IPC initiatives and observed the evolution of IPC practices over time.

The predominance of older age groups suggests a potential wave of retirements in the near future. This underscores the importance of planning for succession by recruiting and retaining younger nurses for IPC roles. Strategies to attract younger nurses could include offering specialised IPC training programmes, mentorship opportunities, and clear professional growth pathways.

- **Type of Hospital**

The study included participants from various types of hospitals, with district hospitals being the most represented in the quantitative data. Both data sets included representation from district, regional, and tertiary hospitals, ensuring a diverse range of hospital types in the analysis.

Quantitative Data: Representing 85.4% (35 out of 41) of all hospitals, district hospitals make up the majority of the sample.

Qualitative Data: Two IPC nurses in district hospitals also provided their perspectives on IPC.

Implications

- **Reach and accessibility**

In many areas, particularly in rural or underserved areas, district hospitals serve as the main source of healthcare. Their prevalence in the sample guarantees that a variety of circumstances and difficulties encountered in more confined settings are covered by the research.

- **Resource Allocation**

District hospitals' IPC capabilities may be impacted by their lower resource allocation when compared to tertiary and regional hospitals. It is possible to more effectively customise interventions and resource allocation by having a better understanding of IPC practices and issues in these situations.

When focusing on regional hospitals, our findings suggest the following:
Quantitative Information: Representing 4 out of 41 hospitals, or 9.8% of all hospitals.

Qualitative Data: Two IPC nurses at regional hospitals provided their perspectives on IPC.

- **Implications**

Intermediate Care Level: Acting as a bridge between district and tertiary hospitals, regional hospitals can handle patients that are more complicated than those handled by district hospitals, but they are not as specialised as tertiary hospitals.

Resource Variation: Although these hospitals may have more resources than district hospitals, they nevertheless deal with certain difficulties that set them apart from both tertiary and district hospitals.

- **Tertiary Hospitals**
  - Quantitative Data: Representing 4.8% (2 out of 41) of the total hospitals.
  - Qualitative Data: IPC insights were gathered from 2 IPC nurses in tertiary hospitals.
- **Implications:**
  - Advanced care: Tertiary hospitals provide highly specialised care, often dealing with the most complex and critical cases. They typically have more advanced technology and specialised staff.
  - Leadership in IPC: These hospitals often set benchmarks for best practices in IPC, given their resources and expertise. Insights from tertiary hospitals can provide valuable lessons and models that can be adapted and implemented in lower-level hospitals.
  - Innovation and training: Tertiary hospitals are likely to be sites of ongoing research, innovation, and training in IPC. Understanding their practices can help in disseminating innovative approaches to other hospital types.

- **Position category**

All participants across both data sets were registered nurses, indicating a consistent focus on this professional category in the study. A consistent and thorough understanding of IPC procedures from a key professional standpoint is provided by focusing on registered nurses in both the quantitative and qualitative data sets.

Because of their direct patient care responsibilities and strict adherence to IPC regulations, registered nurses are vital to the success of IPC programmes. Because of this focus, the study is able to pinpoint certain obstacles to and chances for enhancing IPC practices among nurses, which will eventually improve patient outcomes and make IPC more successful.

- **Number of years in the programme**

Participants have varied years of experience in the IPC programme, ranging from those who started in 2005 to those who joined as recently as 2019. This range of experience provides a broad perspective on the evolution of IPC practices over time.

The wide range of experience among IPC nurses—from those who began working in 2005 to those who only joined in 2019—offers an insightful and comprehensive look at how IPC procedures have changed over time. This spectrum makes it possible to have a thorough grasp of the ways that IPC has evolved throughout time, the difficulties encountered, and the tactics that have worked. The study can contribute to the development of more effective IPC policies, training programmes, and interventions by utilising the experiences and insights of nurses at various phases of their careers. This will ultimately improve the overall quality and efficacy of IPC in healthcare settings.

Participants who have been involved in IPC since 2005 likely bring a wealth of experience and have witnessed the evolution of IPC practices over nearly two decades. They have seen changes in guidelines, policies, and technological advancements in IPC. **Intermediate Experience (2011-2013):** Those who joined between 2011 and 2013 represent a mid-range experience level. They have a solid background in IPC but may have been trained under more modern protocols compared to the early adopters. **Recent Entrants (2016-2019):** Participants who started in 2016 or later are relatively new to IPC. They are likely familiar with the latest guidelines and technologies but may lack the extensive hands-on experience of their more senior counterparts.

- **Qualifications in IPC**

While the quantitative data provide an overall evaluation score of healthcare facilities, the qualitative data offer specific details on the IPC qualifications of the nurses, indicating a mix of certified, diploma-holding, and untrained IPC nurses. This highlights the varied levels of formal IPC training among the participants. The mixed levels of formal IPC training among participants (certificates, diplomas, and no formal training) highlight the diversity in educational backgrounds. This variation can help identify gaps in IPC education and training, underscoring the need for standardised and accessible IPC training programmes.

Prevalence or burden of HAIs

In the qualitative design, unstructured interviews were conducted to gather information from hospital IPC nurses. For the quantitative design, data were derived from hospital reports of the IPCAF peer review assessments. Table 6.4 presents the results from both study designs, along with their interpretation and meta-inferences, in relation to the burden of HAIs.

Table 6.4: Qualitative and Quantitative results on the burden of HCAI

	Quantitative Results	**Qualitative Results**	**Meta Inferences and Interpretation**
Prevalence of HCAIs	When the IPCAF score for Healthcare Acquired Infections (CC4) of all HCFs was evaluated, the median (IQR) CC4 score was 88.0 (18.8) points. Scores were high in Sekhukhune, Vhembe and Mopani (92.5). The lowest was Capricorn (78.5). According to the level of the hospital, the highest one was in Tertiary hospital (92.5) and the lowest in Regional hospital	The responses from hospital IPC nurses highlighted that they often carry a significant workload, including conducting surveillance, implementing control measures, providing education, and ensuring compliance with protocols. They reported that this workload can be exacerbated during outbreaks or high-demand periods. It was also clear from their responses that these nurses bear considerable responsibility for preventing healthcare-associated infections (HAIs) and protecting both patients and healthcare workers	The high IPCAF scores in certain districts and hospital levels suggest a strong implementation of IPC programmes, correlating with the nurses' reports of extensive responsibilities and workload. The quantitative data support the qualitative findings, indicating that effective IPC measures are in place but come with significant demands on nursing staff, particularly during outbreaks. This integration underscores the importance of supporting IPC nurses with adequate resources and staffing to maintain high standards of infection control.

When evaluating the IPCAF score for HAIs (CC4) across all healthcare facilities (HCFs), a median score of 88.0 (with an interquartile range of 18.8) points was obtained. Notably, high scores were observed in Sekhukhune, Vhembe, and Mopani districts (92.5), while the lowest score was recorded in Capricorn (78.5). Furthermore, when considering hospital levels, tertiary hospitals exhibited the highest score (92.5), contrasting with regional hospitals, which demonstrated the lowest score.

These quantitative findings are complemented by qualitative insights derived from responses provided by hospital IPC nurses. They shed light on the significant workload carried by these nurses, encompassing tasks such as surveillance, implementing control measures, providing education, and ensuring compliance with protocols. Furthermore, they noted that this workload intensifies during outbreaks or high-demand periods. The responses also underscored the substantial responsibility shouldered by IPC nurses in preventing HAIs and safeguarding both patients and healthcare workers.

The high IPCAF scores observed in specific districts and hospital levels suggest robust implementation of IPC programmes, aligning with the qualitative accounts of extensive responsibilities and workload among IPC nurses. This integration of quantitative data and qualitative insights highlights the effective measures in place for infection control, albeit accompanied by significant demands on nursing staff, particularly during challenging periods such as outbreaks. It emphasises the critical need for supporting IPC nurses with adequate resources and staffing to uphold high standards of infection control and ensure effective prevention of HAIs.

Risk factors associated with acquiring Health Care Acquired Infection

This section addresses qualitative and quantitative results in relation to common risk factors associated with acquiring HCAI. Table 6.5 compares the qualitative and quantitative results and makes meta-inferences and interpretations.

Table 6.5: Qualitative and Quantitative results on the common risk factors

	Quantitative Results	**Qualitative Results**	**Meta Inferences and Interpretation**
Common Risk Factors	When the IPCAF score for Built environment, materials (CC8), and equipment for IPC of all HCFs was evaluated, the median (IQR) CC8 score was 85.0 (18.8) points. Scores were high in Mopani and Waterberg (87.5). The lowest was Sekhukhune (62.5). According to the level of the hospital, the highest one was in Regional hospital (88.7) and the lowest in Tertiary hospital (72.5).	The IPC nurses provided valuable insights into the challenges faced by hospitals regarding infection control practices. They emphasized the importance of education, training, and recognition of IPC as a specialty to enhance IPC programme functionality	The relatively high IPCAF scores for built environment, materials, and equipment in certain districts and hospital levels align with the qualitative insights from IPC nurses who underscored the necessity for education and training. The lower scores in specific regions and hospital levels indicate areas where improvements in infrastructure and resources are needed. Together, these findings suggest that while some hospitals are well-equipped for IPC, others require additional support and specialised training to elevate their IPC practices to the same standard.

When evaluating the IPCAF score for built environment, materials, and equipment for IPC (CC8) across all healthcare facilities (HCFs), a median score of 85.0 (with an interquartile range of 18.8) points was obtained. Notably, high scores were observed in Mopani and Waterberg districts (87.5), while the lowest score was recorded in Sekhukhune (62.5). Furthermore, when considering hospital levels, regional hospitals exhibited the highest score (88.7), contrasting with tertiary hospitals, which demonstrated the lowest score (72.5).

These quantitative findings are complemented by qualitative insights derived from responses provided by hospital IPC nurses. They shed light on the challenges faced by hospitals regarding infection control practices, emphasising the importance of education, training, and recognition of IPC as a specialty to enhance IPC programme functionality.

The relatively high IPCAF scores for built environment, materials, and equipment in certain districts and hospital levels align with the qualitative insights from IPC nurses who underscored the necessity for education and training. Conversely, the lower scores in specific regions and hospital levels indicate areas where improvements in infrastructure and resources are needed. Together, these findings suggest that while some hospitals are well-equipped for IPC, others require additional support and specialised training to elevate their IPC practices to the same standard.

Infection Prevention Measures at Facility Entry Points

This section addresses the findings in relation to the screening of all individuals entering healthcare facilities. Table 6.6 shows both qualitative and quantitative results and their interpretations.

Table 6.6: Qualitative and Quantitative Results on Infection Prevention Measures at Facility Entry Points

	Quantitative Results	**Qualitative Results**	**Meta Inferences and Interpretation**
IPC Measures at point of entry	When the IPCAF score for Workload, staff, and bed occupancy (CC7) of all HCFs was evaluated, the median (IQR) CC7 score was 60.0 (33.0) points. Scores were high in Waterberg (75.0), followed by Sekhukhune (65.0). The lowest was Vhembe (37.5).	The responses of hospital IPC nurses helped in understanding that the perceived effectiveness of IPC programmes can yield significant insights into areas that require development, contributing to augmenting the overall efficacy of IPC practices. Recognising IPC as a speciality post will be very crucial in increasing IPC staffing and workload	The variability in IPCAF scores for workload, staff, and bed occupancy reflects disparities in resource allocation and staff capacity across districts. The qualitative feedback from IPC nurses emphasises that perceptions of programme effectiveness are crucial for identifying development needs. These findings suggest that high workload and staffing challenges, particularly in districts with lower scores, may hinder IPC programme effectiveness. Addressing these challenges by optimising staff allocation and managing bed occupancy can significantly improve IPC practices and outcomes.

When assessing the IPCAF score for Workload, staff, and bed occupancy (CC7) across all healthcare facilities (HCFs), a median score of 60.0 (with an interquartile range of 33.0) points was obtained. Notably, high scores were observed in Waterberg (75.0), followed by Sekhukhune (65.0), while the lowest score was recorded in Vhembe (37.5).

The responses provided by hospital IPC nurses shed light on the perceived effectiveness of IPC programmes, emphasising its significance in identifying areas requiring development and enhancing the overall efficacy of IPC practices.

The variability in IPCAF scores for workload, staff, and bed occupancy underscores disparities in resource allocation and staff capacity across districts. Qualitative feedback from IPC nurses further emphasises the importance of perceptions regarding programme effectiveness in pinpointing development needs. These findings suggest that challenges such as high workload and staffing shortages, particularly in districts with lower scores, may impede IPC programme effectiveness. Addressing these challenges through optimised staff allocation and management of bed occupancy can significantly enhance IPC practices and outcomes.

Reporting of IPC nurses to different levels of management

This section outlines the qualitative and quantitative findings of different reporting levels experienced by different heath facilities. Table 6.7 shows both qualitative and quantitative results and their meta-inferences and interpretations.

Table 6.7: Qualitative and Quantitative results on the reporting levels to management

	Quantitative Results	**Qualitative Results**	**Meta Inferences and Interpretation**
Reporting levels to management	When the IPCAF score for IPC programme (CC1) of all HCFs was evaluated, the median (IQR) CC1 score was 80.0 (20.0) points. According to the level of the hospital, the highest one was in District hospital (83.0) and the lowest in Tertiary hospital (67.5).	Their suggestions aim to address gaps in understanding and support for IPC among healthcare workers and management, with a focus on improving patient outcomes and reducing HAIs	The variation in IPCAF scores for IPC programmes highlights differences in how well IPC initiatives are implemented and supported across hospital levels. District hospitals generally have stronger IPC programmes, as reflected in their higher scores, compared to tertiary hospitals. Qualitative insights emphasise the need for better support and understanding from management and healthcare workers. This suggests that enhancing managerial support and educating staff on IPC practices are crucial for bolstering IPC programme effectiveness, particularly in tertiary hospitals where scores are lower. Improving these aspects can lead to better patient outcomes and a reduction in HAIs.

The IPCAF score for IPC Programme (CC1) provides a quantitative assessment of how well IPC initiatives are implemented and supported in healthcare facilities. The median score of 80.0 suggests that, on average, IPC programmes are fairly well-established. However, there is notable variation across hospital levels, with district hospitals scoring higher (83.0) than tertiary hospitals (67.5).

The qualitative insights from IPC nurses add depth to these findings, highlighting the need for better support and understanding among healthcare workers and management. This indicates that while the quantitative scores reflect the structural aspects of IPC programmes, such as policies and procedures, qualitative data emphasise the importance of organisational culture and individual attitudes towards IPC.

Improving IPC programmes in tertiary hospitals, where scores are lower, may require targeted efforts to enhance managerial support and educate staff on IPC practices. These efforts could lead to more effective IPC programmes, ultimately resulting in better patient outcomes and a reduced incidence of HAIs.

Addressing challenges of non-adherence to IPC protocols

This section addresses mechanisms of addressing challenges related to non-adherence to IPC protocols and guidelines. Theme, category, and subcategories that emerged are shown in Table 6.8, compared with qualitative and quantitative results, and meta-inferences and interpretations were made.

Table 6.8: Qualitative and Quantitative results on the challenges of non-adherence

	Quantitative Results	**Qualitative Results**	**Meta Inferences and Interpretation**
Challenges of non-adherence	When the IPCAF score for Monitoring, evaluation, and feedback (CC6) of all HCFs was evaluated, the median (IQR) CC6 score was 80.0 (21.3) points. Scores were high in Mopani (91.2), followed by Sekhukhune (85.0). The lowest was Vhembe (63.7). According to the level of the hospital, the highest one was in District hospital (82.5) and the lowest in Regional hospital (68.7).	The IPC nurses indicated that self-efficacy can influence their actions, decisions, and overall effectiveness in preventing and controlling infections. Their responses revealed how confident they feel in carrying out IPC practices such as hand hygiene, isolation protocols, and environmental cleaning.	The disparity in IPCAF scores for monitoring, evaluation, and feedback across different districts and hospital levels highlights variations in adherence to IPC protocols and the effectiveness of feedback mechanisms. High-scoring districts and hospitals likely have more robust systems in place for monitoring and evaluation, which fosters better adherence to IPC practices. Qualitative insights suggest that enhancing nurses' self-efficacy is crucial for improving IPC adherence. Therefore, strengthening monitoring and feedback systems, particularly in lower-scoring regions and hospitals, along with boosting nurses' confidence through training and support, can lead to more effective infection prevention and control practices.

The IPCAF score for Monitoring, evaluation, and feedback (CC6) provides a quantitative assessment of how well healthcare facilities monitor and evaluate their IPC practices. The median score of 80.0 indicates that, overall, facilities have a relatively strong system in place for monitoring and evaluating IPC practices. However, there are significant variations across districts and hospital levels, with Mopani scoring the highest (91.2) and Vhembe scoring the lowest (63.7).

The qualitative insights from IPC nurses shed light on the role of self-efficacy in IPC adherence. Nurses who feel confident in carrying out IPC practices are more likely to adhere to protocols for hand hygiene, isolation, and environmental cleaning. This suggests that improving nurses' self-efficacy through training and support could lead to better IPC adherence.

Overall, the integration of quantitative and qualitative data suggests that enhancing monitoring and feedback systems, particularly in lower-scoring regions and hospitals, can improve adherence to IPC practices. Additionally, boosting nurses' confidence through training and support can further enhance IPC adherence and contribute to more effective IPC practices.

Addressing levels of managerial support to the IPC programme

This section addresses mechanisms of addressing challenges related to non-adherence to IPC protocols and guidelines. Theme, category, and subcategories that emerged are shown in Table 6.9, compared with qualitative and quantitative results, and meta-inferences and interpretations were made.

Table 6.9: Qualitative and Quantitative results on the level of management support

	Quantitative Results	**Qualitative Results**	**Meta Inferences and Interpretation**
Level of Management support	When the IPCAF score for Multimodal strategies for implementing IPC activities (CC5) of all HCFs was evaluated, the median (IQR) CC5 score was 80.0 (30.0) points. Scores were high in Mopani (95.0), followed by Vhembe (90.0). The lowest was Waterberg (60.0). According to the level of the hospital, the highest one was in District hospital (85.0) and the lowest in Regional hospital (67.5).	Ensuring intervention coherence was seen as crucial for increasing the likelihood of successful implementation and ultimately improving infection prevention and control practices and outcomes. There is minimal level of support from management.	The variation in IPCAF scores for multimodal strategies across districts and hospital levels indicates differences in the effectiveness of implementing IPC activities. High scores in districts such as Mopani and Vhembe suggest strong adherence to and effective execution of multimodal strategies, while lower scores in Waterberg and regional hospitals highlight areas needing improvement. Qualitative insights emphasise the importance of intervention coherence for successful IPC implementation. Therefore, focusing on enhancing coherence in IPC interventions, particularly in lower-scoring regions and hospital types, is essential. This can be achieved through comprehensive training, consistent protocols, and robust support systems to ensure all aspects of IPC activities are effectively integrated and executed.

The IPCAF score for multimodal strategies for implementing IPC activities (CC5) provides a quantitative measure of how well healthcare facilities implement various strategies to prevent and control infections. The median score of 80.0 indicates that, overall, facilities have a moderate level of implementation of these strategies. However, there are significant variations across districts and hospital levels, with Mopani scoring the highest (95.0) and Waterberg scoring the lowest (60.0).

The qualitative insights emphasise the importance of intervention coherence for successful IPC implementation. This means that all aspects of IPC activities, such as training, protocols, and support systems, should be well-integrated and executed. Improving intervention coherence, particularly in lower-scoring regions and hospitals, can lead to more successful IPC practices and better infection prevention and control outcomes.

Overall, the integration of quantitative and qualitative data suggests that enhancing intervention coherence, through comprehensive training, consistent protocols, and robust support systems, is essential for improving IPC practices and outcomes. This should be a focus for healthcare facilities looking to strengthen their IPC programmes.

Availability and implementation of IPC policies and guidelines

This section addresses availability of relevant IPC policies and guidelines for referral purposes. Table 6.10, compared with qualitative and quantitative results, and meta-inferences and interpretations were made.

Table 6.10: Qualitative and Quantitative results on the IPC policy document reference

	Quantitative Results	**Qualitative Results**	**Interpretation**
IPC Policy documents references	When the IPCAF score for IPC Guidelines (CC2) of all HCFs was evaluated, the median (IQR) CC2 score was 87.5 (19.0) points. Scores were high in Sekhukhune (100.0) and Waterberg (87.5). The lowest were in Capricorn and Vhembe (80.0). According to the level of the hospital, the highest one was in District hospital (90.0) and the lowest in Tertiary hospital (82.5).	It was highlighted in most of their responses that IPC nurses prioritise patient safety and well-being, adhering to ethical principles such as beneficence and non-maleficence. They strive for fair and equitable distribution of resources and access to care, including infection prevention measures.	The high IPCAF scores in districts like Sekhukhune and hospital levels such as district hospitals indicate strong adherence to IPC guidelines, reflecting a commitment to standardised infection control practices. Lower scores in Capricorn, Vhembe, and tertiary hospitals suggest areas where adherence to guidelines could be improved. Qualitative findings underscore the ethical commitment of IPC nurses to patient safety and equitable care, aligning with the high scores in ethical practice adherence. Therefore, enhancing adherence to IPC guidelines in lower-scoring areas and hospital types through targeted training, resource allocation, and reinforcement of ethical principles is crucial. This alignment between quantitative adherence to guidelines and qualitative ethical commitment suggests a pathway to improved IPC practices by addressing identified gaps and fostering a culture of ethical and effective infection control.

The IPCAF score for multimodal strategies for implementing IPC activities (CC5) serves as a quantitative measure assessing the effectiveness of healthcare facilities in implementing various strategies aimed at preventing and controlling infections. The median score of 80.0 indicates a moderate level of implementation across all facilities. However, when analysing the scores at the district and hospital levels, significant variations become apparent. For instance, Mopani scored the highest with a score of 95.0, indicating a strong implementation of IPC strategies. Conversely, Waterberg scored the lowest at 60.0, suggesting a need for improvement in IPC practices. These variations underscore the importance of examining IPC practices at a more granular level to identify areas for improvement.

Qualitative insights from IPC nurses further emphasise the importance of intervention coherence for successful IPC implementation. This concept emphasises the need for all aspects of IPC activities, such as training, protocols, and support systems, to be well-integrated and executed in a coordinated manner. Without intervention coherence, IPC practices may be fragmented and less effective in preventing and controlling infections.

To improve intervention coherence, healthcare facilities, particularly those with lower scores, should focus on implementing comprehensive training programmes, establishing consistent IPC protocols, and developing robust support systems. These efforts can help align all aspects of IPC activities and enhance the overall effectiveness of infection prevention and control programmes.

In summation, the integration of quantitative and qualitative data highlights the importance of intervention coherence in IPC practices. By addressing this key aspect, healthcare facilities can strengthen their IPC programmes and improve outcomes related to IPC.

Education and training in IPC

This section addresses availability of relevant IPC policies and guidelines for referral purposes. Table 6.11, compared with qualitative and quantitative results, and meta-inferences and interpretations were made.

Table 6.11: Qualitative and Quantitative results on the education and training

	Quantitative Results	**Qualitative Results**	**Interpretation**
Education and training	When the IPCAF score for IPC Education & Training (CC3) of all HCFs was evaluated, the median (IQR) CC3 score was 80.0 (23.0) points. Scores were high in Vhembe (90.0) and Mopani (85.0). The lowest was Capricorn (65.0). According to the level of the hospital, the highest one was in Regional hospital (82.5) and the lowest in Tertiary hospital (62.5).	During the interviews, IPC nurses expressed concerns about the opportunity cost of allocating resources such as time, manpower, and financial resources to enforce discipline for non-compliance. They highlighted that these resources could be used for other important aspects of IPC, such as training, surveillance, or improving infrastructure	The high IPCAF scores in regions like Vhembe and Mopani, and in regional hospitals, reflect strong performance in IPC education and training. However, lower scores in Capricorn and tertiary hospitals indicate areas needing improvement. Qualitative findings reveal that IPC nurses see the enforcement of non-compliance as a resource drain that could be better invested in training and infrastructure improvements. Aligning these insights suggests that focusing on enhancing training programmes and infrastructure, particularly in lower-scoring areas and hospital types, could yield better compliance and overall IPC effectiveness. Prioritizing education and training, as well as optimizing resource allocation, aligns with both quantitative data and qualitative concerns, offering a pathway to improve IPC outcomes and adherence.

The IPCAF score for IPC Education and training (CC3) provides a quantitative measure of how well healthcare facilities implement education and training programmes for infection prevention and control (IPC). The median score of 80.0 indicates a moderate level of implementation across all facilities. However, there are notable variations across regions and hospital levels.

Regions such as Vhembe and Mopani scored high, with scores of 90.0 and 85.0, respectively, indicating strong performance in IPC education and training. Conversely, Capricorn scored the lowest at 65.0, suggesting a need for improvement. Similarly, at the hospital level, regional hospitals scored the highest at 82.5, while tertiary hospitals scored the lowest at 62.5.

Qualitative insights from IPC nurses reveal concerns about the opportunity cost of enforcing discipline for non-compliance. They believe that resources spent on enforcement could be better utilised for training, surveillance, or infrastructure improvements. This suggests a potential gap in resource allocation and highlights the importance of optimising resource use in IPC programmes.

The integration of quantitative and qualitative data suggests that prioritising education and training, as well as optimising resource allocation, could improve IPC outcomes and adherence. Healthcare facilities, especially those in lower-scoring regions and hospital types, should focus on enhancing training programmes and infrastructure to enhance IPC practices and effectiveness. By addressing these areas, facilities can strengthen their IPC programmes and ultimately improve patient outcomes.

6.4 Conclusion

In this chapter, the researcher integrated qualitative and quantitative data and drew meaningful conclusions. In this study, the integrated analysis of quantitative and qualitative data provides valuable insights into the implementation of IPC programmes in healthcare facilities in Limpopo Province. The IPCAF scores indicate a moderate to high level of implementation across various components of IPC programmes, with some areas performing better than others.

The qualitative findings complement the quantitative results by highlighting specific challenges and areas for improvement. These include the need for better resource allocation, particularly in terms of staffing, education, and infrastructure. The qualitative data also underscore the importance of intervention coherence and the role of management support in enhancing IPC practices.

Overall, the integration of quantitative and qualitative data suggests several key recommendations for improving IPC programmes in Limpopo Province. These include:

- Enhancing education and training programmes, particularly in regions and hospitals with lower IPCAF scores.
- Optimising resource allocation to ensure adequate staffing, supplies, and infrastructure for IPC activities.
- Fostering a culture of compliance and accountability among healthcare workers and management.
- Improving intervention coherence by aligning training, protocols, and support systems.

By implementing these recommendations, healthcare facilities in the Limpopo Province can strengthen their IPC programmes and ultimately reduce the burden of healthcare-associated infections, improve patient outcomes, and enhance overall quality of care. The next chapter will focus on intervention strategies of this study.

CHAPTER SEVEN: DEVELOPMENT OF INTERVENTION STRATEGIES

Developing an evidence-based Strategy Using WHO Multimodal Strategy to Improve the IPC Programmes in Public Hospitals in Limpopo Province

7.1 Introduction

The previous chapter focused on the discussion of integrated qualitative and quantitative findings. The current chapter focuses on developing strategies to improve implementation of the IPC programme. Implementing a multimodal strategy to improve an IPC programme using the framework of “Build It, Teach It, Check It, Sell It, Live It” involves a comprehensive approach to address various aspects of IPC practices (Allegranzi et al., 2013a).

7.2 Rationale for developing intervention strategies

The intervention strategies were developed with the aim of promoting realisation of the Sustainable Development Goal (SDG) number 3, which focuses on ensuring healthy lives and promoting well-being for all at all ages (WHO, 2015). The objectives of SGD number 3, which are relevant to this study were to:

7.2.1 Reduce the global maternal mortality ratio

This objective aimed to reduce maternal deaths worldwide. In the context of IPC programmes, reducing HAIS can contribute to improving maternal health by minimising the risk of infections during pregnancy, childbirth, and postpartum care (Allegranzi et al., 2011a). It is pivotal that intervention strategies be developed to improve the performance of IPC programmes (Tomczyk et al., 2021a).

7.2.3 Development of intervention strategies

Developing IPC multimodal intervention strategies for the eight core components of IPC programmes involves a systematic and comprehensive approach to ensure effective IPC (Chen et al., 2016). Implementing a multimodal strategy to improve an IPC programme using the framework of “Build It, Teach It, Check It, Sell It, Live It” involves a comprehensive approach to address various aspects of IPC practices (Shen et al., 2017).

7.3 Proposed intervention strategies

Build It

Objective: Establish a strong IPC foundation

- **Infrastructure and Resources:** Develop the necessary infrastructure, including isolation rooms, proper ventilation systems, and accessible hand hygiene facilities (Tahir et al., 2023). Ensure the availability of essential IPC materials such as PPE, disinfectants, and hand sanitisers.
- **Standardised protocols:** Create standardised, evidence-based IPC protocols and guidelines (Shen et al., 2017). These should cover all aspects of IPC, from hand hygiene to environmental cleaning and antimicrobial stewardship.
- **IPC team:** Establish a dedicated IPC team with clearly defined roles and responsibilities. Ensure the team has adequate resources and support from hospital leadership.
- **Technology and systems:** Implement electronic surveillance systems for monitoring HAIs and other IPC-related data. Utilise data analytics tools to track and analyse IPC performance.

Teach It

Objective: Educate and train healthcare workers

- **Comprehensive training programmes:** Develop and deliver mandatory training programmes for all healthcare workers (Gebremicael et al., 2024). These should include both initial training for new staff and regular refresher courses.
- **Simulation exercises:** Use simulation-based training to enhance practical skills in IPC practices, such as donning and doffing PPE, proper hand hygiene techniques, and environmental cleaning.
- **E-learning modules:** Create online training modules to provide flexible learning opportunities for staff who may not be able to attend in-person sessions.
- **Competency assessments:** Conduct regular assessments to evaluate the competency of healthcare workers in IPC practices. Provide feedback and additional training as needed.

Check It

Objective: Monitor and evaluate IPC practices

- **Audits and inspections:** Conduct regular audits and inspections of IPC practices across all departments. Use standardised checklists to ensure consistency.
- **Performance indicators:** Develop and track key performance indicators (KPIs) related to IPC, such as hand hygiene compliance rates, HAI rates, and environmental cleaning standards.
- **Feedback mechanisms:** Establish a robust feedback mechanism to provide healthcare workers with information on their performance. Use this feedback to identify areas for improvement and recognise achievements.
- **Continuous improvement:** Implement a continuous improvement process where data from monitoring and evaluation activities are used to refine and enhance IPC practices and protocols.

Sell It

Objective: Promote the Importance of IPC to All Stakeholders

- **Awareness campaigns:** Launch awareness campaigns to highlight the importance of IPC practices in preventing HAIs and protecting both patients and staff. Use posters, brochures, and digital media to disseminate information.
- **Leadership engagement:** Engage hospital leadership and management to champion IPC initiatives. Their support is crucial for securing resources and fostering a culture of safety.
- **Staff involvement:** Involve staff in IPC initiatives by encouraging their input and participation. Create IPC champions or ambassadors within each department to promote best practices.
- **Patient and family education:** Educate patients and their families about IPC practices and their role in preventing infections. Provide informational materials and involve them in hand hygiene and other IPC activities.

Live It

Objective: Integrate IPC into everyday practice and culture

- **Behavioural change:** Foster a culture of safety where IPC practices are an integral part of daily routines. Use behavioural change techniques, such as positive reinforcement and role modelling, to promote adherence.
- **Visible leadership:** Ensure that hospital leaders and IPC team members are visible and actively involved in promoting and practicing IPC measures.
- **Recognition and rewards:** Recognise and reward departments and individuals who excel in IPC practices. This can be through awards, public acknowledgment, or other incentives.
- **Sustainability:** Develop strategies to sustain IPC efforts over the long term. This includes ongoing training, regular updates to protocols based on the latest evidence, and continuous engagement of all stakeholders.

7.4. Key gaps identified requiring interventions and proposed implementation strategy

This study identified key challenges, following the analysis of IPCAF results and the interview questions. The gaps identified are described below, substantiated with quotes from the IPC nurses.

7.4.1 Insufficient management support for the IPC programme

Quote

Management support

"Yeah, it's still a challenge. Still a very big challenge to us because we don't receive support from management and other disciplines."

(Regional Hospital IPC)

"Yes, I can agree. And management support and the understanding of program. The minimal support that those who are there. And then they give you support, and there are some that they don't understand. That's why they end up, you know, they just think IPC is just my own thing."

(Regional Hospital IPC)

To illustrate a lack of management support for the IPC programme, the following analysis of the provided statements is made:

- **Quantitative Analysis**

Statement: “The variation in IPCAF scores for multimodal strategies across districts and hospital levels indicates differences in the effectiveness of implementing IPC activities.”

Explanation:

  - The IPCAF scores reflect how well IPC activities are being implemented.
  - Variation in these scores across different districts and hospital levels suggests inconsistency in the effectiveness of IPC implementation.
  - This inconsistency can be attributed to differing levels of management support. In districts or hospitals where management is more supportive, the implementation is likely more effective, resulting in higher scores.
  - Conversely, in places with lower scores, it may indicate inadequate management support, leading to less effective implementation.

- **Ensuring intervention coherence, qualitative insight**

Statement: “Ensuring intervention coherence was seen as crucial for increasing the likelihood of successful implementation and ultimately improving IPC practices and outcomes.”

Explanation:

  - Intervention coherence refers to the alignment and consistency of actions and strategies within the IPC programme (Sekhon et al., 2017).
  - Successful implementation of IPC practices heavily relies on coherent interventions, which require strong and consistent management support.
  - If there is a lack of coherence, it may signal that management is not sufficiently coordinating or prioritising these efforts, thereby undermining the programme’s success.
  - This lack of coherence could be seen as a failure of management to provide the necessary support and oversight to ensure that interventions are systematically and uniformly applied.

- **Median IPCAF score for multimodal strategies**

Statement: “When the IPCAF score for Multimodal strategies for implementing IPC activities (CC5) of all HCFs was evaluated, the median (IQR) CC5 score was 80.0 (30.0) points.”

Explanation:

- The median IPCAF score for multimodal strategies (CC5) is 80.0, with an interquartile range (IQR) of 30.0 points.
- While the median score provides a central tendency, the wide IQR indicates a significant spread in the scores.
- This wide range suggests that while some health care facilities (HCFs) may be performing well, others are lagging behind significantly.
- Such disparity in scores can point to unequal levels of support and resources allocated by management across different HCFs.
- Facilities with lower scores may be those that receive insufficient support, training, and resources from management, further proving a lack of comprehensive management support for the IPC programme.

Conclusion:

The statements collectively highlight inconsistencies and disparities in the implementation and effectiveness of IPC activities. These disparities are likely due to varying levels of management support, as successful and coherent implementation of IPC strategies requires strong and consistent backing from management. The significant variation in scores and the emphasis on the need for intervention coherence underline the critical role of management in ensuring the effectiveness of IPC programmes.

- **The importance of management support**

Management support is crucial for improving IPC programmes for several reasons (Tahir et al., 2023):

- Resource allocation: Management support ensures that sufficient resources, including funding, staffing, and infrastructure, are allocated to IPC initiatives. This support is essential for implementing evidence-

based practices, acquiring necessary equipment and supplies, and maintaining a safe healthcare environment.

- Policy development: Management plays a key role in developing and implementing policies and procedures related to IPC. Their support is needed to establish clear guidelines, protocols, and standards for infection prevention practices, which are essential for ensuring consistency and compliance across the organisation.
- Staff engagement: Management support fosters staff engagement and buy-in for IPC efforts. When management prioritises IPC and communicates its importance to staff, healthcare workers are more likely to adhere to IPC protocols, participate in training programmes, and actively contribute to infection control efforts.
- Leadership and accountability: Management support provides leadership and accountability for IPC programmes. Effective leaders set the tone for IPC practices, hold staff accountable for following protocols, and provide guidance and direction for continuous improvement.
- Risk management: Management support is essential for mitigating risks related to HAIs. By prioritising IPC and implementing preventive measures, management helps reduce the risk of outbreaks, adverse events, and legal liabilities associated with HAIs.
- Quality improvement: Management support is integral to quality improvement efforts in healthcare. By investing in IPC programmes and monitoring outcomes, management can identify areas for improvement, implement changes, and measure the impact of interventions on patient safety and quality of care.

- **Proposed implementation strategy**

WHO's Comprehensive Multimodal Strategy Plan for Improving Management Support in IPC Programme

Objective: Enhance management support for the IPC programme by implementing the WHO's Multimodal Strategy, focusing on actions to build awareness, educate, monitor, advocate, and institutionalise IPC practices among management (Shen et al., 2017).

- **Build It:**

  Action 1: Conduct awareness sessions:

  - Responsible Party: IPC Committee
  - Timeline: Within 1 month
  - Description: Organise sessions to educate management about the importance of IPC and the WHO Multimodal Strategy. Highlight the impact of HAIs on patient outcomes and healthcare costs.

  Action 2: Establish IPC champions:

  - Responsible Party: IPC Committee
  - Timeline: Within 2 months
  - Description: Identify and recruit management members as IPC champions. These individuals will advocate for IPC initiatives within their respective departments and facilitate communication between management and frontline staff.

- **Teach It:**

  Action 3: Provide training workshops:

  - Responsible Party: IPC Committee
  - Timeline: Ongoing
  - Description: Conduct regular training workshops for management on IPC principles, including hand hygiene, PPE use, and environmental cleaning. Customise training sessions to address specific needs and concerns of management members.

- **Check It:**

  Action 4: Establish Key Performance Indicators (KPIs):

  - Responsible party: IPC Committee
  - Timeline: Within 3 months
  - Description: Develop KPIs related to management support for IPC, such as attendance at IPC meetings, participation in IPC initiatives, and incorporation of IPC goals into departmental objectives/ hospital/district objectives.

  Action 5: Implement monitoring mechanisms:

  - Responsible Party: IPC Committee

- Timeline: Ongoing
- Description: Regularly monitor management's adherence to IPC practices and involvement in IPC activities. Use feedback mechanisms to address any gaps or issues identified. An example of a feedback mechanism is the use of structured performance reports and regular feedback sessions. For instance, a monthly IPC compliance report could be shared with management, highlighting key issues such as hand hygiene compliance rates, adherence to isolation protocols, or environmental cleaning audits.

- **Sell It:**

  Action 6: Create advocacy materials:

  - Responsible Party: IPC Committee
  - Timeline: Within 4 months
  - Description: Develop advocacy materials (e.g., brochures, posters, presentations) highlighting the benefits of IPC and the role of management in supporting IPC efforts. Distribute these materials to management members and display them prominently throughout the facility.

- **5. Live It:**

  Action 7: Institutionalise IPC practices:

  - Responsible Party: IPC Committee
  - Timeline: Ongoing
  - Description: Integrate IPC principles and practices into the organisational culture and policies. Ensure that IPC considerations are included in decision-making processes and that IPC goals are aligned with the facility's overall objectives.

  Action 8: Recognise and reward:

  - Responsible party: IPC Committee
  - Timeline: Ongoing
  - Description: Establish a system to recognise and reward management members who demonstrate exemplary support for IPC.

This could include acknowledgment in staff meetings, awards, or other forms of recognition.

Resources needed:

- Training materials and resources
- Communication tools (e.g., presentations, brochures)
- Monitoring tools (e.g., checklists, surveys)
- Recognition and reward system

Timeline:

- Months 1-2: Build awareness and establish IPC champions
- Months 3-4: Provide training workshops and develop KPIs
- Months 5-6: Implement monitoring mechanisms and create advocacy materials
- Months 7-12: Institutionalise IPC practices, recognise and reward management support

Responsible parties:

- IPC Committee
- IPC champions
- Hospital management

7.4.2 IPC post not recognised as a speciality post

Quotations

"A shortage that we're experiencing now is very, very, very difficult."
(District Hospital IPC Nurse)

"I think maybe the challenge is that the IPC is not recognized as one of the specialties. If maybe that, then maybe if it can be recognized as a specialty, maybe that's the way healthcare professionals and also management can consider the IPC."
(Regional Hospital IPC)

- **Quantitative Analysis**

Statement: "When the IPCAF score for Workload, staff, and bed occupancy (CC7) of all HCFs was evaluated, the median (IQR) CC7 score was 60.0 (33.0) points."

Explanation:

- The median score of 60.0 with a wide interquartile range (IQR) of 33.0 points indicates significant variability and generally low scores in workload, staffing, and bed occupancy across healthcare facilities (HCFs).
- These low and variable scores suggest that many HCFs are struggling to manage workloads, adequately staff their IPC programmes, and maintain appropriate bed occupancy levels.
- Recognising IPC as a specialty post would mean dedicated staff and resources for IPC, leading to improved management of these critical areas and higher, more consistent IPCAF scores.

- **Perceived effectiveness of IPC programmes**

Statement: “The responses of hospital IPC nurses helped in understanding that the perceived effectiveness of IPC programmes can yield significant insights into areas that require development, contributing to augmenting the overall efficacy of IPC practices.”

Explanation:

- Infection Prevention and Control (IPC) nurses, who play a critical role in the implementation of IPC programmes, offer valuable insights into their effectiveness and highlight areas that require improvement. Their feedback reveals that the current IPC efforts are not achieving their full potential due to gaps in resources, training, and support. Recognising IPC as a specialty post could help address these shortcomings by providing targeted training and resources, ultimately improving both the perceived and actual effectiveness of IPC programmes.

- **Importance of recognising IPC as a specialty post**

Statement: “Recognising IPC as a specialty post will be very crucial in increasing IPC staffing and workload.”

Explanation:

Recognising Infection Prevention and Control (IPC) as a specialty post would formally acknowledge the critical role of dedicated IPC professionals and contribute to

increased staffing levels. Specialised IPC staff would bring the necessary expertise and focus to manage the complex demands of infection prevention and control, thereby alleviating the workload on existing staff and enhancing the overall effectiveness of IPC programmes. Furthermore, this formal recognition is likely to attract more qualified professionals to the field, addressing staffing shortages and strengthening the capacity to implement effective IPC measures.

- **Variability in resource allocation and staff capacity**

Statement: “The variability in IPCAF scores for workload, staff, and bed occupancy reflects disparities in resource allocation and staff capacity across districts.”

Explanation:

- Significant disparities in Infection Prevention and Control Assessment Framework (IPCAF) scores highlight inconsistencies in the allocation of resources and staff across different districts. These disparities can be addressed by recognising IPC as a specialty post, ensuring that dedicated resources and staff are consistently available across all districts. Such a designation would encourage standardised resource allocation and staffing levels, thereby reducing variability and enhancing the overall effectiveness of IPC programmes.

- **Qualitative feedback from IPC nurses**

Statement: “The qualitative feedback from IPC nurses emphasises that perceptions of programme effectiveness are crucial for identifying development needs.”

Explanation:

- Feedback from IPC nurses underscores the critical importance of their perspectives in evaluating the effectiveness of IPC programmes and pinpointing areas requiring improvement. Recognising IPC as a specialty post would empower these nurses by providing additional resources and support, equipping them to address identified development needs more effectively. Moreover, such recognition would validate their role and contributions, fostering greater engagement and enhancing their effectiveness in implementing IPC practices.

- **Impact of high workload and staffing challenges**

Statement: “These findings suggest that high workload and staffing challenges, particularly in districts with lower scores, may hinder IPC programme effectiveness. IPC specialty posts to be created.”

Explanation:

High workload and staffing challenges present significant barriers to the effectiveness of IPC programmes, especially in districts with lower IPCAF scores. Establishing IPC specialty posts could directly tackle these issues by ensuring that dedicated and adequately trained staff are available to manage IPC activities. This approach would result in more manageable workloads, enhanced implementation of IPC measures, and ultimately, improved outcomes in infection prevention and control.

Conclusion:

Recognising IPC as a specialty post is essential for addressing the current challenges in workload, staffing, and resource allocation. The low and variable IPCAF scores, feedback from IPC nurses, and the identified staffing challenges all point to the need for specialised, dedicated IPC professionals. This formal recognition would ensure more consistent and effective implementation of IPC programmes, ultimately improving infection prevention and control practices and outcomes across all health care facilities.

- Creating specialised IPC posts in healthcare facilities is important for several reasons (Tahir et al. 2023):
    - Dedicated Focus: Having specialised IPC positions allows for a dedicated focus on infection prevention and control within the facility (Gebremicael et al., 2024). These professionals can focus solely on developing, implementing, and monitoring IPC policies and practices, ensuring that infection control remains a priority.
    - Expertise: Specialised IPC professionals bring expertise in IPC, including knowledge of best practices, guidelines, and regulations. They can provide guidance and support to healthcare workers, helping to reduce the risk of HAIs.
    - Risk reduction: By focusing on proactive measures, specialised IPC professionals can help reduce the risk of HAIs and other infections. This

can lead to improved patient outcomes, reduced healthcare costs, and a safer healthcare environment for both patients and healthcare workers.

- Compliance: Having specialised IPC positions can help ensure compliance with IPC guidelines and regulations. These professionals can monitor adherence to protocols, provide training and education, and implement corrective actions as needed to maintain compliance.
- Outbreak Response: During outbreaks or infectious disease emergencies, specialised IPC professionals are essential for coordinating response efforts, implementing control measures, and preventing further spread of infection within the facility.

  Quality improvement: Specialised IPC positions contribute to overall quality improvement efforts within healthcare facilities. By reducing the incidence of HAIs and improving infection control practices, these professionals help enhance the quality and safety of patient care.

- **WHO Multimodal Strategy Plan for Creating IPC Posts and Categorising them as Specialised Posts**

Objective: To strengthen infection prevention and control (IPC) programmes in hospitals by creating specialised IPC posts and categorising them as specialised positions within the healthcare system (Tahir et al., 2023).

- **Build It:**

  Action 1: Establish IPC Steering Committee:

  - Responsible Party: Hospital Administration
  - Timeline: Within 1 month
  - Description**:** Form a committee to oversee the creation and implementation of specialised IPC posts. Include key stakeholders such as hospital administrators, IPC experts, and human resources personnel.

  Action 2: Conduct IPC needs assessment:

  - Responsible Party: IPC Steering Committee
  - Timeline: Within 2 months
  - Description: Conduct a thorough assessment of IPC needs in the hospital to determine the number and types of specialized IPC posts required.

- **Teach It:**

  Action 3: Develop IPC job descriptions:

  - Responsible Party: IPC Steering Committee
  - Timeline: Within 3 months
  - Description: Develop detailed job descriptions for specialised IPC posts, outlining roles, responsibilities, qualifications, and reporting structure.

  Action 4: Provide IPC training:

  - Responsible Party: IPC Steering Committee
  - Timeline: Ongoing
  - Description: Provide specialised training for individuals hired for IPC posts, focusing on IPC principles, best practices, and relevant guidelines.

- **Check It:**

  Action 5: Implement IPC post creation:

  - Responsible Party: Human Resources Department
  - Timeline: Within 4 months
  - Description: Create specialised IPC posts based on the needs assessment and job descriptions developed by the IPC Steering Committee.

  Action 6: Establish monitoring mechanisms:

  - Responsible Party: IPC steering committee
  - Timeline: Ongoing
  - Description: Establish monitoring mechanisms to track the performance of specialised IPC posts and the impact on IPC practices in the hospital. An example of a feedback mechanism is the use of structured performance reports and regular feedback sessions. For instance, a monthly IPC compliance report could be shared with management, highlighting key metrics such as hand hygiene compliance rates, adherence to isolation protocols, or environmental cleaning audits.

- **Sell It:**

  Action 7: Advocate for specialised IPC posts:

- Responsible Party: IPC Steering Committee
- Timeline: Within 5 months
- Description: Advocate for the recognition of specialised IPC posts as essential positions within the healthcare system, highlighting their role in improving patient safety and reducing healthcare-associated infections.

- **Live It:**

  Action 8: Institutionalise Specialised IPC posts:

  - Responsible Party: Hospital Administration
  - Timeline: Ongoing
  - Description: Institutionalise specialised IPC posts as permanent positions within the hospital's organisational structure, ensuring their continued support and funding.

  Action 9: Evaluate and adjust:

  - Responsible Party: IPC steering committee
  - Timeline: Annually
  - Description: Evaluate the effectiveness of specialised IPC posts in improving IPC practices and patient outcomes. Make adjustments to the programme as needed based on evaluation findings.

- **Resources needed:**
  - IPC steering committee members
  - IPC experts for training and support
  - Human resources for job creation and monitoring
- **Timeline:**
  - Months 1-3: Establish IPC steering committee, conduct needs assessment, develop job descriptions, and provide training.
  - Months 4-6: Create specialised IPC posts and establish monitoring mechanisms.
  - Months 7-9: Advocate for specialised IPC posts and institutionalise them within the healthcare system.
  - Months 10-12: Evaluate the effectiveness of specialised IPC posts and make adjustments as needed.
- **Responsible parties:**
  - IPC steering committee

- Hospital administration
- Human Resources Department

By implementing this WHO Multimodal Strategy plan, hospitals can strengthen their IPC programmes by creating specialised IPC posts and categorising them as essential and specialised positions within the healthcare system. This can lead to improved IPC practices, reduced HAIs, and better patient outcomes.

- **Comprehensive advocacy strategy for specialised IPC posts**

Objective: To advocate the recognition of specialised IPC posts as essential positions within the healthcare system, emphasising their critical role in enhancing patient safety and reducing HAIs (Tahir et al., 2023).

- **Key messages:**
  - Specialised IPC posts are essential for implementing evidence-based IPC practices.
  - Specialised IPC professionals are trained to identify, prevent, and control HAIs, leading to improved patient outcomes and reduced healthcare costs.
  - Investing in specialised IPC posts demonstrates a commitment to patient safety and quality care.
- **Target audiences:**
  - Hospital administrators: To gain support for creating and funding specialized IPC posts within their facilities.
  - Government health officials: To advocate policy changes that recognise and support specialised IPC posts across healthcare systems.
  - Healthcare workers: To raise awareness about the importance of specialised IPC roles and their impact on patient safety.
  - Professional organisations: To enlist their support in advocating the recognition of specialised IPC posts.

- **Communication channels:**
  - Presentations: Deliver presentations to hospital administrators, government officials, and healthcare workers to educate them about the value of specialised IPC posts.

- Reports and publications: Publish reports and articles highlighting the benefits of specialised IPC roles in reducing HAIs and improving patient outcomes.
- Social media: Utilise social media platforms to share key messages and success stories related to specialised IPC posts.
- Workshops and Training Sessions: Conduct workshops and training sessions to educate healthcare workers about the role of specialised IPC professionals in IPC.
- Advocacy Campaigns: Launch advocacy campaigns to raise awareness about the importance of specialised IPC posts among key stakeholders.

- **Timeline:**
  - Month 1-2: Develop key messages and identify target audiences.
  - Month 3-4: Create advocacy materials and communication channels.
  - Month 5-6: Launch advocacy campaign and engage with target audiences.
  - Ongoing: Monitor progress, gather feedback, and adjust strategies as needed.

- **Responsible parties:**
  - IPC steering committee
  - Hospital administration
  - Government health officials
  - Professional organisations

- **Resources needed:**
  - IPC steering committee members
  - Advocacy materials (e.g., presentations, reports, social media content)
  - Communication channels and platforms

7.4.3 Limited opportunities for IPC education and training

Quotations

“I highly recommend the training because from the Infection Control programme. It's not anybody who can do it ready to face the challenges we encounter.”

(Tertiary Hospital IPC Nurse)

“I think on the training or on the employees, if for example, if let's say they are training the students, whether the healthcare providers, whether irrespective of category, they should also include the IPC programme in their training”.

(Tertiary Hospital IPC Nurse)

I think they will come and do a proper implementation and then people will see what we are doing and we are taking.

(Tertiary Hospital IPC)

“Yeah, it's it's very important because I think it will also develop the person who's going for training. And once the person is developed, obviously the person will be able to implement whatever infection control practice. As you know that knowledge is power. Obviously the person will be empowered and obviously the person will be able to impact every of them information to other colleague”.

(District Hospital IPC Nurse)

Quantitative Analysis

Statement: “When the IPCAF score for IPC Education & Training (CC3) of all HCFs was evaluated, the median (IQR) CC3 score was 80.0 (23.0) points. Scores were high in Vhembe (90.0) and Mopani (85.0). The lowest was Capricorn (65.0).”

Explanation:

- The median score of 80.0 with an interquartile range (IQR) of 23.0 points indicates a generally high level of IPC education and training across healthcare facilities (HCFs).
- Regions such as Vhembe and Mopani, with scores of 90.0 and 85.0 respectively, exhibit strong performance in IPC education and training.

- The lower score in Capricorn (65.0) highlights a significant area for improvement, suggesting that staff in this region may not be receiving adequate training compared to their counterparts in other regions.

Qualitative insights

Statement: “During the interviews, IPC nurses expressed concerns about the opportunity cost of allocating resources such as time, manpower, and financial resources to enforce discipline for non-compliance. They highlighted that these resources could be used for other important aspects of IPC, such as training, surveillance, or improving infrastructure.”

Explanation:

- IPC nurses have identified the enforcement of non-compliance as a significant drain on resources that could otherwise be utilised for more impactful IPC activities.
- Redirecting resources towards training, surveillance, and infrastructure improvements could enhance the overall effectiveness of IPC programmes.
- This insight emphasises the importance of strategic resource allocation to maximise the benefits of IPC efforts.

Regional and hospital type variability

Statement: “The high IPCAF scores in regions such as Vhembe and Mopani, and in regional hospitals, reflect strong performance in IPC education and training. However, lower scores in Capricorn and tertiary hospitals indicate areas needing improvement.”

Explanation:

- The disparity in scores between different regions and hospital types indicates inconsistencies in the quality and extent of IPC education and training.
- Higher scores in Vhembe and Mopani suggest that effective training programmes lead to better IPC outcomes.
- Lower scores in Capricorn and tertiary hospitals point to the need for targeted interventions to elevate the standard of IPC training in these areas.

Strategic recommendations

Statement: “Qualitative findings reveal that IPC nurses see the enforcement of non-compliance as a resource drain that could be better invested in training and infrastructure improvements. Aligning these insights suggests that focusing on enhancing training programmes and infrastructure, particularly in lower-scoring areas and hospital types, could yield better compliance and overall IPC effectiveness.”

Explanation:

- By prioritising IPC education and training, particularly in regions and hospitals with lower scores, resources can be used more effectively to improve compliance and IPC outcomes (Shen et al., 2017).
- Investing in infrastructure improvements alongside training ensures that staff have the necessary environment and tools to implement IPC practices effectively.
- The alignment of qualitative concerns from IPC nurses with quantitative data underscores the need for a strategic focus on training and resource optimisation.

Conclusion

Statement: “Prioritising education and training, as well as optimising resource allocation, aligns with both quantitative data and qualitative concerns, offering a pathway to improve IPC outcomes and adherence.”

Explanation:

- Enhancing IPC education and training programmes, especially in areas with lower scores, is crucial for improving the overall effectiveness of IPC practices.
- Optimising the allocation of resources by redirecting them from enforcement to training and infrastructure can lead to more sustainable and effective IPC outcomes.
- This dual approach, informed by both quantitative data and qualitative feedback, provides a comprehensive strategy to strengthen IPC efforts across all health care facilities.

Summary

Recognising the importance of training in IPC is essential for ensuring high compliance and effectiveness of infection prevention measures (Allegranzi et al., 2013). Quantitative data reveals significant variability in training efficacy across regions, while qualitative insights from IPC nurses highlight the need for better resource allocation. Prioritising training and infrastructure improvements, particularly in lower-scoring areas, can enhance IPC outcomes and adherence, ultimately leading to better healthcare quality and patient safety.

- **Training in IPC is crucial for maintaining a safe healthcare environment and preventing HAIs**

Here are some key reasons why training in IPC is important (Ehsan et al., 2024) :

- **Prevention of infections:** Training in IPC equips healthcare workers with the knowledge and skills needed to prevent the spread of infections. This includes understanding the principles of infection transmission, implementing standard precautions, and using PPE correctly.
- **Patient safety:** Proper IPC practices can significantly reduce the risk of HAIs, which are a major cause of morbidity and mortality among patients. Training ensures that healthcare workers are aware of the risks and take appropriate measures to protect patients from infections.
- **Healthcare worker safety:** IPC training also focuses on protecting healthcare workers from exposure to infectious agents. This includes training on safe handling and disposal of sharps, proper use of PPE, and vaccination against vaccine-preventable diseases.
- **Compliance with regulations:** Healthcare facilities are required to comply with IPC regulations and guidelines set forth by regulatory bodies and professional organisations. Training ensures that healthcare workers are aware of these requirements and can implement them effectively.
- **Outbreak preparedness:** IPC training prepares healthcare workers to respond to infectious disease outbreaks and other public health emergencies. This includes knowing how to implement control measures, isolate patients, and communicate effectively with public health authorities.
- **Quality improvement:** Training in IPC is a key component of quality improvement efforts in healthcare. By ensuring that healthcare workers adhere to best practices in infection control, training can help improve the overall quality of patient care.
- **Cost-effectiveness:** Investing in IPC training can lead to cost savings for healthcare facilities by reducing the incidence of HAIs, which can result in extended hospital stays, additional treatments, and increased use of resources.
- **Public health impact:** Training in IPC has broader public health implications beyond individual healthcare facilities. By preventing the spread of infections

within healthcare settings, IPC measures help protect communities from outbreaks and reduce the burden on public health systems.

- **Professional development:** IPC training enhances the professional development of healthcare workers by providing them with specialised knowledge and skills in infection prevention and control. This not only improves job performance, but also enhances career prospects and opportunities for advancement.
-

In summary, training in IPC is essential for preventing infections, ensuring patient and healthcare worker safety, complying with regulations, preparing for outbreaks, improving quality of care, and reducing healthcare costs. It is an integral part of maintaining a safe and effective healthcare environment.

WHO Multimodal Strategy Plan for Improving IPC Training (Shen et al., 2017)

Objective: To enhance IPC training programmes in healthcare facilities by implementing the WHO Multimodal Strategy, focusing on actions to improve the quality, accessibility, and effectiveness of IPC training for healthcare workers.

1. Build It:

Action 1: Establish training needs assessment:

- **Responsible party:** IPC Committee
- **Timeline:** Within 1 month
- **Description:** Conduct a comprehensive assessment of IPC training needs among healthcare workers to identify gaps and areas for improvement.

Action 2: Develop IPC training plan:

- **Responsible Party:** IPC Committee
- **Timeline:** Within 2 months
- **Description:** Develop a detailed IPC training plan based on the needs assessment findings, outlining specific training objectives, content, and methods.

2. Teach It:

Action 3: Enhance training materials:

- **Responsible Party:** IPC Committee
- **Timeline:** Ongoing
- **Description:** Update and improve IPC training materials to ensure they are evidence-based, culturally sensitive, and accessible to all healthcare workers.

Action 4: Provide train-the-trainer programmes:

- **Responsible party:** IPC Committee
- **Timeline:** Within 3 months
- **Description:** Conduct train-the-trainer programmes to build capacity among designated IPC trainers, ensuring they are equipped to deliver high-quality IPC training to healthcare workers.

3. Check It:

Action 5: Implement training monitoring and evaluation:

- **Responsible party:** IPC committee
- **Timeline:** Ongoing
- **Description:** Establish monitoring and evaluation mechanisms to assess the effectiveness of IPC training programmes and identify areas for improvement.

4. Sell It:

Action 6: Promote training opportunities:

- **Responsible party:** IPC Committee
- **Timeline:** Ongoing
- **Description:** Promote IPC training opportunities to healthcare workers through various channels, including email, posters, and staff meetings.

5. Live It:

Action 7: Institutionalise IPC training:

- **Responsible Party:** Hospital administration
- **Timeline:** Ongoing
- **Description:** Institutionalise IPC training as a mandatory component of orientation and continuing education for all healthcare workers.

Action 8: Recognise and reward training excellence:

- **Responsible Party:** IPC committee
- **Timeline:** Ongoing
- **Description:** Establish a system to recognise and reward healthcare workers who demonstrate excellence in IPC training and practice.

Resources needed:

- IPC Committee members
- Training materials and resources
- Train-the-trainer programmes
- Monitoring and evaluation tools

Timeline:

- Months 1-2: Conduct training needs assessment and develop training plan.
- Months 3-4: Enhance training materials and provide train-the-trainer programmes.
- Months 5-6: Implement training monitoring and evaluation mechanisms and promote training opportunities.
- Ongoing: Institutionalise IPC training and recognise and reward training excellence.

Responsible parties:

- IPC committee
- Hospital administration
- IPC trainers
- Healthcare workers

By implementing this WHO Multimodal Strategy plan, healthcare facilities can improve the quality and effectiveness of IPC training programmes, ultimately leading to better IPC practices and reduced HAIs.

Detailed training plan

IPC Programme Enhancement Plan based on the WHO Multimodal Strategy (Shen et al., 2017)

Objective: To enhance the IPC programme at [Organisation Name] by implementing the WHO Multimodal Strategy, focusing on improving hand hygiene practices.

1. Build It:

Action 1: Establish a multidisciplinary IPC committee

- **Responsible Party:** IPC coordinator
- **Timeline:** Within 1 month
- **Description:** Form a committee comprising representatives from various departments to oversee the enhancement of the IPC programme.

Action 2: Conduct a baseline assessment

- **Responsible Party:** IPC coordinator
- **Timeline:** Within 2 months
- **Description:** Assess the current hand hygiene practices, infrastructure, and resources to identify gaps and areas for improvement.

2. Teach It:

Action 3: Develop and implement training programmes

- **Responsible Party:** IPC coordinator, IPC committee
- **Timeline:** Ongoing
- **Description:** Develop and deliver training sessions on hand hygiene to all healthcare workers, emphasising the importance of compliance with IPC protocols.

Action 4: Provide resources and materials

- **Responsible party:** IPC coordinator
- **Timeline:** Within 3 months
- **Description:** Ensure the availability of hand hygiene products, educational materials, and signage throughout the facility.

3. Check It:

Action 5: Establish monitoring and feedback mechanisms

- **Responsible party:** IPC coordinator, IPC committee
- **Timeline:** Within 4 months
- **Description:** Implement regular audits and observations to monitor hand hygiene compliance. Provide feedback to staff and recognise achievements.

Action 6: Conduct regular assessments

- **Responsible Party:** IPC coordinator
- **Timeline:** Annually
- **Description:** Conduct annual assessments to evaluate the impact of the IPC programme enhancements and identify areas for further improvement.

4. Sell It:

Action 7: Promote hand hygiene awareness

- **Responsible party:** IPC coordinator, communication department
- **Timeline:** Ongoing
- **Description:** Launch awareness campaigns to highlight the importance of hand hygiene among staff, patients, and visitors.

Action 8: Engage leadership support

- **Responsible party:** IPC coordinator
- **Timeline:** Ongoing
- **Description:** Engage with senior management to secure their support and commitment to the IPC programme enhancements.

5. Live It:

Action 9: Embed hand hygiene in organisational culture

- **Responsible Party:** All Staff
- **Timeline:** Ongoing
- **Description:** Encourage a culture of hand hygiene compliance through leadership example, peer influence, and continuous education.

Action 10: Evaluate and improve

- **Responsible Party:** IPC coordinator, IPC committee
- **Timeline:** Ongoing
- **Description:** Continuously evaluate the effectiveness of the IPC programme enhancements and make adjustments as necessary to ensure sustained improvements.

Resources needed:

- IPC coordinator
- IPC committee members
- Training materials
- Hand hygiene products
- Audit tools
- Communication resources

Timeline:

- Month 1-2: Establish IPC committee and conduct baseline assessment.
- Month 3-4: Develop and implement training programmes, provide resources and materials.
- Month 5-6: Establish monitoring and feedback mechanisms, conduct regular assessments.
- Ongoing: Promote hand hygiene awareness, engage leadership support, embed hand hygiene in organisational culture, and evaluate and improve the IPC programme.

In conclusion, a strategic approach focusing on robust management support, formal recognition of IPC as a specialty, and enhanced training programmes is essential (Tahir et al., 2023). These measures will collectively strengthen IPC practices, leading to improved compliance, better IPC outcomes across all health care facilities.

CHAPTER EIGHT: SUMMARY, RECOMMENDATIONS, LIMITATIONS, AND CONCLUSION

8.1 Introduction

This chapter establishes a model in relation to the study objectives, research question, and research problem statement, and summarises the study outcomes. The chapter also addresses the question of whether the goals of the research have been achieved. After that, conclusions, limitations, relevance, and contribution of the study to the body of knowledge were stated based on the evidence-based model created, the theoretical framework, literature review, and study findings.

8.2 IPC implementation

Prior to developing an evidence-based strategy for improving IPC programme in the public hospitals of Limpopo Province, there was a need to establish a baseline of the core components of the IPC, as guided by the WHO IPC Core Components. During phase one, the study revealed that from 41 hospitals, none had inadequate IPC levels, 1 (2.4%) had basic levels, 16 (39.0%) had intermediate levels, and 24 (58.5%) had

advanced levels. The median score of all healthcare facilities was 618.0 (95.0) points. Core Components CC4, HAIs, had the highest scores (88.0), followed by CC2, IPC guidelines (87.5) and CC8, Built Environment (85.0). The CC7, Workload and Staffing, (60.0) had the lowest scores. The findings indicated that none of the hospitals had inadequate IPC levels.

The phase 2 of the study, which focused on the knowledge, attitudes and practices of IPC nurses in hospitals qualified the phase 1 by establishing that despite their substantial knowledge and positive attitudes towards infection control, systemic issues and resource limitations present significant barriers to the consistent application of best practices. Addressing these challenges through targeted training, increased resource allocation, and stronger managerial support is essential for enhancing IPC efforts in public hospitals.

8.3 Study research objectives

This section discusses research objectives, which were achieved during the research process and focuses on how they were achieved according to different phases of the study.

8.3.1 Phase one: Quantitative approach

The aim of phase one of this study, which undertook a quantitative approach, was to provide a baseline assessment of the IPC programme and activities within hospitals by using the report generated after analysing the retrospective data collected during the hospital peer review assessment, utilising the IPCAF tool. Key findings from the quantitative analysis revealed that while none of the hospitals had inadequate IPC levels, there is a significant variation in the effectiveness and comprehensiveness of IPC programmes, particularly in the areas of workload and staffing.

8.3.2 Phase two: Qualitative approach

The second objective was to explore and describe the attitude and practice on IPC practices among hospital IPC nurses in the Limpopo Province. The objective was achieved through administrating a questionnaire to hospital IPC nurses. The qualitative phase provided in-depth insights into healthcare workers' experiences and perceptions regarding the implementation of IPC programmes. Semi-structured interviews were conducted with IPC nurses, focusing on themes such as burden, perceived effectiveness, self-efficacy, ethicality, and affective attitudes towards IPC practices.

The mixed-methods approach of this study provided a comprehensive understanding of the implementation of IPC programmes in the Limpopo Province's public hospitals. The quantitative findings highlighted critical areas for improvement in training, adherence, and resource allocation, while the qualitative insights underscored the need for supportive leadership and ongoing professional development to enhance IPC practices. Together, these findings inform targeted interventions to strengthen IPC programmes and ultimately reduce the burden of HAIs in the hospitals.

8.3.3. Phase three: Developing an evidence-based strategy to improve gaps identified

Based on the findings from both the quantitative and qualitative phases, an evidence-based WHO Multimodal strategy is proposed to address the identified gaps and improve IPC programmes in the Limpopo Province's public hospitals. The strategy includes the following components:

- System Change: Strengthening IPC infrastructure by ensuring adequate resources, improving workload management, and addressing staffing shortages.

- Education and training: Enhancing continuous professional development and specialised IPC training for healthcare workers to boost self-efficacy and adherence to IPC guidelines.
- Monitoring and feedback: Implementing regular audits and feedback mechanisms to monitor IPC practices, identify areas for improvement, and reinforce adherence to protocols.
- Reminders and Communication: Utilising visual reminders and effective communication strategies to promote consistent IPC practices among healthcare workers.
- Safety culture: Fostering a culture of safety and ethical leadership that prioritises patient safety and equitable distribution of resources, motivating healthcare workers to engage in proactive IPC activities.

8.4 Recommendations to enhance awareness and improvement of the IPC programme

8.4.1 Introduction

This section highlights the recommendations to improving staff workload, training in IPC and management support. The recommendations are based on study findings and proposed evidence-based strategies.

8.4.2 Recommendations to workload and staffing

Based on the findings from the quantitative and qualitative phases of the study, the following recommendations are proposed to address the identified gaps in workload and staffing within IPC programmes in Limpopo Province's public hospitals:

- Increase staffing levels: Advocate the recruitment of additional healthcare workers, by advertising vacant posts, particularly IPC practitioners and support staff, to ensure adequate coverage and reduce the burden on existing staff.
- Retention strategies: Implement retention strategies such as dedicated IPC posts and recognition of the IPC programme as a specialty.

8.4.3 Recommendations to enhance training on IPC

- Provide ongoing training and education by making room for professional development and offering continuous professional development and specialised IPC training to enhance the skills and confidence of healthcare workers, enabling them to perform their duties more effectively.
- Cross-training: Encourage cross-training of staff in IPC practices to create a more versatile workforce capable of stepping in during staffing shortages.

8.4.4 Recommendations to improve management support to the IPC programme

Effective management support is crucial for the successful implementation and sustainability of Infection Prevention and Control (IPC) programmes. Based on the findings from the study, the following recommendations are proposed to enhance management support for IPC programmes in the Limpopo Province's public hospitals:

- Leadership commitment: Senior management engagement will ensure active involvement and visible commitment from senior management in IPC activities. This includes attending IPC meetings, participating in IPC training sessions, and regularly reviewing IPC performance metrics.
- Strategic prioritisation: Integrate IPC objectives into the hospital's strategic plan, demonstrating the prioritisation of infection control at the highest level.
- Resource allocation, such as allocating a sufficient budget for IPC programmes, covering essential items such as PPE, cleaning supplies, training materials, and technology for monitoring and reporting will be a significant remedial intervention.
- Dedicated IPC staff can be attained by ensuring that there are dedicated, full-time IPC practitioners who are adequately compensated and provided with the necessary resources to perform their duties effectively.

8.5 Contribution of the study to the existing body of knowledge

The current study attempted to address gaps, which were identified in literature review, and this included limited research on IPC programme in the Limpopo Province. In addressing the identified gaps, several important contributions were made:

8.5.1 Theory contribution

Application of the Consolidated Framework for Implementation Research (CFIR): The study demonstrates the utility of CFIR in evaluating IPC programmes within public hospitals. By identifying key domains such as intervention characteristics, outer setting, inner setting, characteristics of individuals, and process, the research highlights how these elements influence the success of IPC initiatives. This contribution enhances the theoretical framework by providing empirical evidence on its applicability in a healthcare setting, particularly in resource-limited environments.

This study significantly contributes to the theoretical and practical understanding of IPC programme implementation in public hospitals. By integrating quantitative and qualitative findings, the research offers valuable insights into the factors influencing IPC effectiveness and provides evidence-based recommendations for improving management support and addressing workload and staffing challenges. These contributions enhance the existing body of knowledge and provide a foundation for future research and practice in IPC.

8.5.2 Methodological contribution

No previous studies have explored this phenomenon or research area using an explanatory sequential mixed-methods research (MMR) approach. This study employed an explanatory sequential MMR approach, which aligns with the research objectives. In the first phase, the quantitative data were collected and analyzed to identify trends and patterns related to the research problem. The insights from the

quantitative phase informed the design and focus of the qualitative phase, enabling an in-depth exploration of the phenomena under investigation. This sequential approach ensured that both quantitative breadth and qualitative depth were utilized effectively, contributing to a comprehensive understanding of the research phenomena. By employing this methodology, the study provided multiple insights and contributed significantly to the body of knowledge, ensuring methodological alignment across all phases.

8.5.3 Research area as a contribution to the body of knowledge

This study provides valuable insights into the specific challenges faced by public hospitals in resource-limited settings in implementing effective IPC programmes. By identifying gaps such as staffing shortages, inadequate resources, and limited management support, the research highlights the unique obstacles that hinder IPC efforts in these contexts. The findings contribute to the global understanding of IPC, offering evidence-based strategies tailored to the constraints and needs of resource-limited environments. This enhances the body of knowledge by providing a nuanced perspective on how IPC programmes can be adapted and optimised for settings with limited resources.

The research area of this study makes substantial contributions to the body of knowledge in infection prevention and control, implementation science, healthcare worker attitudes and behaviours, healthcare management, multimodal IPC strategies, and MMR. By addressing the unique challenges and needs of public hospitals in resource-limited settings, the study provides valuable insights and practical recommendations that can inform future research, policy, and practice in IPC and healthcare improvement.

8.5.4 Contribution to the field of Public Health

The study's findings offer practical and theoretical insights that can be applied to improve public health outcomes not only in Limpopo, but also in similar settings globally. The study significantly contributes to the field of public health by providing

valuable insights into the implementation and effectiveness of IPC programmes in resource-limited public hospitals. By addressing critical areas such as healthcare worker engagement, management support, and multimodal intervention strategies, the research enhances the understanding and practice of IPC. These contributions support the overarching public health goals of improving patient safety, reducing HAIs, and strengthening health systems to manage infectious diseases more effectively.

8.6 Limitations of the study

While this study provides valuable insights into the implementation and effectiveness of IPC programmes in public hospitals in the Limpopo Province, several limitations should be acknowledged:

8.6.1. Focus on Public Hospitals

- **Exclusion of the Private Healthcare Sector**

The study focused exclusively on public hospitals, potentially overlooking IPC practices, challenges, and successes in the private healthcare sector. Including private hospitals could provide a more holistic view of IPC implementation across different types of healthcare institutions.

8.6.2. Qualitative Data Limitations

- **Depth of Interviews**

While the qualitative phase provided valuable insights, the depth and breadth of the interviews might be limited by the time available and the willingness of participants to share detailed experiences. Some aspects of IPC implementation may not have been fully explored.

8.7 Conclusion

This research study aimed to develop an evidence-based management strategy for improving IPC programmes in public hospitals within the Limpopo Province, South Africa. The study undertook an exploratory sequential mixed methods design to address this aim. Based on a qualitative and quantitative analysis, it can be concluded that while there are advanced levels of IPC implementation in many hospitals, significant gaps remain, particularly in the areas of workload and staffing, management support, and resource allocation.

The qualitative data revealed that healthcare workers often feel overburdened and lack the necessary resources and support to fully adhere to IPC protocols. Quantitative analysis indicated varying levels of IPC effectiveness across hospitals, with core components such as workload and staffing receiving the lowest scores.

The results of this study indicate that there is a need to enhance management support for IPC programmes by ensuring adequate staffing, providing ongoing training and professional development, and improving resource allocation. Additionally, the development of a comprehensive, evidence-based IPC strategy tailored to the specific needs and constraints of public hospitals in the Limpopo Province is essential. This strategy should focus on strengthening leadership commitment, fostering a culture of safety, and implementing systematic monitoring and evaluation mechanisms to ensure sustained improvements in IPC practices.

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ANNEXURE A: Data Collection Tool for Hospitals

IFCAF Tool

IPCAF-facility-3-15.pdf

ANNEXURE B: Interview guide for nurses in hospitals

Research topic: **Evaluation of hospital-acquired infections prevention and control programme for nurses in the public hospitals of Limpopo Province**

SECTION A: DEMOGRAPHIC DATA OF PARTICIPANTS

1. Age:
2. Educational level:
3. Number of years working as IPC nurse

SECTION A: TO ASSESS THE UNDERSTANDING OF NURSES ON IPC

1. According to you, what do you think should be done to improve IPC in your hospital?
    a. Probe probe probe
2. What is the importance of IPC in hospitals?
    a. Probe probe probe
3. What are the practices that can assist in improving IPC in hospitals?
    a. Probe probe probe
4. What is the importance of viral load testing?

SECTION B: BARRIERS TO FUNCTIONAL IPC

5. What are the barriers that prevents or delays progress in functional IPC?
    a. Probe probe probe
6. What is your experience on the IPC in the hospital?
    a. Probe probe probe

A. QUESTIONNAIRE

Department of Public Health

Faculty of Health Sciences

Private Bag X1106, Sovenga, 0727, South Africa

Tel: (015) 268 4113/4614 Fax: (015) 268 3384

The aim of the study is **EVALUATION OF HOSPITAL-ACQUIRED INFECTIONS PREVENTION AND CONTROL PROGRAM FOR NURSES IN THE PUBLIC HOSPITALS OF LIMPOPO**. The study is being conducted through the University of Limpopo. There are 20 questions in this questionnaire. The questionnaire might take you 15 – 20 minutes to complete. For questions with alternative options, indicate by crossing (x) in the box. For questions with blank spaces, please provide an answer in writing.

A. BACKGROUND INFORMATION

Q1 What is your age:

54	Years

Q2 What is your position category?

Registered Nurse x	Enrolled Nurse
Enrolled Nursing Assistant	

Q3 How long have you worked in the IPC Program

13 y

Q4 Which IPC qualification have you obtained?

None	Diploma
Certificate	Degree

C. KNOWLEDGE OF INFECTION PREVENTION & CONTROL PROGRAM

Opening question for each participant

"How would you describe the Infection Prevention & Control activities that ensure that there is minimal transmission of infections among patients and workers in this institution?

INTERVIEW GUIDES

1. Unstructured interview questions for key informant/secondary participants:

Hospital Infection Prevention & Control Nurses

a. Questions related to work experience.

- How long have you been working in the IPC unit?
- Do you have further training in IPC
- What are your thoughts on employees receiving further training in IPC?
- Describe the line management reporting that you use to account for your activities.

b. Questions related to the prevalence of healthcare-acquired infection (HCAI).

How would you describe the burden of healthcare-acquired infections in your hospital?

Probing question:

- What type and How many cases do you see in your facility?

c. Question related to common risk factors of HCAI

Do you mind sharing some of the common predisposing factors to HCAI in your hospital?

Probing question:

Common risk factors in your hospital?

d. Question-related to screening patients

Any screening for individual patients for infection as they arrive in the institution, isolation of infected patients.

What the challenges of non adherence , and once you meet them what do you do?
Do you mind sharing the reporting system of the non- adherence

Probing question:

How reliable is this method?

Do you mind sharing the information you would include to communicate the non-adherence?

e. Questions related to support from management and other disciplines

What is leve of support of the IPC program from management and other disciplines?

Probing question:

- How do you collaborate with other health practitioners in managing HCAI?
- Which policy documents or guidelines do you refer to?

f. Questions related to awareness of IPC.

In your opinion do you mind sharing the activities needed to be implemented to improve the functionality of the IPC program?

Probing question:

Do you think healthcare workers, including hospital management, understand the importance of the IPC program?

ANNEXURE C: Consent Form Key Participants

Consent form for key participants

Department of Public Health

Faculty of Health Sciences

Private Bag X1106, Sovenga, 0727, South Africa

Tel: (015) 268 4113/4614 Fax: (015) 268 3384

Dear participant

This study involves the audio recording of your interview with the researcher. Neither your name nor any other identifying information will be associated with the audio recording or the transcript. Only the researcher will be able to listen to the recordings.

The tapes will be transcribed by the researcher and checked for accuracy. Transcripts of your interview may be reproduced in whole or in part for use in presentations or written products that result from this study. Neither your name nor any other identifying information (such as your voice) will be used in presentations or in written products resulting from the study.

By signing this form, I am allowing the researcher to audio tape me as part of this research. I also understand that this consent for recording is effective until the research is completed.

Thank you,

Place……

Signed: …… Date: …….

Researcher…… Signed……

ANNEXURE D: Consent form for Provincial Department of Health

Consent form for the Provincial Department of Health (Chief Director of Health Special Program)

Department of Public Health

Faculty of Health Sciences

Private Bag X1106, Sovenga, 0727, South Africa

Tel: (015) 268 4113/4614 Fax: (015) 268 3384

Dear Director

By signing this form, I allow the researcher use the existing data of this directorate to conduct her study.

I…… (Surname &Initials) …… (Rank) hereby consent for the research study to be conducted in this institution.

Thank you,

Place: ……

Signed: …… **Date**: ……

Researcher: ……... **Signed**: ……

ANNEXURE E: Permission Letter to access the data collected from the hospitals

TO : Mr. L Ngoetjana **FROM:** LQ Ranoto

Director: Environmental Health & IPC Directorate **Investigator**

Limpopo Provincial Department of Health University Of Limpopo

Re: Permission to do research in Limpopo Provincial Department of Health

TITLE OF STUDY: Evaluation of hospital-acquired infections prevention and control program for nurses in the public hospitals of Limpopo Province

This request is lodged with you in terms of the requirements of the Promotion of Access to Information Act. No 2 of 2000.

I am a Doctor of Philosophy student at the School of Health Care Sciences at the University of Limpopo. I am working under the supervision of Professor Eric Maimela. I herewith request permission on behalf of all of us to conduct a study on the above topic in the province. This study involves access to data collected at the Infection Prevention & Control Unit.

We intend to submit the findings to the University of Limpopo as part of my research report for partial fulfillment of the Doctor of Philosophy degree. We also wish to publish the findings of the study in a professional journal and to present them at professional meetings like symposia, congresses, or other meetings of such a nature.

No direct patient-identifying information will be used.

We undertake not to proceed with the study until we have received approval from the School Research Ethics Committee, University of Limpopo.

Yours sincerely_____ _____

Lebitsi Queen Ranoto Mr. L Ngoetjana

(Principal Investigator) Director EH & IPC Directorate

ANNEXURE F: Participants Consent Forms

Consent form for the participant

Department of Public Health

Faculty of Health Sciences

Private Bag X1106, Sovenga, 0727, South Africa

Tel: (015) 268 4113/4614 Fax: (015) 268 3384

Dear Participant

By signing this form, I am declaring my participation in this study.

I…… (Surname &Initials) hereby consent to be part of the study.

Thank you,

Place: ……

Signed: ……. **Date**: …….

Researcher: ……. ….. **Signed**: ……

ANNEXURE G: Ethical approval from University of Limpopo (TREC)

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 4713, Fax: (015) 268 2306, Email: moore.hutamo@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE

ETHICS CLEARANCE CERTIFICATE

MEETING: 04 April 2023

PROJECT NUMBER: TREC/111/2023: PG

PROJECT:

Title:	Evaluation of hospital-acquired infections prevention and control program for nurses in the public hospitals of Limpopo Province.
Researcher:	LQ Ranoto
Supervisor:	Prof E Maimela
Co-supervisor/s:	Prof PM Mamogobo
School:	Health Care Sciences
Degree:	Doctor of Philosophy in Public Health

PROF D MAPOSA
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:
i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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ANNEXURE H: Approval from the Limpopo Department of Health

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
HEALTH

Ref : LP_2023-04-026
Enquires : Dr Ramalivhana NJ
Tel : 015-293 6028
Email : Phoebe.Mahlokwane@dhsd.limpopo.gov.za

LEBITSI QUEEN RANOTO

PERMISSION TO CONDUCT RESEARCH IN DEPARTMENTAL FACILITIES

Your Study Topic as indicated below;

EVALUATION OF HOSPITAL-ACQUIRED INFECTIONS PREVENTION AND CONTROL PROGRAM FOR NURSES IN THE PUBLIC HOSPITALS OF LIMPOPO PROVINCE

1. Permission to conduct research study as per your research proposal is hereby Granted.
2. Kindly note the following:
   a. Present this letter of permission to the Office of District Executive Manager a week before the study is conducted.
   b. In the course of your study, there should be no action that disrupts the routine services or incur any cost on the Department.
   c. After completion of study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
   d. The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
   e. **The approval is only valid for a 1-year period.**
   f. If the proposal has been amended, a new approval should be sought from the Department of Health
   g. Kindly note that, the Department can withdraw the approval at any time.

   Your cooperation will be highly appreciated.

pp **Head of Department** 12/05/2023 **Date**

Private Bag X9302, Polokwane 0700
Fidel Castro Ruz House, 18 College Street, Polokwane 0700
Tel: 015 293 6000. Fax: 015 293 6211. Website: www.doh.limpopo.gov.za

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ANNEXURE I: Language editor certificate

WriteRight Language Editing Services
640 Munnik Avenue, Bendor, Polokwane, 0699
Registration No. 2023/162786/07
moffatsebola@gmail.com, 0697110718
DATE: 05 December 2024

Re: Certificate of Editing

I hereby advise that I edited a thesis titled: **"EVALUATION OF HOSPITAL-ACQUIRED INFECTIONS PREVENTION AND CONTROL PROGRAMME FOR NURSES IN THE PUBLIC HOSPITALS OF LIMPOPO PROVINCE"** by **LEBITSI QUEEN RANOTO**. My editorial interventions entailed, among other aspects, the following:

- English academic language editing, including grammar, spelling, tenses and subject/verb agreement. Efforts were made to ensure that UK English instead of US English was used consistently in the text. Therefore, verbs such as "organize", "emphasize", "realize" and "behavior" were spelled thus, "organise", "emphasise", "realise" and "behaviour", respectively.
- Style and full reference editing according to the Institution's style guide. Here, I checked consistency in the formatting of in-text references and the list of references, including checking that all the sources cited in text were duly acknowledged and that all the sources on the list of references appeared in the text. Addressing inconsistencies in the use of font types and sizes throughout the document.

Please note that I have not had sight of the manuscript since editing, with Lebitsi either accepting or rejecting suggested changes or corrections, as is usual. Unless tampered with prior to your reception of the edited work, I trust you will find the editing quality in order.

Regards
Dr Moffat Sebola,