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Abstract

**Background:** Healthcare-Associated Infections (HAIs) are those infections acquired after hospitalisation and manifest 48 hours after admission to the hospital. It is estimated that 5-10% of in-patients develop an HAI during their stay (Gaid et al., 2017). Infection Prevention and Control (IPC) presents the cheapest and best solution to curb increasing HAI rates, with 30% of HAI preventable if key IPC components are adequately followed (Storr et al., 2017; WHO, 2018). It is widely accepted that any IPC guidance or recommendations should be evidence-based (Storr et al., 2017; WHO, 2016). The World Health Organization (WHO) released evidence-based recommendations in 2016, including strategies for preventing HAIs and controlling the spread of infections within healthcare facilities. A systematised literature review conducted between February 2018 – March 2018 to inform this study revealed very little research conducted on the implementation of IPC guidance at the health facility level in low-income countries and a dearth of qualitative research in this area. As such, there is a need to understand the implementation of IPC guidance in low-middle countries using a qualitative approach. Therefore, this study aimed at exploring the implementation of IPC guidance at the health facility level in Uganda and to generate a theoretical explanation for the processes involved in the implementation of this guidance in these settings.

**Methods:** This study employed a qualitative research design based on the constructivist grounded theory research methodology (Charmaz, 2006). Individual interviews were conducted with 13 frontline health workers involved in implementing and applying IPC guidance at a tertiary hospital in Uganda. The study also employed the theoretical domains framework (TDF) and behaviour change wheel (BCW)/COM-B model for behavioural analysis in order to analyse the identified factors which may present as barriers and enablers to the implementation of IPC guidance and to make preliminary recommendations for intervention design.

**Findings:** The main findings from the study indicate that in trying to implement IPC guidance, Healthcare Workers (HCWs) go through a process of ‘striving for improved practice’, which consists of four phases; recognising the importance of IPC, playing a
role, encountering challenges and overcoming challenges. However, they never quite come close to full implementation because of the organisational and individual challenges within these contexts. The theoretical code that explains this process is "asymptote", which means coming close but not close enough. The findings also identify enabling factors within these contexts that facilitate implementation whilst revealing a high degree of improvisation among HCWs in ensuring the effective practice of IPC measures. By applying behaviour change theory, the study also identifies the most important behavioural influences on implementation that include opportunity, capability and motivation that can be targeted to improve implementation. Key intervention functions such as enablement, environmental restructuring, training and education, persuasion, and incentivisation are also identified that can be used to design interventions to improve the implementation of this IPC guidance within these settings.

**Conclusion:** Implementing IPC guidance in low-resource Uganda is a complex process involving unique challenges. This study presented a substantive theory that provides insight into the implementation of this IPC guidance in this low-resource context. The study also provided a theoretical basis for intervention design and development through the use of the TDF, COM-B and BCW while identifying some key recommendations to improve the implementation of this IPC guidance within these contexts.
# Table of Contents

Abstract ............................................................................................................................ iii  
Table of Contents .............................................................................................................. v  
List of Figures ................................................................................................................. xiii  
List of tables .................................................................................................................... xiv  
List of acronyms .............................................................................................................. xv  
Acknowledgements ........................................................................................................ xvii  
Dedication ....................................................................................................................... xix  
Author’s Declaration ....................................................................................................... xx  
COVID-19 Impact statement ........................................................................................... xxi  
CHAPTER ONE: INTRODUCTION ........................................................................................ 1  
1.1 Introduction ............................................................................................................ 1  
1.2 Organisation of the thesis ...................................................................................... 1  
1.3 Background ............................................................................................................. 3  
  1.3.1 Risk factors for HAIs ......................................................................................... 4  
  1.3.2 HAIs and Antimicrobial Resistance (AMR) ....................................................... 5  
1.4 The WHO core components of IPC programmes at the national and acute health care facility level ............................................................................................................ 8  
1.5 Summary ............................................................................................................... 10  
CHAPTER TWO: LITERATURE REVIEW ............................................................................. 11  
2.1 Introduction .......................................................................................................... 11  
2.2 Methodology ......................................................................................................... 11  
  2.2.1 Search Strategy .................................................................................................. 12  
  2.2.2 Area of Interest .................................................................................................. 15  
  2.2.3 Sources of literature ........................................................................................... 16  
  2.2.4 Inclusion and exclusion criteria .......................................................................... 17  
  2.2.5 Study designs and limitations applied .............................................................. 18
2.3 Data management strategy ................................................................. 18
  2.3.1 Data extraction ........................................................................... 18
  2.3.2 Critical Appraisal ................................................................. 18
    2.3.2.1 Quantitative study tool .................................................. 19
    2.3.2.2 Qualitative study tool ............................................... 20
  2.3.3 Data synthesis ........................................................................... 20

2.4 Results ......................................................................................... 21
  2.4.1 PRISMA ............................................................................... 21
  2.4.2 Study selection ........................................................................ 22

2.5 Overview of included studies ....................................................... 23
  2.5.1 Publication year ................................................................. 23
  2.5.2 Geographical location of the included studies ....................... 23
  2.5.3 Research methods of included studies ................................... 24
  2.5.4 Guidelines covered ............................................................ 25
  2.5.5 Implementation of intervention strategies ............................ 26
  2.5.6 Outcome measures .............................................................. 28

2.6 Critical appraisal of the papers ..................................................... 30
  2.6.1 Critical appraisal for quantitative studies ............................... 31
  2.6.2 Critical appraisal for qualitative studies ............................... 33

2.7 Synthesis of findings .................................................................... 33
  2.7.1 Hand Hygiene guidance ....................................................... 34
  2.7.2 Other global IPC guidance .................................................. 35
  2.7.3 Methodological synthesis .................................................... 35

2.8 Conclusions ................................................................................. 37
  2.8.1 Gaps Identified in the literature ............................................. 38

2.9 Summary ....................................................................................... 39

CHAPTER THREE CONTEXT OF THE STUDY ........................................... 40

3.1 Introduction ............................................................................... 40

3.2 Location of Uganda .................................................................... 40
3.3 Socio-economic status of Uganda ................................................................. 41
3.4 Healthcare system of Uganda ......................................................................... 42
3.5 Health guidelines in Uganda ........................................................................... 46
3.6 IPC guidance in Uganda .................................................................................. 47
3.6.1 IPC Structure in Uganda .............................................................................. 48
3.7 Summary ......................................................................................................... 49

CHAPTER FOUR: METHODOLOGY .................................................................... 50
4.1 Introduction ..................................................................................................... 50
4.2 Selecting a Research Methodology ................................................................. 50
  4.2.1 Research aim and objectives .............................................................. 51
4.3 Research Philosophy ...................................................................................... 52
  4.3.1 Ontological Assumptions ................................................................. 52
  4.3.2 Epistemological Assumptions ............................................................ 53
4.4 Research Paradigms ...................................................................................... 54
  4.4.1 Positivist Paradigm .............................................................................. 55
  4.4.2 The Interpretivist and Constructivist Paradigms ................................. 57
  4.4.3 Choice of Research Paradigm .............................................................. 60
4.5 Methodological Considerations ................................................................... 61
4.6 Grounded theory .......................................................................................... 64
  4.6.1 Constructivist grounded theory .......................................................... 67
  4.6.2 Choice of grounded theory approach and rationale .......................... 69
4.7 Theoretical perspective: Symbolic Interactionism ...................................... 70
4.8 Summary ....................................................................................................... 73

CHAPTER FIVE: METHODS: DOING GROUNDED THEORY ....................... 74
5.1 Introduction ................................................................................................... 74
5.2 Ethical Considerations analysis ..................................................................... 74
  5.2.1 Recruitment and access ....................................................................... 77
5.3 Overview of Sampling ........................................................................................... 78
  5.3.1 Initial sampling ............................................................................................... 79
  5.3.2 Theoretical Sampling ...................................................................................... 79

5.4 Data Generation ................................................................................................... 81
  5.4.1 Conducting Interviews .................................................................................. 82
  5.4.2 Development of the interview guide ............................................................. 83
  5.4.3 Interview process, concurrent data collection and analysis .......................... 84

5.5 Data management and analysis ............................................................................ 86
  5.5.1 Memo writing ................................................................................................. 86

5.6 The coding process ................................................................................................ 87
  5.6.1 Initial coding ................................................................................................... 88
  5.6.2 Focused coding and beyond .......................................................................... 89

5.7 Constant Comparison Method .............................................................................. 90

5.8 Category Development and Theoretical Development ........................................ 90
  5.8.1 Emergence of the core category .................................................................... 95
    5.8.1.1 Theoretical coding ................................................................................... 97
  5.8.2 Theoretical Sensitivity ................................................................................... 98
  5.8.3 Theoretical Saturation .................................................................................... 99

5.9 Modification of the study due to COVID-19 pandemic ......................................... 99

5.10 Rigour ................................................................................................................ 100
  5.10.1 Peer debriefing ........................................................................................... 103
  5.10.2 Audit trail .................................................................................................... 103
  5.10.3 Reflexivity ................................................................................................... 104

5.10 Summary ........................................................................................................... 105

CHAPTER SIX: OVERVIEW OF THE EXPLANATORY GROUNDED THEORY .............. 106

6.1 Introduction ........................................................................................................ 106

6.2 Identified theoretical codes and the theory development ..................................... 107

6.3 The storyline ........................................................................................................ 108
  6.3.1 Asymptote .................................................................................................... 108
6.3.2 The basic social process and stages of ‘Striving’ for Improved IPC practice in
the implementation of IPC guidance ................................................................. 109

6.3 Summary ..................................................................................................... 112

CHAPTER SEVEN: FINDINGS: STRIVING FOR IMPROVED IPC PRACTICE: A GROUNDED
THEORY OF HEALTHCARE WORKERS’ STRUGGLES IN IMPLEMENTING IPC GUIDANCE IN
A LOW RESOURCE SETTING ............................................................................ 113

7.1 Introduction ................................................................................................. 113

7.2 The basic social process of striving ............................................................ 114

7.3 Phase 1: Recognising the importance of IPC ............................................. 115
  7.3.1 Being aware of IPC guidance ................................................................. 116
  7.3.2 Making sense of IPC guidance ............................................................... 118

7.4 Phase 2: Playing a role ............................................................................. 120

7.5 Phase 3: Encountering challenges ............................................................. 123
  7.5.1 Organisational Challenges ................................................................. 124
    7.5.1.1 Resource constraints ..................................................................... 125
    7.5.1.2 Lack of support supervision from either the national or local levels ... 128
    7.5.1.3 Lack of training and orientation .................................................... 129
    7.5.1.4 A lack of voice ............................................................................. 131
  7.5.2 Individual Challenges ......................................................................... 132

7.6 Enabling Conditions .................................................................................. 133

7.7 Phase 3: Overcoming Challenges: Improvising ........................................ 141
  7.7.1 Improvising ......................................................................................... 142
    7.7.1.1 On-demand improvisation ............................................................ 142
    7.7.1.2 Planning for the future improvisation ......................................... 146

7.8 Summary .................................................................................................. 148

CHAPTER EIGHT: BEHAVIOURAL ANALYSIS ....................................................... 149

8.1 Introduction ............................................................................................... 149

8.2 Importance of theory in implementation ............................................... 150
  8.2.1 Theoretical Domains Framework (TDF) ............................................ 152
Appendix IX: National registration and clearance .................................................... 272
Appendix X: Participant information sheet and consent form ................................. 273
Appendix XI: District Health Office clearance .......................................................... 277
Appendix XII: Deciding on whom to interview first .................................................. 278
Appendix XIII: Interview guide .................................................................................. 281
Appendix XIV: Revised interview guide following initial analysis ......................... 282
Appendix XV: Reflective field notes .......................................................................... 285
Appendix XVI: NVivo program used for data storage, organisation and analysis .... 288
Appendix XVII: Examples of mind-maps and diagram sketches used ....................... 289
Appendix XVIII: Examples of initial memos after each interview ......................... 291
Appendix XIX: Initial codes ..................................................................................... 293
Appendix XX: Examples of generated codes ......................................................... 295
Appendix XXI: Initial codes grouped into focused codes of meaning ....................... 296
Appendix XXII: Theoretical memos ....................................................................... 298
Appendix XXIII: Memos demonstrating different conceptualisation models during different stages of analysis .............................................................. 303
References .............................................................................................................. 305
List of Figures

Figure 1: Poor infection control contributes to increased AMR.................................7
Figure 2: PRISMA diagram showing search results..................................................22
Figure 3: Location of Uganda. Adapted from World Atlas........................................41
Figure 4: Representation of Uganda’s healthcare system........................................43
Figure 5: Process of theoretical and category development.....................................91
Figure 6: ‘Developing’ Categories ............................................................................92
Figure 7: Refined categories ....................................................................................94
Figure 8: Subcategories added to categories..........................................................95
Figure 9: Asymptote of IPC guidance implementation..........................................109
Figure 10: The basic process of striving .................................................................110
Figure 11: Components of the asymptote as conceptualised in the study ...........114
Figure 12: Sub-categories for recognising the importance of IPC .......................116
Figure 13: Sub-categories of Playing a role............................................................121
Figure 14: Sub-categories of appreciating challenges ..........................................124
Figure 15: Enablers of implementation ...................................................................134
Figure 16: Sub-categories of overcoming challenges ............................................142
Figure 17: The COM-B framework and behaviour change wheel.......................155
List of tables

Table 1: WHO core components for IPC programmes ................................................................. 9
Table 2: PICO framework for search questions ........................................................................ 12
Table 3: Generic search strategy ............................................................................................. 14
Table 4: Inclusion criteria ....................................................................................................... 17
Table 5: Exclusion Criteria ..................................................................................................... 17
Table 6: Results from the database search ............................................................................ 21
Table 7: Year distribution of included studies ....................................................................... 23
Table 8: Geographical location of included studies ............................................................... 24
Table 9: Research designs of included studies ...................................................................... 24
Table 10: Type of guidelines from included studies .............................................................. 25
Table 11: Guidelines covered ................................................................................................. 26
Table 12: Comparison of compliance rates across studies .................................................... 28
Table 13: Healthcare units by level and population covered ................................................ 45
Table 14: IPC structure in Uganda ......................................................................................... 49
Table 15: Memo: Tweaking the categories ............................................................................. 93
Table 16: Memo: More light on "Making Do" ....................................................................... 96
Table 17: Memo: Revising manoeuvring ............................................................................... 97
Table 18: Relating theoretical codes to my data ................................................................... 98
Table 19: The TDF version used for this study ..................................................................... 153
Table 20: The COM-B framework and behaviour change wheel ........................................ 156
Table 21: Barriers and enablers to the implementation of the IPC guidance ..................... 158
Table 22: TDF matched to COM-B/BCW components and intervention functions .......... 170
List of acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ABHR</td>
<td>Alcohol-based Handrub</td>
</tr>
<tr>
<td>AMR</td>
<td>Antimicrobial Resistance</td>
</tr>
<tr>
<td>APSIC</td>
<td>Asia Pacific Society of Infection Control</td>
</tr>
<tr>
<td>BCW</td>
<td>Behaviour Change Wheel</td>
</tr>
<tr>
<td>CDC</td>
<td>Centre for Disease Control</td>
</tr>
<tr>
<td>CME</td>
<td>Continuous Medical Education</td>
</tr>
<tr>
<td>COM-B</td>
<td>Capability, Opportunity, Motivation, Behaviour</td>
</tr>
<tr>
<td>CPD</td>
<td>Continuous Professional Development</td>
</tr>
<tr>
<td>ECDC</td>
<td>European Centre for Disease Control</td>
</tr>
<tr>
<td>HAI</td>
<td>Healthcare Associated Infection</td>
</tr>
<tr>
<td>HBV</td>
<td>Hepatitis B Virus</td>
</tr>
<tr>
<td>HC</td>
<td>Health Centre</td>
</tr>
<tr>
<td>HCW</td>
<td>Healthcare Worker</td>
</tr>
<tr>
<td>HSD</td>
<td>Health Sub-District</td>
</tr>
<tr>
<td>ICAN</td>
<td>Infection Control Africa Network</td>
</tr>
<tr>
<td>ICN</td>
<td>Infection Control Nurse</td>
</tr>
<tr>
<td>IDI</td>
<td>Infectious Disease Institute</td>
</tr>
<tr>
<td>IPC</td>
<td>Infection Prevention and Control</td>
</tr>
<tr>
<td>IRB</td>
<td>Institutional Review Board</td>
</tr>
<tr>
<td>MDGs</td>
<td>Millennium Development Goals</td>
</tr>
<tr>
<td>MDROs</td>
<td>Multi-Drug Resistant Organisms</td>
</tr>
<tr>
<td>MoH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>NGOs</td>
<td>Non-Governmental Organisations</td>
</tr>
<tr>
<td>NICU</td>
<td>Neonatal Intensive Care Unit</td>
</tr>
<tr>
<td>PFP</td>
<td>Private For Profit</td>
</tr>
<tr>
<td>PNFP</td>
<td>Private Not for Profit</td>
</tr>
<tr>
<td>PNO</td>
<td>PrincipAL Nursing Officer</td>
</tr>
<tr>
<td>RHITES-E</td>
<td>Regional Health Integration to Enhance Services</td>
</tr>
<tr>
<td></td>
<td>In Eastern Uganda</td>
</tr>
<tr>
<td>RRHEC</td>
<td>Regional Referral Hospital Research Ethics</td>
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xv
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>SDG</td>
<td>Sustainable Development Goal</td>
</tr>
<tr>
<td>SHEA</td>
<td>Society for Healthcare Epidemiology of America</td>
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<tr>
<td>SSI</td>
<td>Surgical Site Infection</td>
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<tr>
<td>TB</td>
<td>Tuberculosis</td>
</tr>
<tr>
<td>TDF</td>
<td>Theoretical Domains Framework</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>UNCST</td>
<td>Uganda National Council for Science and Technology</td>
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<tr>
<td>VHT</td>
<td>Village Health Team</td>
</tr>
<tr>
<td>VRE</td>
<td>Vancomycin-resistant <em>Enterococcus</em></td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organisation</td>
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<tr>
<td>WHO GLASS</td>
<td>World Health Organisation Global Antimicrobial Resistance and Surveillance Use System</td>
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<tr>
<td>WHO IDSR</td>
<td>World Health Organisation Integrated Disease Surveillance Regulations</td>
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<tr>
<td>WHO MMHIS</td>
<td>World Health Organisation Multimodal Hand Hygiene Improvement Strategy</td>
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This thesis is dedicated to my mother, Ms Christine Kiwanuka, my sister Ms Angella Namabajjwe, my late grandmother Ms Christine Nabalira and my wife, Mrs Bwalya Sunkutu Kalule.
Author’s Declaration

I confirm that this dissertation is the result of my research endeavours. I also confirm that this work has not been submitted for another degree, qualification or module credit at this or any other seat of learning. Information derived from the published and unpublished work of others has been acknowledged in the text.

Signature redacted

Place and Date of Signing: Glasgow, 09 January 2023
COVID-19 Impact statement

As advised by the Institutional Review Board (IRB) authorities in Uganda, the initial plan required the researcher to gather data from facilities at more than one facility level. This was to elicit views from a diverse range of participants, including those at lower healthcare facilities such as Healthcare Centre IV (HCIV) and Health Centre III (HCIII). Additionally, this was to allow theoretical sampling and saturation as dictated by the research methodology. However, following the first period of field work, during October 2019–November 2019, this original plan became impossible, as the global COVID-19 pandemic led to border closures, travel restrictions and lockdowns, which meant that the researcher could not travel for subsequent data collection trips as originally planned. In addition, the researcher explored the possibility of conducting virtual interviews. However, healthcare workers (HCWs) prioritised the pandemic response and therefore could not have any virtual interviews. As a result, the researcher had to modify the study’s original data collection plans and objectives. A decision was made with the supervisory team to use the collected data (n = 13 interviews) as both the student and supervisory team felt that it was possible to demonstrate appropriate application of research skills and to develop an early (if not saturated) theory from this data.

Further, in choosing grounded theory originally, the researcher did not want to impose a framework on the research but instead let a theory emerge from the findings. However, with the inability to collect more data due to the COVID-19 pandemic, it was agreed with the supervisory team that in order to strengthen the utility of the research findings and to develop additional, complementary research skills, the scope of the study could be expanded. Therefore, to supplement the findings, an extra objective was added to the original research plan; ‘to apply behaviour change theory by undertaking an analysis of identified factors which may present as barriers and enablers to the implementation of IPC guidance and to make preliminary recommendations for intervention design’.

However, the context and the original aims of the study remained the same. The following content of this thesis presents the research as it was undertaken in light of the
above necessary changes.
CHAPTER ONE: INTRODUCTION

1.1 Introduction

This chapter sets the scene for the study exploring the implementation of the IPC guidance in Uganda. Although this chapter is not a formal literature review, various literature in the research area will be drawn upon to introduce the reader to this study's goal. The chapter starts with a broad overview of the thesis, the various chapters and how they are sequentially ordered before exploring the background to the study and justification for focusing on this particular area of research.

1.2 Organisation of the thesis

Chapter one presents the background to the study by exploring the literature on HAIs, risk factors of HAIs, the relationship between HAIs and AMR and the WHO IPC core components.

Chapter two presents a review of the literature through a systematised literature review that provided a broad understanding of the implementation of the WHO IPC core components and other global IPC guidance. This review identified an evidence gap within the literature that revealed a lack of robust studies without any theoretical underpinnings and a scarcity of qualitative research on this topic within Uganda and low-income countries.

Chapter three presents the study setting and context by providing information on the socio-economic status of Uganda, healthcare systems and health guidelines in Uganda while concluding with a focus on IPC structure and guidance.

Chapter four presents philosophical and methodological discussions on how the investigation was carried out and justifies the decisions that led to the selected methodology. A grounded theory approach was employed as the research
methodology, with one-on-one interviews being the data generation and collection method, resulting in a substantive theory explaining how IPC guidance is implemented within such contexts of low-income countries.

**Chapters five and six** detail how the research was conducted, how data was collected, analysed and how the theory emerged from the data. These chapters also detail the researcher’s journey of doing grounded theory research and present an overview of the developed theory.

**Chapter seven** presents the developed grounded theory; explaining the theory, categories, properties, and how they relate. This chapter also presents evidence from the data for each developed category through participant quotes.

**Chapter eight** presents the behavioural analysis of the identified factors that present as barriers and enablers to the desired behaviour of implementation of IPC guidance and makes preliminary recommendations in relation to the broad categories of intervention functions that might help improve the uptake of this guidance.

**Chapter nine** discusses the significant findings identified in chapters six and seven and how these relate to the broader literature.

**Chapter ten** provides contributions of the study to knowledge and practice, an evaluation of the theory, implications of the research, and recommendations on how IPC guidance could be better implemented.
1.3 Background

HAIs are infections that occur while receiving health care, developed in a healthcare facility within 48 hours or more after hospital admission (WHO, 2018). According to Monegro et al. (2021), these may also include infections manifesting after discharge and those acquired by healthcare workers (HCWs) because of their work. The Centres for Disease Control and Prevention (CDC) (2018) estimates that on any given day, about one in 31 (3.2%) hospital patients has at least one HAI in the US, while the ECDC (2016) estimates that at least one in 15 (6.7%) hospital patients have at least one HAI in Europe. In comparison, the WHO estimates a prevalence of 5-19% in low-income countries compared to 5-12% in high-income countries (WHO, 2015). Although data from low-middle income countries is limited, a systematic review of literature review and meta-analysis of the burden of HAIs in Southeast Asia performed on 41 studies revealed a pooled prevalence of 9% (Ling et al., 2015). Alemu et al. (2020), in a meta-analysis to estimate the nationwide burden and types of HAI in Ethiopia, reported a pooled prevalence of 16.96%. These figures are higher than those from the US and Europe, showing a disproportionate effect of HAIs in these countries.

Furthermore, although these infections are primarily experienced in hospitals, they extend to long-term community care facilities. Most of these are transmitted through cross-contamination between patients and HCWs during care delivery (Serrano et al., 2017). Additionally, the presence of indwelling catheters, intravascular devices and mechanical ventilation systems, which are valuable tools for managing and treating patients, may also lead to these unintended infections (Haque et al., 2018). These may include bloodstream, respiratory tract, urinary tract, gastrointestinal tract, and surgical site infections (Gaid et al., 2017).

These infections often result in significant patient morbidity, mortality, and prolonged duration of hospital stays and require additional diagnostic and therapeutic interventions, generating extra costs in addition to those already incurred by the patient's underlying disease and sometimes resulting in death (WHO, 2018; CDC, 2018). It is estimated that 37,000 HAI attributable deaths annually are experienced in Europe.
Although aggregate data from the U.S. is limited, data from the National and State HAI infections progress report of 2015 showed that approximately 72,000 hospital patients died with HAIs during their hospitalisations (CDC, 2016). Additionally, HAIs have financial implications, often associated with additional hospital stays and additional diagnostic tests and treatment, although these are often poorly and variably reported (Cassini et al., 2016; Sarkis Manoukian et al., 2021). However, a study by Manourkian et al. (2021) investigating the impact of all types of HAI on the inpatient cost of HAI in Scotland and the UK estimated the total annual cost to be £774 million. The ECDC estimates a yearly cost of €7 billion in Europe (ECDC, 2016). In comparison, the direct medical expenses incurred by hospitals in the U.S. have been quoted at US$28.4 billion each year (CDC, 2018).

There are also indirect costs incurred by patients and their carers, often resulting from out-of-pocket expenditures and quality of life-related consequences (Scott et al., 2019). Manoukian et al. (2021), in a study evaluating post-discharge costs associated with HAI in Scotland, estimate a £1,500 excess cost per HAI in the 90 days as patients who have had an HAI are more likely to be re-admitted and be prescribed antibiotics in the community with a complicated recovery journey. HAIs often lead to loss of HCW productivity due to absenteeism or opportunity costs due to resources being directed away from other healthcare initiatives (Haque et al., 2018). A cross-sectional study in Iran calculating absenteeism costs using the human capital approach estimated total costs due to absenteeism to be nearly $1.3 million, with an average of $671.4 per patient (Faramarzi et al., 2021). This negative impact on patients, healthcare systems and the Government is unquestionable, and any patient is at risk. However, certain factors have been shown to increase this risk (Datta et al., 2014).

**1.3.1 Risk factors for HAIs**

Risk factors tend to differ according to the country, type of healthcare facility and the care area where the patient is admitted, with differences between high-income and low-income countries noted. Literature from high-income countries cites factors such as; age above 65 years, admission as an emergency and to the intensive care unit (Datta et
al., 2014), hospital stays longer than seven days (ECDC, 2016), placement of a central venous catheter, indwelling urinary catheter, or an endotracheal tube and undergoing surgery (Klavs et al., 2016). Results from a point prevalence survey of HAI in Scotland indicate that older age is significantly associated with the prevalence of HAI (p=0.03), with residents aged 85 to 90 years having a significantly higher prevalence of HAI than residents aged less than 78 years. Having been admitted to the hospital in the last three months (p=0.005), having a urinary catheter in place at the time of the survey (p=0.02), and having any wounds (pressure sores or other wounds) (p=0.02) were all independently associated with a higher prevalence of HAI (Cairns et al., 2017).

These risk factors are generally similar in low and middle-income countries. A longitudinal study to determine the incidence, prevalence, and risk factors of HAI in Ethiopia revealed a high risk among patients who underwent a surgical procedure and those with a history of previous hospitalization (ARR = 1.65, 95% C.I:1.07, 2.54). On the other hand, young adults (18 to 30-year-old) had a lower risk of developing HAI (ARR = 0.54 95% C.I: 0.32,0.93). Likewise, among non-surgical care groups, the risk of HAI was found to be high in patients with chest tubes (ARR = 4.14, 95% C.I: 2.30,7.46), on mechanical ventilation (ARR = 1.99, 95% C.I: 1.06,3.74) and with underlying disease (ARR = 2.01, 95% C.I: 1.33,3.04) (Ali et al., 2018). However, factors associated with poverty such as limited resources (Allegranzi et al., 2011), lack of basic hygiene, age under one year, low birth weight, malnutrition, parenteral nutrition and underlying diseases have been reported to increase the risk in such countries (Ling et al., 2015). A prospective study to determine the incidence and risk factors of HAIs among pediatric patients in Ethiopia found that children with underlying disease conditions of severe acute malnutrition (adjusted RR: 2.83, 95% CI 1.61 to 4.97) had higher risks of developing an HAI. Because of these factors, there is a disparate effect of HAIs in such countries.

**1.3.2 HAIs and Antimicrobial Resistance (AMR)**

The challenge of AMR is closely linked to HAIs. HAIs are often caused by resistant bacteria, but the occurrence of an HAI in the first place can also increase the risk of
developing resistant strains. An analysis of clinical studies and national reports by Henriksen et al. (2019) revealed a strong association between the prevalence of Acinetobacter spp. and rates of resistance against third generation among Enterobacteriaceae. The burden of resistance is likely to increase with an increased rate of HAIs and antibiotic usage. According to the WHO (2015), AMR develops when bacteria adapt and grow in the presence of antibiotics. Nearly 8% of hospitalised patients develop an HAI, 20% of which could be caused by a multidrug-resistant organism (ECDC, 2016). This problem is worsened by the continued misuse and overuse of these drugs globally in human medicine and food production (WHO, 2015).

A report from the English surveillance programme for antimicrobial utilisation and resistance shows there were an estimated 65,162 AMR infections diagnosed in 2019, up from 61,946 in 2018 (UKHSA, 2021). While a report from the CDC showed a rise of 15% in AMR infections starting during hospitalization from 2019 to 2020 (CDC, 2022). Such increases in AMR continue to drastically reduce the efficacy of antibiotics in treating infections, worsened by the rise of resistant strains of pathogens like Staphylococcus aureus, Enterobacteriaceae, Acinetobacter Baumannii, and more recently, untreatable strains of Carbapenem-resistant Enterobacteriaceae and Vancomycin-resistant Enterococci (VRE) (O’Neill, 2019). The direct consequences of infection from such resistant pathogenic organisms can be severe, often leading to longer duration of illness among patients, higher rates of mortality, extra costs of treatment, and inability to carry out procedures that rely on effective antibiotics to prevent infection (Murray et al., 2022). Approximately 35,000 deaths annually have been reported as a direct consequence of resistant infections in the U.S. (CDC, 2019) and 25,000 deaths annually reported in Europe (ECDC and WHO, 2022). Therefore, there is a need to develop effective interventions to prevent the further development and spread of multidrug-resistant organisms, one of which is the prevention of HAIs through effective IPC practices. However, poor IPC practices may contribute to increased resistance and loss of life as illustrated in figure 1.
It is estimated that about a third of HAIs could be prevented if critical components of infection control were adequately introduced and followed (WHO, 2016). The WHO defines infection prevention and control (IPC) as a practical, evidence-based approach that prevents patients from being harmed by avoidable infections (WHO, 2018). It is now widely accepted that IPC should include effective hygiene, effective IPC measures, pertinent diagnostics and appropriate use of antibiotics (WHO, 2016). However, there is a large variability in how successful countries and hospitals implement IPC programmes to protect patients against HAIs (Hale et al., 2015). As such, guidelines such as the Core Infection Prevention and Control Practices for Safe Healthcare Delivery in All Settings by the CDC (2015), Guidelines on Core Components for Infection Prevention and Control Programmes by the WHO (2016), Infection Prevention and Control in Healthcare by the ECDC (2013) and the Infection Control for the Asian healthcare work by the Asian Pacific Society of Infection Control (APSIC) (2022) have been published to ensure less variability.
However, challenges lie with general awareness and effective implementation into practice which has seen infection rates of HAIs and multi-drug resistant organisms continue to rise (Wushouer et al., 2017). Therefore, with the increasing reliance on unified guidelines to improve patient safety and healthcare effectiveness, research on this topic was needed. Notably, the last decade has seen an increase in IPC research, leading to the publication of many IPC recommendations and guidelines at global, national, and local levels. To this end, research in this area was required on implementation strategies to ensure less variability and greater implementation success.

1.4 The WHO core components of IPC programmes at the national and acute healthcare facility level

To ensure less variability in IPC practice and tackle the increasing challenges in HAIs and AMR, the WHO released evidence-based recommendations in 2016 (Table 1) that include national components and healthcare facility strategies for preventing HAIs and controlling the spread of infections within healthcare facilities (Storr et al., 2017). This was a significant development from earlier guidance because it was evidence-based. If implemented successfully, these recommendations should reduce HAIs, significantly reducing antimicrobial demand and impacting morbidity, mortality and healthcare costs worldwide (WHO, 2016). However, the mere presence of these guidelines does not suffice for successful IPC, with implementation likely to vary across different settings and contexts. Therefore, research into the implementation of guidelines was needed to generate evidence that will inform future implementation strategies.
<table>
<thead>
<tr>
<th>Core component 1: Infection prevention and control programmes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a. Health care facility level</td>
</tr>
<tr>
<td>1b. National level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core component 2: National and facility level infection prevention and control guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence-based guidelines should be developed and implemented for the purpose of reducing HAI and AMR. The education and training of relevant health care workers on the guideline recommendations and the monitoring of adherence with guideline recommendations should be undertaken to achieve successful implementation. <em>(Strong recommendation, very low quality of evidence)</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core component 3: Infection prevention and control education and training</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a. Health care facility level</td>
</tr>
<tr>
<td>3b. National level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core component 4: Health care-associated infection surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a. Health care facility level</td>
</tr>
<tr>
<td>4b. National level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core component 5: Multimodal strategies for implementing infection prevention and control activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a. Health care facility level</td>
</tr>
<tr>
<td>5b. National level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core component 6: Monitoring/audit of IPC practices and feedback and control activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a. Health care facility level</td>
</tr>
<tr>
<td>6b. National level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core component 7: Workload, staffing and bed occupancy at the facility level</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following elements should be adhered to in order to reduce the risk of HAI and the spread of AMR: (1) bed occupancy should not exceed the standard capacity of the facility. (2) health care worker staffing levels should be adequately assigned according to patient workload. <em>(Strong recommendation, very low quality of evidence)</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core component 8: Built Environment, materials and equipment for IPC at the facility level</th>
</tr>
</thead>
<tbody>
<tr>
<td>8a. General principles</td>
</tr>
<tr>
<td>8b. Materials, equipment and ergonomics for appropriate hand hygiene</td>
</tr>
</tbody>
</table>

**Table 1:** WHO core components for IPC programmes. Adapted from Storr et al. (2017)
1.5 Summary

This chapter has provided a broad overview of the thesis’s genesis and sketched out an outline of the thesis, providing a general overview of the background and contributing risk factors for HAIs. The relationship between HAIs and AMR and a background on the WHO IPC core components have also been explored. The chapter also outlines the current problem of HAIs and their potential consequences for patients, hospitals and governments.

Increasingly, there is a need for research into the WHO IPC core components, particularly in the global south, to develop interventions that can successfully embed this guidance within such healthcare systems and contexts. The next chapter provides the literature review process that identified the research gap for this study.
CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature concerning the implementation of the WHO IPC core components. The chapter proceeds to delineate the adopted search strategy before critically appraising and synthesising relevant studies, identifying gaps in the evidence base and methodologies used. As part of this appraisal and synthesis of the research studies, each was analysed, results reported according to PRISMA guidelines (Page et al., 2021) and the critical findings summarised in tabulated and narrative format.

To capture a broad understanding of the implementation of the WHO IPC core components, the following questions were considered relevant for the review:

- What research has been conducted on the implementation of the WHO IPC core components?
- What methods have been used in the research on the implementation of the WHO IPC core components?
- How have the WHO IPC core components been implemented?
- What is the quality of the research on the implementation of the WHO IPC core components?
- What gaps exist in the literature on the implementation of the WHO IPC core components?

2.2 Methodology

A systematised literature review to address the above questions was conducted starting in February 2018 and concluded at the end of March 2018. According to Grant and Booth (2009), a systematised literature review allows the author to demonstrate an awareness of the entire process and technical proficiency in the component steps of a systematic
review. However, such a review falls short of claiming the comprehensiveness fundamental to the systematic review method. Grant and Booth add that this review may form the basis for a more extensive piece of work, a dissertation, or be used when there is a lot of variability among studies. To this end, due to the heterogeneity within the identified body of literature, the evidence required to address the review questions was not suitable for conducting a systematic review. As such, a systematised literature review was conducted which served as a basis for this thesis.

### 2.2.1 Search Strategy

A search strategy was developed to address the search questions. However, it was vital to create keywords before embarking on the search. Bramer (2018) highlights that keywords are important as they determine the range of results from each resource, and these results reflect the remit of the research questions. A search tool was used to identify the keywords. However, different search tools exist, such as PICO, PICOS and SPIDER. A systematic review comparing various tools showed that there is a more significant number of hits from the PICO searches compared to the SPIDER and PICOS searches, with greater sensitivity (Methley et al., 2014). For this reason and considering the need for a comprehensive search, the PICO framework was used to develop keywords to facilitate the search, as shown in Table 2 below.

<table>
<thead>
<tr>
<th>Population</th>
<th>Interest</th>
<th>Context</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection Prevention</td>
<td>WHO IPC core components</td>
<td>Any healthcare setting at a local, national or global level</td>
<td>Implementation</td>
</tr>
<tr>
<td>and control</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2: PICO framework for search questions**

Four domains were identified using the PICO framework to help structure the search strategy; a fifth domain on study design was added to capture empirical studies. Key terms were developed for each domain, and synonyms were sought using Google’s search engine and a thesaurus. A series of tests of the search strategy was done using the MEDLINE database through the EBSCO gateway using developed keywords and synonyms to refine search terms and add Medical Subject Headings (MeSH) terms.
Following this process, MeSH terms such as ‘universal precautions’, ‘health plan implementation’ and ‘communicable disease control were added to the search strategy.

Further reading around the concepts of implementation and guidelines was done to understand the different meanings used in various literature. This helped refine search terms with words such as "adoption", and "uptake" added. Boolean operators "AND" and "OR" were used to combine and widen terms during the search (Grewal et al., 2016). Truncations and wildcards were used to search for different variations of the terms, which allowed different variants and spellings of a word to be searched (Satapathy et al., 2010). A generic search strategy was developed by combining keywords and their synonyms with boolean operators while using wildcards and truncations, as shown in Table 3. However, this was adapted according to the functionality of each database searched. An extract from the MEDLINE database in Appendix I shows how these terms were operationalised.
<table>
<thead>
<tr>
<th>Population</th>
<th>(MH &quot;infection control&quot; OR &quot;infection prevention and control&quot; OR &quot;infection prevention &amp; control&quot; OR &quot;IPC&quot; OR &quot;infection prevention&quot; OR “infection control*&quot; OR &quot;communicable disease prevention and control&quot; OR MH &quot;communicable disease control&quot; OR “nosocomial infection prevention and control” OR “nosocomial infection prevention &amp; control” OR “nosocomial infection prevention” OR “nosocomial infection control” OR MH &quot;Cross Infection+/PC&quot; OR “cross-infection prevention and control” OR “cross-infection prevention &amp; control” OR “HAI prevention and control” OR “Universal precautions” OR MH &quot;Universal Precautions&quot; OR &quot;infectious disease prevention and control&quot; OR infectious disease prevention &amp; control&quot; OR “infectious disease control” OR “infectious disease prevention”):ti,ab</th>
</tr>
</thead>
<tbody>
<tr>
<td>AND</td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>(MH &quot;Guideline&quot; OR guide* OR recommendation* OR &quot;consensus statements&quot; OR regulation* OR MH &quot;Policy&quot; OR policy OR policies OR directive* OR advice OR strategy OR strategies OR standard* OR protocol* OR guidance):ti,ab</td>
</tr>
<tr>
<td>AND</td>
<td></td>
</tr>
<tr>
<td>Context</td>
<td>(global* OR &quot;international*&quot; OR world* OR worldwide or universal* OR transnational* OR multinational* OR intercontinental* OR transcontinental* OR general*):ti,ab</td>
</tr>
<tr>
<td>AND</td>
<td></td>
</tr>
<tr>
<td>Outcome</td>
<td>(implement* OR adoption OR execute* OR execution* OR uptake OR Acceptability OR &quot;put into effect&quot; OR &quot;Put into use&quot;):ti,ab</td>
</tr>
<tr>
<td>AND</td>
<td></td>
</tr>
<tr>
<td>Study design</td>
<td>MH (&quot;Qualitative Research&quot; OR qualitative OR quantitative OR “mixed method” OR “case report” OR “case series” OR MH &quot;Case Reports&quot; OR MH &quot;Cohort Studies&quot; OR cohort OR “prospective cohort” OR “retrospective cohort” OR MH &quot;Retrospective Studies&quot; OR MH &quot;Prospective Studies&quot; OR “time series analysis” OR MH &quot;Interrupted Time Series Analysis&quot; OR “cross-sectional” OR MH &quot;Cross-Sectional Studies&quot; OR “longitudinal” OR MH &quot;Longitudinal Studies&quot; OR “case-study” OR MH &quot;Case-Control Studies&quot; OR “case-control” OR “observational study” OR “ecological study” OR “population study” OR “randomised control trial” OR MH &quot;Randomized Controlled Trial&quot; OR “non-randomised control trial” OR “interrupted time series” OR “systematic review” OR &quot;before and after&quot; OR MH &quot;Controlled Before-After Studies&quot;):ti,ab</td>
</tr>
</tbody>
</table>

Table 3: Generic search strategy
2.2.2 Area of Interest

The review focused on the implementation of WHO the IPC core components. Due to the different definitions and meanings of implementation and guidelines used in the literature, it was essential to define and operationalise these concepts for this review.

From the literature, two concepts of implementation were identified. First, implementation involves putting the actual plan, knowledge, or findings into practice (Proctor et al., 2011; Peters et al., 2013). Peters et al. (2013) explain that this may cover aspects ranging from the process, impact, efficacy, efficiency, adoption, uptake and evaluation. The second concept identified from the literature was ‘implementation research’, which is the study of how evidence-informed interventions are put into practice in real-world settings (Bauer et al., 2015). This involves understanding how these plans produce effects or change in the defined context. Detailed mapping of these concepts is shown in Appendix II. For this review, implementation was described as the transfer of an idea that works across many people. Any studies that addressed any aspects highlighted by Peters et al. (2013) were included.

It was also important to define the concept of ‘guidelines’ given its versatility and use in literature. Several related words and concepts, such as policy, standard, and recommendations, are often used synonymously with guidelines and interchangeably. The 28th Bethesda Conference on Practice Guidelines and Quality of Care defines guidelines as a related set of generalisations derived from past experiences arranged in a coherent structure to facilitate appropriate responses to specific situations (James et al., 1997). In contrast, Hurwitz et al. (1998) define guidelines as a collection of recommendations embodying specific standards of clinical management. Based on the different definitions, it’s clear that guidelines are intended to help health service providers, patients, and the government deliver the best possible solution for a health problem. These could take any of these forms; policy, protocols, guidelines or standards, depending on whether they are mandatory or required by law (WiPP, 2006). Therefore, for purposes of this review, guidelines were defined as a collection of statements intended to provide alternatives with benefits to health workers, patients and policymakers when providing or receiving healthcare and could take any form, as
suggested by WiPP (2006). Any study identified should have addressed IPC core components on issues such as bloodstream infection control guidelines, hand hygiene guidelines, surgical site infections guidelines, tuberculosis control policies or strategies and antimicrobial control policies. However, for studies to be included, the guidelines must be developed by an organisation prominent in the global health field with a broad global reach, such as the WHO, the CDC and the European Centre for Disease Control (ECDC). Guidelines developed by societies such as the APSIC, ICAN and Society for Healthcare Epidemiology of America (SHEA) were excluded as these do not necessarily have a wide global reach and are often considered expert opinion.

2.2.3 Sources of literature

Online databases were the primary source of literature as they allowed access to research articles which would have been more difficult if physical library catalogues had been used (Stansfield et al., 2016). A snowballing strategy was adopted to supplement the search, which involved reviewing relevant material cited in the retrieved articles. This process involved looking at reference lists of relevant articles to select those that met the inclusion criteria. Although time-consuming, this technique picked up relevant papers not displayed in the search results (Felizardo et al., 2016).

Five databases were searched; MEDLINE, PubMed, Cochrane, PsycINFO and CINHAL. MEDLINE and PubMed were chosen because they cover a wide selection of allied health and nursing journals covering particular infection prevention and control issues relevant to the search (Wright et al., 2015). These also offer integrated access to high-quality literature. The Cochrane library was chosen because it provides access to trials through the Cochrane Central Registry of Clinical Trials. CINHAL was selected because it is a good source of qualitative evidence, particularly in nursing, relevant to the review (Wright et al., 2015). Although predominantly a psychology database, PsycINFO was used because it could extract literature addressing behavioural barriers and facilitators to implementation that are relevant to the search questions. In summary, all these databases are well-established, multidisciplinary research platforms, holding a wide
variety of peer-reviewed journals with indexes that allow rapid and efficient access to ordered records.

2.2.4 Inclusion and exclusion criteria

The inclusion and exclusion criteria provided a basis for the reviewer to draw valid and reliable conclusions (Tables 4 and 5) to guide the retrieval and assessment of identified studies (Condron, 2021). Hornberger and Rangu (2020) add that these set the boundaries of the review which minimises ambiguity and increases reproducibility.

<table>
<thead>
<tr>
<th>Population</th>
<th>Studies on infection prevention and control practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest</td>
<td>Studies addressing implementation of WHO IPC core components</td>
</tr>
<tr>
<td>Context</td>
<td>All settings i.e. international, national, community and healthcare facilities</td>
</tr>
<tr>
<td>Outcome</td>
<td>Studies with any aspect of implementation</td>
</tr>
<tr>
<td>Study designs</td>
<td>All study designs</td>
</tr>
</tbody>
</table>

Table 4: Inclusion criteria

Since the focus was on the WHO IPC core components, it was important not to put any limitations on context. Therefore, the review focused on studies conducted across any health facility, national or international level settings covering any geographical location.

**Exclusion Criteria**

- Papers that are not empirical studies, such as opinion pieces, commentary pieces, and papers with no research components
- Studies covering IPC guidelines developed and adopted by a single country, or organisation
- Studies not dealing with implementation
- Clinical audits
- Animal studies and simulation studies
- Guidelines from infection control societies

Table 5: Exclusion Criteria
2.2.5 Study designs and limitations applied

The review included only empirical studies with study designs that include quantitative, qualitative and mixed-method designs. To be as inclusive as possible, there was no limitation on the language of the study or the availability of full text and publication year. The Cochrane Handbook for Systematic Reviews of Interventions (2022) recommends that date restrictions should be applied only if it is known that relevant studies could only have been reported during a specific period. Although this likely led to the identification of a large number of records, care was taken to ensure that these were properly screened. Additionally, as the first guidelines for the prevention and control of nosocomial infections were developed before 1990, there was no limitation on the year of publication.

2.3 Data management strategy

2.3.1 Data extraction

A data form adapted from the NICE Dementia study (2007) was used due to the heterogeneity of study designs among the included papers. Although other tools were available, this form allowed to extract as much information as possible with greater flexibility. The data extraction process was iterative, and the reviewer moved between reading the full text of the publications and retrieving relevant data as described by Noyes et al. (2018). Extracting information included; study aims, context, sample recruitment, methods, ethical considerations, guidelines implemented, process of implementation and findings. These were tabulated as shown in Appendix III.

2.3.2 Critical Appraisal

Critical appraisal is the process of carefully and systematically examining research to judge its trustworthiness, value and relevance in a particular context (Tod et al., 2021).
It allows for evaluating the appropriateness of the study design for the research question and a careful assessment of the key methodological features of the study design. Ferreira and Patino (2018) note that not all research is good quality, and often many studies are biased, which can lead to false conclusions. To this end, it is always important to carry out a critical appraisal of the literature. However, Katrak et al. (2004) noted in a systematic review of critical appraisal tools that there are many guidelines and assessment tools that provide a structured approach to the critical appraisal process, but no "gold-standard" instrument exists for any study design, nor is there any widely accepted generic tool that can be applied equally well across different study types. Therefore, as qualitative and quantitative studies come from different research paradigms with different underlying principles, critical appraisal tools were adapted according to the study design. These are explained in the following sections.

2.3.2.1 Quantitative study tool

Two different tools were used as the included studies had two main types of quantitative study designs; cross-sectional and quasi-experimental (non-control before and after studies). The AXIS tool by Downes et al. (2016) (Appendix IV) was used for cross-sectional designs as it was designed explicitly to assess cross-sectional studies to address the quality of the study design, reporting and to identify the risk of bias in such study designs. The Quality Assessment Tool for Before-After studies with No Control Group by the National Heart and Lung Institute (2014) (Appendix V) was used for quasi-experimental designs to address concepts that were key to the study’s internal validity and was the only one used that gave grading, e.g., moderate risk, high risk and low risk of bias. Although these tools are not validated, they contain concepts critical for the appraisal of the internal validity of the specific study designs (Harrison et al., 2016). Consideration was given to the standard quality assessment tools developed by Kmet et al. (2004) and the EPHP (1998), as these could have been used in both types of quantitative studies. However, using a tool designed for a specific study design was essential. Although using a validated tool like the CASP would have been preferable, none of these were considered relevant for the specific study designs of the included papers.
However, quality assessment tools, including those chosen for this review, have often been criticised for limiting assessments to mere checkboxes. This potential limitation was overcome by using guidance documents provided with the tools and providing comments for each decision to maximise reliability and validity. Additionally, the issue of no weighting attached to the importance of each question in these tools is often raised as in the AXIS tool. As the tool does not provide a numerical scale for assessing the quality of the study, a degree of subjective assessment is required (Downes et al., 2016). However, the AXIS tool had the extra benefit of assessing each aspect of the study design to give an overall assessment of the quality of the study. By providing this subjectivity, AXIS allowed more flexibility in incorporating quality of reporting and risk of bias when making judgements on the quality of the evidence. Additionally, Harrison et al. (2016) emphasize that each question in a tool is just as important, which minimizes bias during assessment (Harrison et al., 2016).

2.3.2.2 Qualitative study tool

Although several tools exist for appraising qualitative research, the availability and possibility of selecting a previously validated tool to increase the reliability and dependability of the review findings meant that the CASP tool (2018) (Appendix VI) for qualitative research was selected. Additionally, this tool requires the assessor to add comments to justify their decision-making, thus making the assessment more transparent.

2.3.3 Data synthesis

The extracted data were synthesised in such a way as to answer the research questions for this review and to assemble the literature being reviewed for the area of interest (Booth, 2011). Narrative synthesis, as described by Mays et al. (2005), was applied. It involved using the extracted information about the studies, including intervention, population, context, sample recruitment, outcomes, and study quality, and presenting it in a consistent way according to research questions.
2.4 Results

A total of 7,168 articles were retrieved from the different databases, with a breakdown shown in table 6.

<table>
<thead>
<tr>
<th>Databases</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDLINE</td>
<td>299</td>
</tr>
<tr>
<td>CINHAL</td>
<td>73</td>
</tr>
<tr>
<td>PubMed</td>
<td>5817</td>
</tr>
<tr>
<td>Web of Science</td>
<td>698</td>
</tr>
<tr>
<td>Cochrane</td>
<td>241</td>
</tr>
<tr>
<td>PsycINFO</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7,168</strong></td>
</tr>
</tbody>
</table>

Table 6: Results from the database search

2.4.1 PRISMA

In selecting studies for inclusion, the PRISMA flow diagram (Figure 1) was used to guide this process. This process was managed through RefWorks referencing software.
2.4.2 Study selection

The screening was done by one reviewer using a web-based application called Rayyan.qcri. The process started with screening for duplicates, with a total of 973 duplicates removed, leaving a balance of 6,195 articles. This was followed by screening using titles and abstracts for relevant papers that met the inclusion criteria. This process excluded 6,011 articles, leaving 184 studies for full-text review.

Figure 2: PRISMA diagram showing search results
Using full-text screening, 164 studies were excluded based on the inclusion and exclusion criteria. Twenty studies that met the inclusion criteria were subsequently included for data extraction. By applying snowballing by reviewing the reference lists of the 20 included studies, three more studies were identified that met the inclusion criteria and were included for data extraction, bringing the final number to 23 studies.

2.5 Overview of included studies

This section describes the characteristics of the studies, followed by a summary of the included studies.

2.5.1 Publication year

The studies identified were published between 1987 – 2018, as shown in Table 7. Notably, most studies (n=18/23, 78.3%) were from the last decade (2010-2018). This increase in published literature indicates that there has been a growth in interest in this area since 2010-18.

<table>
<thead>
<tr>
<th>Year category</th>
<th>1980’s</th>
<th>1990’s</th>
<th>2000’s</th>
<th>2010-2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>Percentage</td>
<td>4.3%</td>
<td>8.7%</td>
<td>8.7%</td>
<td>78.3%</td>
</tr>
</tbody>
</table>

Table 7: Year distribution of included studies

2.5.2 Geographical location of the included studies

Table 8 shows the geographical distribution of the studies. Seven (30.4%) of the 23 selected studies were from Africa (Reid et al., 2012; Schmitz et al., 2014; Uneke et al., 2014; Pfafflin et al., 2017; Mugomeri, 2018). This large percentage emphasises the importance of this topic in this region of the world. Additionally, the bulk of these studies addressed Tuberculosis Control (TB) control, thus highlighting the significance of
TB in this part of the world. Three (13%) studies were conducted in multiple countries, highlighting potentially the lack of research investigating the extent to which these guidelines are implemented globally (Raviglione et al., 1997; Reid et al., 2012; Allegranzi et al., 2013).

<table>
<thead>
<tr>
<th>Location</th>
<th>Africa</th>
<th>America</th>
<th>Middle East</th>
<th>Asia</th>
<th>Europe</th>
<th>Multiple</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Studies</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Percentage</td>
<td>30.4%</td>
<td>17.3%</td>
<td>13%</td>
<td>13%</td>
<td>13%</td>
<td>13%</td>
</tr>
</tbody>
</table>

Table 8: Geographical location of included studies

2.5.3 Research methods of included studies

Only empirical studies from peer-reviewed journals were included in the review. Table 9 shows the type of study according to study designs. Studies were quantitative and qualitative, with 21 (91.3%) quantitative and 2 (8.7%) qualitative; 13 (56.5%) of the 21 quantitative studies had a quasi-experimental design (non-control before and after), and 8 (34.8%) studies had a cross-sectional design which showed a dearth of randomised trials and qualitative studies.

<table>
<thead>
<tr>
<th>Study design</th>
<th>Number of papers</th>
<th>Percentage</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>(non-control before and after)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross-sectional</td>
<td>8</td>
<td>34.8%</td>
<td>Malangu &amp; Mngomezulu 2015; Allegranzi et al. 2014; Reid et al. 2012; Elaine et al. 2007; Shai et al. 2004; Raviglione et al. 1997; Birnbaum et al. 1990; Celentano et al. 1987.</td>
</tr>
<tr>
<td>Qualitative</td>
<td>2</td>
<td>8.7%</td>
<td>Mugomeri 2018; Mandyata et al. 2017</td>
</tr>
</tbody>
</table>

Table 9: Research designs of included studies
2.5.4 Guidelines covered

The included studies covered the WHO IPC core components and other global IPC guidelines, namely; WHO Integrated Disease Surveillance Guidelines (IDSR), Hand Hygiene Guidelines in Health Care, WHO TB Control Policy, WHO Guidelines on Global Antimicrobial Resistance Surveillance System (GLASS), and CDC Guidelines on Prevention and Control of Nosocomial Infections. Hand hygiene guidelines had the most extensive coverage (60.9%) within the literature, as shown in Table 10. This proportion of studies emphasises the global importance of hand hygiene in IPC.

<table>
<thead>
<tr>
<th>Type of guideline</th>
<th>No. of papers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Hygiene guidelines</td>
<td>14</td>
<td>60.9%</td>
</tr>
<tr>
<td>Nosocomial/ Infection prevention and control</td>
<td>3</td>
<td>13%</td>
</tr>
<tr>
<td>TB control Policy</td>
<td>3</td>
<td>13%</td>
</tr>
<tr>
<td>IPC core components</td>
<td>1</td>
<td>4.4%</td>
</tr>
<tr>
<td>GLASS</td>
<td>1</td>
<td>4.4%</td>
</tr>
<tr>
<td>IDSR</td>
<td>1</td>
<td>4.4%</td>
</tr>
</tbody>
</table>

Table 10: Type of guidelines from included studies

Notably, the guidelines covered in the studies were produced by two international health organisations, the WHO and the CDC, with the majority (82.6%) of studies conducted on guidance produced by the WHO, as shown in Table 11. This shows the potential role these organisations play in producing global health guidance.
2.5.5 Implementation of intervention strategies

Implementation of intervention strategies varied among studies. Twelve of the 23 studies focused on implementing the WHO hand hygiene guidelines, and these utilised the WHO multimodal hand hygiene improvement strategy (WHO MHHIS), consisting of 5 components; system change, training and education, evaluation and feedback, reminders in the workplace and institutional safety climate (WHO, 2009). This strategy was often applied through a five-stage process; facility preparedness, baseline evaluation, implementation, follow-up and evaluation and review and planning. Five studies (Allegranzi et al., 2010, 2013, 2014; Arntz et al., 2016; Moro et al., 2017) implemented the WHO MMHIS strategy without any modifications. However, seven studies implemented the strategy variably with some changes or adaptations. Two studies (Uneke et al., 2014; Farhoudi et al., 2016) from low-middle-income countries could not afford alcohol-based hand rubs (ABHR) at every point of care. Therefore, they had to do with what was available including placing only one unit per ward. Schmitz et al. (2014) decided to adapt the strategy to three components; system change, evaluation and feedback and reminders at the workplace, instead of the usual five components of the WHO MHHIS. Farhoudi et al. (2016) adapted the strategy by enrolling nursing staff on IPC courses twice a year, using billboards instead of posters as

<table>
<thead>
<tr>
<th>WHO – 19 papers</th>
<th>IPC core components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hand Hygiene guidelines</td>
</tr>
<tr>
<td></td>
<td>IDSR</td>
</tr>
<tr>
<td></td>
<td>GLASS</td>
</tr>
<tr>
<td>CDC – 4 papers</td>
<td>Guidelines on prevention and control of nosocomial infections</td>
</tr>
<tr>
<td></td>
<td>Hand Hygiene guidelines</td>
</tr>
</tbody>
</table>

Table 11: Guidelines covered
reminders, with the view that the billboards would be more durable. Al Kuwaiti (2017) and Chen et al. (2016) added a strict visitors policy that included HH training for hospital visitors. Chun et al. (2016) slightly changed the education and training component by using a web-based learning programme on hand hygiene which was compulsory for all participating health workers, while Mestre et al. (2012) included a quality improvement tool to sustain compliance. Päfflin et al. (2017) emphasised the use of gloves in addition to the use of ABHR. This shows how flexible and adaptable the WHO MHHIS is. However, the downside is that the hand hygiene strategy was not implemented in a consistent manner, and therefore it was not appropriate to compare studies.

Of the 11 studies that did not utilise the WHO MHHIS strategy, three did not describe the process of implementation (Reid et al., 2012; Birnbaum et al., 1990; Raviglione et al., 1997). Others varied in how they described the implementation process; for example, Celentano et al. (1987) described the process as simply having the recommended guidelines documents supported by a policy conforming to this. Mugomeri (2018) and Mandyata et al. (2017) implemented IPC guidance through health system structures like the Ministry of Health, provincial health officer, district health management team, public and private health facilities. In the study by Larson et al. (2007), implementation of the CDC HH guidelines involved a change in hand hygiene policies, the presence of recommended products and holding multidisciplinary meetings in sampled healthcare facilities. Similarly, Shai et al. (2004) implemented IPC measures through providing gloves, promoting HH, cleaning and disinfecting after each patient.

In comparison, in implementing the WHO GLASS, Sirijatuhat et al. (2018) developed a web application to transfer blood culture specimen data and capture clinical data of patients with positive blood cultures. Infection control nurses and physicians input these data at the hospital wards via smartphones. Malangu and Mngomezulu (2015) explored the implementation of the WHO TB control policy through ensuring that administrative measures were in place, establishment of committees, separation of suspected patients, adequate ventilation systems in place, use of protective equipment and presence of hospital TB control policy.
2.5.6 Outcome measures

Outcome measures varied among studies. Eleven out of 23 studies measured implementation success using changes in compliance rates (Mestre et al., 2012; Allegranzi et al., 2013; Schmitz et al., 2014; Uneke et al., 2014; Arntz et al., 2016; Chen et al., 2016; Chun et al., 2016; Farhoudi et al., 2016; Al Kuwaiti, 2017; Moro et al., 2017; Pfafflin et al., 2017). These studies reported improvements in compliance rates, ranging from 1.4% to 92.2% after the implementation of the WHO MHHIS (Table 12).

<table>
<thead>
<tr>
<th>Study</th>
<th>Average baseline compliance rates</th>
<th>Average final compliance rate (%)</th>
<th>Percentage change in compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mestre et al., 2012</td>
<td>57.0%</td>
<td>87.0%</td>
<td>30.0%</td>
</tr>
<tr>
<td>Allegranzi et al., 2013</td>
<td>54.3%</td>
<td>68.5%</td>
<td>14.2% ** High income countries</td>
</tr>
<tr>
<td></td>
<td>22.3%</td>
<td>46.1%</td>
<td>23.8% *Low income countries</td>
</tr>
<tr>
<td>Schmitz et al., 2014</td>
<td>2.1%</td>
<td>12.7%</td>
<td>10.6%</td>
</tr>
<tr>
<td>Uneke et al 2014</td>
<td>No baseline</td>
<td>65.3%</td>
<td></td>
</tr>
<tr>
<td>Chen et al., 2016</td>
<td>62.3%</td>
<td>73.3%</td>
<td>11.0%</td>
</tr>
<tr>
<td>Chun et al., 2016</td>
<td>33.2%</td>
<td>92.2%</td>
<td>59.0%</td>
</tr>
<tr>
<td>Farhoudi et al., 2016</td>
<td>29.8%</td>
<td>71.0%</td>
<td>41.2%</td>
</tr>
<tr>
<td>Kuwaiti et 2017</td>
<td>50.2%</td>
<td>71.5%</td>
<td>21.3%</td>
</tr>
<tr>
<td>Moro et al., 2017</td>
<td>40.0%</td>
<td>63.0%</td>
<td>23.0%</td>
</tr>
<tr>
<td>Pfaffin et al., 2017</td>
<td>1.4%</td>
<td>13.1%</td>
<td>11.7%</td>
</tr>
</tbody>
</table>

Table 12: Comparison of compliance rates across studies

The studies were not entirely comparable, as one did not measure baseline compliance rates (Uneke et al., 2014). However, a summative comparison shows that the most significant percentage change in compliance was noted in the study by Chun et al. (2016), while the smallest percentage change was pointed out in the study by Schmitz et al. (2014). The lowest overall compliance rates were reported by Schimtz et al. (2014), while the highest overall compliance rates were reported by Chun et al. (2016). The differences in the compliance rates do not necessarily mean the WHO MHHIS was implemented better in such studies, but the variation in study contexts, settings, and
implementation could have contributed to the observed differences in compliance rates.

Additionally, five of these 11 studies used changes in HAI rates as an additional outcome measure (Mestre et al., 2012; Allegranzi et al., 2013; Chen et al., 2016; Chun et al., 2016). All these studies showed a general reduction in HAI rates following implementation. Chun et al. (2016) added cost savings as an outcome measure, savings outweighing the intervention costs and cost-benefit of $5.08. The findings of this study revealed that cost savings outweighed implementation costs. Four studies used the change in knowledge awareness and perception as an additional outcome measure (Allegranzi et al., 2010, 2013; Moro et al., 2017; Pfäfflin et al., 2017). In these studies, an increase in knowledge awareness and change in perception was reported. This was associated with increased compliance, with the average knowledge score rising from 18.7 to 24.7 after education.

While implementing the CDC HH guidelines, Larson et al. (2007) used implementation scores and HAI rates as outcome measures. In this study, an implementation score of 12 was considered the highest level of implementation progress; however, the findings revealed a mean score of 10.5 among surveyed hospitals with overall reduced HAI rates post-implementation. Celentano et al. (1987) measured implementation using diffusion and adoption rates. Findings revealed 84% - 94% diffusion rates and adoption rates 22.9% - 78.4% among surveyed hospitals. Similarly, Birnbaum et al. (1990) used adoption rates as an outcome measure, revealing a rate of 64.4%. Allegranzi et al. (2014) used the hand hygiene self-assessment framework score to establish implementation progress. The findings revealed a mean score of 373.2, indicating intermediate to advanced progress, citing infection prevention staffing as a success factor.

Three studies looked at the extent of implementation of the WHO TB strategies. These studies measured implementation by the presence of at least one strategy document from the surveyed sites. However, the mere presence of a document does not mean the intervention was implemented. The findings revealed few sites had implemented all the control measures. This varied depending on the size of the facility, with smaller facilities
implementing fewer to no measures compared to larger facilities (Raviglione et al., 1997; Reid et al., 2012; Malangu and Mngomezulu, 2015). This was because resources available to health facilities varied, with smaller facilities having fewer resources at their disposal and ultimately affecting implementation. Raviglione et al. (1997) established that 47% of the surveyed countries had not implemented any TB control strategy. The treatment success rate was lower in these countries than in those that had implemented the strategy.

Sirijatuphat et al. (2018), while implementing the WHO GLASS, used the percentage of blood cultures as an outcome measure revealing 40.2% of positive blood cultures from the overall submitted samples. However, the amount of resources required to implement this strategy rendered it not feasible on a large scale. Shai et al. (2004) measured changes in methicillin-resistant *Staphylococcus aureus* (MRSA) contamination in an outpatient clinic for people with leg ulcers before and after implementation of the CDC guidelines on infection control for healthcare personnel. However, there was no conclusive result to suggest that the implementation of infection control measures reduced contamination with MRSA. Two qualitative studies (Mandyata et al., 2017; Mugomeri, 2018) explored challenges during the implementation of the WHO IDSR and the WHO IPC core components, respectively. The challenges cited were inadequate resources, poor IPC policy implementation support, role uncertainty, lack of expertise and financial disincentives.

### 2.6 Critical appraisal of the papers

Each study was critically analysed using a tool relevant to the study design. Fourteen studies showed consideration of research ethics in the form of seeking either informed consent or ethical approval from the relevant bodies (Larson et al., 2007; Allegranzi et al., 2010; Reid et al., 2012; Allegranzi et al., 2013, 2014; Schmitz et al., 2014; Uneke et al., 2014; Malangu and Mngomezulu, 2015; Chun et al., 2016; Al Kuwaiti, 2017; Mandyata et al., 2017; Pfäfflin et al., 2017; Mugomeri, 2018; Sirijatuphat et al., 2018). One study had an ethical committee exemption (Arntz et al., 2016). However, seven studies did not mention obtaining either ethical approval or exemption (Moro et al.,
2017; Farhoudi et al., 2016; Chen et al., 2016; Shai et al., 2004; Raviglione et al., 1997; Birnbaum et al., 1990; Celentano et al., 1987). Newson and Lipworth (2015) point out that research ethics approval processes can help ensure that research is well designed since the approval process involves oversight of a proposed project's methodological and other scientific aspects. However, ethics committees can also create hazards to scientific validity. Jamrozik (2004) argues that the requirement for written and informed consent for participation leads to additional paperwork, which threatens to undermine participation and is likely to increase selection bias in responses. Nathe and Krakow (2019), in a systematic review of the challenges of informed consent, found that the average length of the consent forms had increased 10-fold between 1987 to 2010, and participant understanding was shown to be inversely proportional to page count. However, as Gupta (2013) puts it, informed consent resides in three critical and essential elements; voluntarism, information disclosure, and decision-making capacity. Therefore, every study should ensure these are met during the research process, which was met in the seven studies.

The sample recruitment used in all studies was purposive, with just one paper reporting using random sampling (Celentano et al., 1987). As Campbell et al. (2020) pointed out, purposive sampling has the advantage of ensuring a balance of group sizes and may enable the researcher to target specific populations or individuals of interest. The limitation, however, is that samples are not easily defensible as being representative of the population due to the potential subjectivity of the researcher, thus introducing bias (Etikan, 2016). In the studies included in the review, randomisation was not possible because of the study designs of the papers and the inability to exclude patients from the potential benefits of IPC measures. Therefore, the ‘gold standard’ for quantitative research of randomisation was not a realistic option for these studies.

2.6.1 Critical appraisal for quantitative studies

Two quantitative research designs were used in the studies included in this review; quasi-experimental (non-control before and after) and cross-sectionalal designs. The quality assessment tool used before and after studies involved assigning a risk of bias
rating. Accordingly, most studies had a moderate risk of bias, with only two studies registering low levels of risk of bias (Allegranzi et al., 2013; Arntz et al., 2016). Most cross-sectional studies had well-explained methods. However, concerns about non-response bias were not mentioned or addressed except in one paper (Birnbaum et al., 1990).

Concerning cross-sectional studies, the choice of the design could have been influenced by the location of research sites and the resources involved. Sedgwick (2014) asserts that cross-sectional studies are generally quick, easy, and cheap to perform compared to other study designs since there is no follow-up. This is true in the cross-sectional studies included in this review, as they used postal surveys to collect data from different healthcare facilities. This would have required more resources for researchers to travel to the various healthcare facilities if another research design involving face-to-face data collection methods had been used. However, Solem (2015) points out that cross-sectional studies often fail to differentiate cause and effect from simple association since data on each participant is recorded only once. Additionally, sending out questionnaire surveys generates self-reported data, often introducing problems with data validity and social desirability bias (Brenner and DeLamater, 2016).

Studies that utilised the quasi-experimental design did not have a control group. One of the reasons often cited for not having a control group is the potential ethical issues of randomising patients that are raised sometimes (Goldstein et al., 2018). For example, in cases of potential benefits of the intervention, the control group would be denied the benefits. Because of non-randomisation and the absence of control groups, such studies often require less time and resources. However, these studies often raise questions about internal validity (Maciejewski, 2020). Handley et al. (2018) advise that it is vital to identify and address threats to validity to minimise their impact through blinding and controlling for confounders. None of the studies that employed a quasi-experimental design blinded their participants. Only six studies statistically controlled for confounders (Allegranzi et al., 2010; Mestre et al., 2012; Allegranzi et al., 2013; Schmitz et al., 2014; Moro et al., 2017; Pfäfflin et al., 2017).
2.6.2 Critical appraisal for qualitative studies

Only two studies used a qualitative approach, employing key informant interviews for data collection. However, this approach did not suit the aims and objectives of 1 study (Mugomeri, 2018). This study aimed to assess the efficacy of IPC committees. This question would have been better answered with a quantitative or mixed-method approach. However, this study was unique because it is the only study that looked at the implementation of WHO IPC core components. Both studies employed purposive sampling with sample sizes ranging from 13 – 16 participants. Sample adequacy in qualitative research is often a centre of debate as it pertains to the appropriateness of the sample composition and size, as it is important in evaluating the quality and trustworthiness of such research. Morse (2015) posits that the more useable the data are, collected from each person, the fewer the participants needed. However, it is always important to give the rationale behind why a specific sample size was utilised as it enhances transparency and auditability of the study (Vasileiou et al., 2018). None of the two qualitative studies in this review cited evidence from the literature to justify their sample sizes.

Furthermore, since qualitative research does not involve instruments with established metrics about validity and reliability, it is vital to address how study findings are credible, transferable, confirmable, and dependable. This can be ensured by using audit trails, reflexivity and triangulation (Nowell et al., 2017). However, none of the qualitative studies reported leaving an audit trail. Both studies used aspects of triangulation, Mugomeri (2018) ensured that a focus group and key informant interviews were employed during data collection, while Mandyata et al. (2017) used two researchers for data analysis.

2.7 Synthesis of findings

The main aim of this review was to systematically identify and bring together research conducted on the implementation of WHO IPC core components and explore the different methods used in this research through appraising the literature. The review
identified 23 studies with seven studies (Reid et al., 2012; Schmitz et al., 2014; Uneke et al., 2014; Malangu and Mngomezulu, 2015; Mandyata et al., 2017; Pfäfflin et al., 2017; Mugomeri, 2018) conducted in African countries that included; Ethiopia, Nigeria, Lesotho, Zambia, Tanzania and South Africa with the rest coming from Europe, Asia, America and the Middle East. The review also noted that both qualitative and quantitative research approaches were used in these studies. However, this was skewed towards quantitative designs, with only two studies employing a qualitative approach. To guide the discussion, studies were grouped into two themes; 'hand hygiene guidance' and 'other IPC guidance'. The two themes were used because findings from the review revealed hand hygiene guidance was predominant with less coverage of other IPC guidance. Since it was impossible to investigate the effectiveness of the implementation of the guidelines due to heterogeneity within the studies in regard to study designs and outcome measures, the evidence was synthesised in a narrative summary.

2.7.1 Hand Hygiene guidance

Studies on the implementation of hand hygiene used the WHO MHHIS, except for one study (Larson et al., 2007), which explored the implementation of the CDC HH guidelines through changing hand hygiene policies and providing recommended products. Although they followed the same strategy, there were variations in the way in which this was done. This was adapted according to the different contexts of the study location. Although adaptation can improve acceptance and adherence, thus improving uptake, it can also weaken the evidence base and create considerable variations in implementation success (Moore et al., 2021). Therefore, it was challenging to make comparisons across the different studies. However, there were three common outcome measures noted in these studies. These were compliance rates, HAI rates and knowledge and awareness. Generally, there was an increase in compliance rates from 1.4% to 92.2% across the studies, a reduction in HAI rates with improvement in knowledge and awareness of the guidance with scores ranging between 18.7 to 24.7 across the different studies. Other outcome measures used in the study included implementation scores and cost savings. Because these varied between studies, no comparisons were made on these indicators.
In summary, the high number of studies covering hand hygiene guidelines shows that this is the predominant topic and indicates a continuing interest in hand hygiene. This may be as a result of hand hygiene having the most developed set of guidelines, with the first guidelines being published in 1981 by the CDC. Another possible explanation is the amount of effort that has gone into promoting the WHO ‘clean your hands’ campaign internationally across various settings. Literature also suggests that hand hygiene is the most important and cost-effective strategy to prevent HAIs (Sutton et al., 2019). To this end, this provides a plausible explanation for the recent rise in studies on the implementation of hand hygiene guidance.

2.7.2 Other global IPC guidance

The review revealed studies on other global IPC guidance, including WHO TB control guidance, surveillance guidance, nosocomial control guidance, and the WHO IPC core components. Generally, these studies revealed that implementation of international IPC guidelines was feasible with moderate low to medium levels of progress, albeit with some challenges. The implementation strategies in these studies varied considerably, with each study using a different approach. Additionally, the outcome measures used varied across each study. As such, comparing these studies across any meaningful constructs was impossible. The widely varying constructs used in implementation research and the lack of detail regarding these constructs could have been a probable cause (Proctor et al., 2011). However, Nilsen (2015) points out that using theoretical frameworks such as determinant and evaluation frameworks can be a potential solution, as incorporating these would help guide the synthesis process and clarify outcomes. However, none of the included studies attempted to use a framework.

2.7.3 Methodological synthesis

Both quantitative and qualitative study approaches were utilised within the body of evidence. However, research in this area has been skewed towards quantitative research, with only two studies employing a qualitative design. The quantitative studies
utilised a cross-sectional design and quasi-experimental design. Although all cross-sectional studies (Celentano et al., 1987; Birnbaum et al., 1990; Raviglione et al., 1997; Shai et al., 2004; Larson et al., 2007; Reid et al., 2012; Allegranzi et al., 2014) except for 1 study (Malangu and Mngomezulu, 2015) had well-explained methods, none of them discussed the theory and reasons behind the use of these methods. Furthermore, these studies utilised survey questionnaires and only two used pre-tested questionnaires. In one study, the survey form was piloted for content validity and clarity, although no further information was given behind the use of this form. The questionnaires were self-administered. Whilst self-administered questionnaires can increase responders’ willingness to release sensitive information and reduce interviewer bias; they face problems of respondent bias and misinterpretation of questions. A narrative review of systematic and non-systematic searches of the literature on the effects of the mode of questionnaire administration on data quality found that effects appeared to be more marked in self-administration modes, particularly self-administered questionnaires (Bowling, 2005). The use of validated tools could have improved the validity of the findings in these studies. In conclusion, although cross-sectional survey questionnaires can be a relatively quick way to answer research questions, there was no theory to guide the study design. The validity of the study findings is questionable in studies that did not use pre-tested questionnaires.

Thirteen of the included studies (Allegranzi et al., 2010; Mestre et al., 2012; Allegranzi et al., 2013; Uneke et al., 2014; Schmitz et al., 2014; Arntz et al., 2016; Chen et al., 2016; Chun et al., 2016; Farhoudi et al., 2016; Moro et al., 2017; Pfäfflin et al., 2017; Sirijatuphat et al., 2018) used a quasi-experimental design. This design is frequently used when it is not logistically feasible or not ethical to conduct a randomised controlled trial, as was the case in these studies. The lack of randomisation has been identified as a significant limitation for these study designs as they are likely to introduce selection bias (Handley et al., 2018). Data was collected using standardised observation forms based on the WHO 5 hand hygiene moments. Walshe et al. (2012) argued that a standardised form allows for better aggregation of data and minor observer variation. However, in any observational research, there is always a risk of the Hawthorne effect and standardisation is dependent on adequate training of the observers (Goodwin et al.,
2017). This, coupled with sample selection, introduced moderate levels of bias in the included studies. In summary, the majority of these studies, except for two (Allegranzi et al., 2013; Arntz et al., 2016), had limitations; therefore, the results from these studies should be interpreted with caution.

There was no depth of inquiry in the two studies that employed a qualitative design. One study sought to establish efficacy but instead reported findings as challenges. In this study, the design was not appropriate for the research question. Additionally, the decision to use a qualitative approach had no theoretical rationale, and none of the studies used a theoretical framework to guide data analysis or interpretation. In summary, these two studies were poorly designed and lacked the rigour required in qualitative research and as such, results were considered with caution.

2.8 Conclusions

The literature review set out to address five research questions focusing on the implementation of the WHO IPC core components. However, only one included study (Mugomeri, 2018) addressed the WHO IPC core components specifically. This study employed a qualitative approach to evaluate the effectiveness of IPC committees in the southern African country of Lesotho. In this study, the authors mentioned that implementation was through health system structures with guidelines received at the ministry of health and cascaded down to the provincial health offices, district health management teams, and public and private health facilities. The study was of moderate quality with no audit trail or justification for sample size. Additionally, the study lacked theoretical underpinnings for either design of the questionnaire or the analysis of the results. However, there was research on the implementation of other IPC guidelines which included 22 studies. The way these studies addressed the literature research questions is summarized below.

Fourteen of these studies focused on the implementation of hand hygiene guidelines, three on nosocomial/infection prevention and control guidelines, three on the TB control policy, one on GLASS guidelines and one on Integrated Disease Surveillance guidelines. All but one of these studies employed quantitative methods with two main
approaches; quasi-experimental and cross-sectional research designs. The overall
quality of the evidence was average. Studies that employed the quasi-experimental
research design had a moderate risk of bias, apart from two studies that reported a low
risk of bias. Although the cross-sectional studies had well-explained methods, the
inherent limitations of the method, particularly the inability to differentiate cause and
effect from simple association, imply that it’s difficult to put the changes in outcome
measures down to the intervention. The qualitative study lacked the depth of inquiry
with no use of theory or theoretical frameworks.

Twelve of these studies focused on implementing the WHO hand hygiene guidelines and
utilised the WHO MHHIS as an implementation strategy. Other studies either did not
describe the implementation strategies or used different approaches such as cascading
the guidance down through the health system structures to the required users. Other
implementation strategies involved a change in hand hygiene policies, the introduction
of recommended products and holding multidisciplinary meetings. Similarly, Shai et al.
(2004) ensured IPC practices through multiple interventions including the use of gloves,
promotion of HH, cleaning and disinfecting after each patient and using a web
application for surveillance.

2.8.1 Gaps Identified in the literature

Within this body of evidence, there was a dearth of qualitative research and limited
research conducted on the implementation of IPC guidance at the health facility level in
low-income countries and none in Uganda. Further, as current implementation research
literature advocates the use of theory or explanatory models or theoretical frameworks
to inform study design, none of the studies included in the review utilised a theoretical
framework during implementation or data analysis and interpretation (Ridde et al.,
2020). Birken et al. (2017) contend that although using theory does not necessarily
result in effective implementation, it often registers more success than if not used. To
this end, there is a need for more robust research designs backed by theoretical
underpinnings and a need to develop theoretical explanations for the implementation of IPC guidance at the health facility level in a low-income country.

From personal experience as a public health professional who worked in Uganda; surveillance systems, infection prevention and AMR stewardship needed strengthening. However, this must be through generating evidence within such contexts. Since the main body of the evidence from the literature review was on hand hygiene, I was interested in looking at the implementation of IPC guidance in general. To this end, the study will focus on the implementation of IPC guidance at the health facility level in Uganda using a qualitative approach underpinned by theory.

2.9 Summary

This chapter has identified the evidence base regarding the implementation of the WHO IPC core components and global IPC guidance as well as identified the gaps within this evidence. The review identified 23 studies that covered IPC guidelines: WHO IPC core components, WHO Integrated Disease Surveillance guidelines, hand hygiene guidelines in health care, WHO TB control policy, WHO guidelines on Global Antimicrobial Resistance Surveillance System, and CDC guidelines on prevention and control of nosocomial infections.

The majority of this IPC research was on the implementation of hand hygiene guidance, with little emphasis placed on the implementation of other IPC guidance, with the bulk of evidence generated from the context of high-income countries. Yet often, implementation is directed to low-middle-income countries. As such, there is a need to generate evidence on the implementation of this guidance in low-middle countries like Uganda. The next chapter provides background socio-economic information on Uganda.
CHAPTER THREE CONTEXT OF THE STUDY

3.1 Introduction

Having identified a gap in evidence on the implementation of the WHO IPC core components in Uganda from the literature review, this chapter sets out the specific context for the research and sets the scene for the research. It provides essential contextual information about Uganda. The chapter details the geography, population, social-economic situation, healthcare services, and IPC structure in Uganda. This description was developed in 2018 as a precursor to the study.

3.2 Location of Uganda

Uganda is a landlocked country in East Africa, neighboured by Kenya and Tanzania to the east and south, respectively (Figure 2). It also shares a border with Rwanda to the south, the Democratic Republic of Congo (DRC) to the west and South Sudan to the north. It covers an area of approximately 241,038 square kilometres (World Atlas, 2018).
3.3 Socio-economic status of Uganda

According to the National Population Council (2021), Uganda has a population of approximately 40.8 million people. This has been attributed to a high fertility rate, which currently stands at 5.8 children per woman, making it one of the highest in the world (Ariho et al., 2018). Most of its inhabitants live in rural areas, with farming as their main economic activity. Per capita income stands at $600 (World Bank, 2018). Major exports include coffee, tea, vanilla, flowers, sesame and cotton. A lot of foreign exchange comes from tourism, and the country is beginning to extract oil. (World Bank, 2018).
However, the country continues to be plagued by high poverty levels, with more than a third of the population living below the extreme poverty line of $1.90 per day (World Bank, 2016). Estimates from the Uganda National Household Survey 2016/2017 suggest that the population living below the national poverty line rose from 20% in the financial year 2013 to about 21% in 2017 (UBOS, 2017), with the Northern and Eastern regions of the country disproportionately affected. According to the Uganda Poverty Assessment Report, the number of poor people living in the Northern and Eastern regions increased between 2006 and 2013, from 68% to 84% (World Bank, 2016). Additionally, households in Uganda's northern and eastern regions have much lower levels of human capital, fewer assets, and more limited access to services and infrastructure than households in other parts of the country.

3.4 Healthcare system of Uganda

Healthcare services in Uganda are delivered by both public sector (government) and private entities that include private-not-for-profit (PNFP) and private-for-profit (PFP) organisations, as well as complementary health service providers (WHO, 2017). According to the Ministry of Health (MoH) (2018b) data, the number of health facilities (public, private and private not-for-profit) in Uganda stands at 6,937. A considerable percentage of these (45.16%) are Government-owned, with 14.44% Private and Not For Profit (PNFP). The remaining 40.29% are Private For-Profit (PFP), and 0.10% are community-owned facilities (Ministry of Health, 2018b). Both public and private facilities are under the stewardship of the Ministry of Health (MoH). However, approximately 90% of the private-for-profit facilities are located in Uganda's capital, Kampala.

The administrative head of the health system in Uganda is the Ministry of Health (MoH), governing both the public and private sectors. The primary administrative levels for the health system are at the national (central government) level and the district (and city) level (local governments), represented in Figure 3 (Ministry of Health, 2018b). The ministry supervises activities at the national, regional and district headquarters. In
contrast, the district directorate manages the health subdistrict (HSD), which is made up of all health centres (HC) and village health teams (VHT) (Ministry of Health, 2018b). Although health service delivery is aligned with administrative levels, the regional-level facilities have no direct administrative level to match them and therefore report directly to the Ministry of Health. The HSD is the primary provider of primary healthcare in Uganda.

Figure 4: Representation of Uganda’s healthcare system showing the administrative, service delivery and regulatory arrangements. Adapted from WHO (2017)
The government-owned health facilities are organised in a decentralised healthcare system with a national referral hospital, regional referral hospitals, district hospitals, and HCs of three types; HC IV, HC III and HCII (Ministry of Health, 2018b). National referral hospitals have a target population of 10 million people (Ministry of Health, 2018b). They provide referral services to regional and general hospitals across the country and offer highly specialised medical and surgical services, advanced diagnostic services, advanced research and training for medical doctors, nurses and paramedical officers (WHO, 2017).

Below the national referral hospitals are 14 health zones, each consisting of a regional referral hospital (RRH) with a target population of approximately 2 million people (UBOS, 2017). These provide and act as referral centres for general hospitals and HCIVs. These hospitals offer specialised medical and surgical care, basic research, and training to nurses and paramedical officers. A district may also have a general hospital or HC IV with an estimated target population of between 500,000 and 100,000 people. HCIV offers preventive, general medical, and surgical services but limited specialist services. While general hospitals, in addition to services offered at HC IV, other general services will be provided as well as in-service training, consultation and research to communities.

Below these are primary health care facilities, HC III and HC II, that focus on the prevention and treatment of infectious illnesses. HCIII facilities have essential laboratory services, maternity care, and in-patient care. They are usually staffed by nurse aides, qualified nurses, clinical officers, or physician assistants and act as referral centres for HC II. HC II is the lowest formal health care delivery level. Nurse aides and qualified nurses mostly staff these centres. At the community level are VHTs who provide day-to-day referrals of patients from the community. The numbers of the various health units at each level are included in table 13.
The organisational structure of the private health services in Uganda is not as elaborate as that of the public sector. Although Uganda’s Ministry of Health does not have accurate numbers on PFPs, estimates put the number at over 2,000 with the vast majority being in Kampala capital city, the central region and urban areas resulting in limited rural healthcare coverage (Mejia-Mantilla et al., 2021). The majority of the private health sector (76%) is composed of facilities providing outpatient services to address common diseases like malaria along with somewhat larger clinics that offer delivery and laboratory services (USAID, 2015). Thirteen percent of this sector are Health Centre IV facilities, operating as ‘mini hospitals’ with inpatient care and surgical capabilities (USAID, 2015). The level or amount of services they provide is often not as straightforward as in the public sector as services differ from facility to facility.

On the other end, Private-not-for-profit health facilities, often faith-based, work very closely with the public sector and are heavily subsidised by the Government. Although autonomous, they are supervised and report to the district health services (WHO, 2017).
3.5 Health guidelines in Uganda

In Uganda, health guidelines are developed by the MoH under the quality assurance department. This department coordinates the whole process and maintains an updated inventory of all guidelines developed by the various departments. Nabyonga Orem et al. (2012) noted that programmes related to the Millennium Development Goals (MDGs), such as malaria, HIV, reproductive health, and child programs, had the highest number of guidelines. The special attention paid to achieving these goals to improve health service delivery may have sparked guideline development in these areas. Notably, the number of health guidelines escalated after 2003. This coincided with initial funding from the Global Fund against HIV, T.B. and Malaria, and the President's Emergency Fund for AIDS Relief (PEPFAR), coupled with the USAID/President's Malaria initiative in 2006. This led to the development of several guidelines such as the Infection Control and Prevention Guidelines 2004, produced by the AIDS Control Program, Policies and Guidelines on Infection Control 2005, produced by the Quality Assurance Department, Tuberculosis (TB) Infection Control Guidelines 2007, produced by the National T.B./Leprosy Program, and Infection Control at Health Facilities and Management of Epidemic Diarrheal Disease Outbreaks 2005 produced by the Community Health Department (Nabyonga Orem et al., 2012). The overlap of purpose and content also occurred within departments, leading to duplicated content among several guidelines (Mutatina et al., 2017). For example, Infection Control and Prevention Guidelines 2004, produced by the AIDS Control Program and the Policies and Guidelines on Infection Control 2005, produced by the Quality Assurance Department.

However, in 2010 there was a more coordinated development and upgrade of health guidelines as the MoH aimed to streamline guideline development with the hope that improved coordination mechanisms would lead to a better allocation of resources within the sector (Mutatina et al., 2017). Some of the guidelines that have been developed since then are the Maternal and Perinatal Death Surveillance & Response guidelines 2017, Guidelines for Designation, Establishment and Upgrading of Health units 2011, the National HIV Testing Services Policy and Implementation Guidelines 2016, Uganda Clinical Guidelines 2016, Uganda National guidelines for T.B. infection

Although several guidelines exist, Uganda’s health sector is still struggling with poor service delivery. Pereira et al. (2022) notes that a high number of guidelines can be overwhelming to any user, create confusion and consequently impact their use. Additionally, guideline development consumes time and resources, which could have been used to meet pertinent healthcare needs. As such, prioritising which areas are essential can help reduce the wastage of resources.

3.6 IPC guidance in Uganda

Over the last two decades, Uganda has seen the emergence of epidemics such as Ebola, Marburg virus and Cholera. These, coupled with long-term infectious diseases like HIV, T.B. and hepatitis B virus (HBV), as well as multidrug-resistant infections, continue to be of public health significance, putting both patients, HCWs and visitors at risk of acquiring infections in health care settings (Mbonye and Sekamatte, 2018). Therefore, IPC measures are critical to minimise the risk of transmission of these infections and ultimately reduce unnecessary deaths.

In response to this, the MoH developed an array of guidelines specific to infections. For example, TB Infection Control (TB-IC) guidelines were explicitly designed to prevent and control TB., the Injection Safety and Healthcare Waste Management guidelines, the Post-exposure Prophylaxis guidelines for HIV, and the Hepatitis B and Control guidelines (Ministry of Health, 2017). To ensure that these make a lasting impact and to reduce variance between these guidelines, as well as the duplication of both resources and roles, the MoH, through the quality assurance department, harmonised these guidelines into the Uganda National Prevention and Control Guidelines in 2013 (Ministry of Health, 2013). This has served as the gold standard for infection control across health facilities.
across the country. However, there has not been any update since the development of these guidelines, even in light of the released WHO IPC core components (WHO, 2016). Additionally, there has not been any effort to evaluate the implementation of these guidelines, with no record of how these are actualised in practice.

3.6.1 IPC Structure in Uganda

The structure of IPC in Uganda is organised in such a way that the national infection control committee at the MoH spearheads the implementation of the guidance, development, update of policies and procedures, approval of chemicals used for disinfection, methods of sterilisation, training, and supervision of all cadres (Ministry of Health, 2013, 2018a). The committee also determines and sets achievable targets for the improvement of staff and patient safety. Additionally, there is an IPC committee at the regional referral hospitals, general hospitals and HC IV, as shown in table 14. In contrast, HC III and II have a working group of at least three to oversee infection prevention and control issues, with minutes of this working group submitted to the Infection Control Committee at HC IV.

These infection control teams form the backbone of Uganda’s IPC programmes (Wasswa et al., 2015). They oversee the day-to-day infection control practices, including drawing up work plans and budgets in an integrated approach for all patient care services (Ministry of Health, 2013; Biedron et al., 2019). Additionally, they are responsible for rapidly identifying and investigating any outbreaks of infections through regular monitoring, providing advice on the isolation of patients with known infectious diseases, developing systems for the provision of information to all staff on measures of infection control, proper management of clinical waste and recommending best practices on infection control to the national committee for adoption (Ministry of Health, 2013; Mbonye and Sekamatte, 2018). The committees also hold monthly meetings on infection control practices in health units.
3.7 Summary

This chapter has provided some essential contextual information about Uganda, particularly regarding the country's profile, the socio-economic status of the country and healthcare system. Furthermore, this chapter has provided insights into health guidance in Uganda and the structure of IPC guidance in the country.

The next chapter will seek to find an appropriate methodology to fulfill the research aim identified in chapter 2.
CHAPTER FOUR: METHODOLOGY

4.1 Introduction

Having explored the rationale, the gap in the literature and the selected context for the thesis, this chapter explores the methodological underpinnings of the study and explains the thinking that led to the decision to adopt a constructivist grounded theory approach.

As there are many methodological approaches on offer, each of which carries different aims, involving different research designs and utilising different research methods, the first part of this chapter presents a traditionally accepted route to finding the most appropriate research design and method. It continues with the researcher’s reasoning for rejecting certain designs and ends with the rationale for the chosen research methodology.

Holden et al. (2004) contend that it is standard research practice to consider methodological options to address the study's aim. Choosing a methodology followed the standard academic prerequisites in research where a declared philosophical stance, literature review and theoretical framework to guide the study are expected. To this end, identifying the most appropriate methodological approach began by looking at the philosophical stance before getting into the different applicable methodologies.

4.2 Selecting a Research Methodology

In choosing a research methodology, it is important to explore and understand the philosophical stances underpinning each research design as these hold claims on what counts as valid knowledge (Creswell, 2007). Many philosophical approaches exist, attributed to the divergent ways of thinking and explicating natural phenomena (Holden and Otoole, 2004). Crossan (2003) contends that, although often a hidden feature of many research processes, these approaches continue to influence decisions at different points along the research process, right from choosing a research design down to
research methods and analysis. Therefore, to conduct clear, congruent research, there is a need for researchers to work through different philosophical debates to make more concrete and practical decisions about research questions, methodology and methods, as these influence how the researcher works with the participants and, consequently, the final product of the study (Mack, 2010). By establishing this congruence between research methods and underpinning methodology, the reader can subsequently evaluate the quality of the resultant findings. However, central to this are assumptions the researcher holds about the world discussed in section 4.3. Before doing so, it is essential to identify the research aim and objectives.

4.2.1 Research aim and objectives

Thomas and Hodges (2016) assert that having a clear understanding of a research aim and objectives paves the way for other important decisions about the research design. Therefore, this study aimed to explore the implementation of IPC guidance at the health facility level in Uganda and to generate a theoretical explanation for the processes involved in implementation of the guidance in these settings. Key objectives to enable this were:

- To understand how healthcare workers at a health facility level in Uganda make meaning of IPC guidelines.
- To understand how healthcare workers at a health facility level in Uganda make decisions regarding the use of IPC guidelines.
- To identify factors that influence healthcare workers' decisions regarding the use of IPC guidelines within this context.
- To generate a theory to explain the process through healthcare workers' experiences as IPC guideline users within this context

Although these objectives remained the same, an additional adjective was added to reflect the study plan changes due to the COVID-19 pandemic and these modifications are presented in chapter 5, section 5.9.
4.3 Research Philosophy

A review of the philosophy underpinning the research process has been established as a vital aspect of conducting research. This view is supported by Hughes and Sharrock (2016), who espouse that a research philosophy opens a researcher's mind to other possibilities, enriching their research skills and enhancing their confidence that they are using the appropriate methodology. Saunders et al. (2000) emphasises that this must be given due attention to ensure that the most appropriate approach is chosen to address the research aims. This stance has advanced the view that the researcher should articulate the philosophical assumptions underlying the methodology to ensure that a coherent and consistent approach to the collection and interpretation of data is applied. These assumptions relate to the researcher’s views on the nature of knowledge or reality (ontology) and the relationship between the researcher and knowledge (epistemology) (de Gialdino, 2009). Depending on the purpose of the studies, a researcher may select different sets of assumptions that determine which and how research methods are used. This is discussed in detail in the following sections.

4.3.1 Ontological Assumptions

"Ontology refers to claims regarding nature and structure of being" (Rawnsley, 1998, p.2). It is concerned with assumptions about the nature of the reality under investigation, whether socially constructed (relativism) or independent of an individual appreciation of it (realism). Relativism argues that the social world, which is external to individuals, is composed of words, concepts and labels which do not comprise a real structure unless used as tools for describing, making sense of, and negotiating the social world. In contrast, realism argues that reality is external and objective (Garrett and Cutting, 2015). Therefore, in dealing with these assumptions, the researcher has to take a position on what they believe regarding reality and truth (Porter, 2010). Considering the research issue in the present study, a relativist would believe that meanings and understandings of IPC guidance will be constructed differently by the different HCWs within
the contexts in which they are implemented. These different meanings will stem from the multiple realities of how the different HCWs experience these guidelines within their different contexts and will ultimately influence the implementation processes. Conversely, a realist position would believe that there is only one way to understand, experience and eventually implement IPC guidance regardless of the context. Therefore, the ways in which IPC guidance will be implemented are of one’s knowledge, tools and assumptions.

For this thesis, a relativist ontological position was taken to embrace the possibility of multiple constructions of how HCWs view, understand and implement IPC guidance.

4.3.2 Epistemological Assumptions

Epistemology refers to the basis of knowledge and how one might begin understanding the world (Hathcoat et al., 2019). It relates to the nature of knowledge and allows the researcher to deal with knowledge and attain and make sense of it. In making sense of this knowledge, the researcher makes certain assumptions regarding sources of knowledge, what counts as reliable sources, and what can be known (Garrett and Cutting, 2015).

Epistemological assumptions have traditionally tended to be based on two positions; objectivism and subjectivism. The objectivist position believes that there is one truth, often termed objective reality, independent of the activities of the person or subject in question (Schneider, 1995). On the other hand, the subjectivist position argues that there exist multiple realities, which are essential unique characteristics of human behaviour (Schwandt, 1994). Ultimately, these profoundly affect how the researchers will go about uncovering knowledge of social behaviour. For example, on the issue in this thesis, an objectivist view would imply that there will be one meaning of IPC guidance which would be independent of the guideline users. In contrast, the subjectivist view will position the understanding of guidelines as different for different users. Ultimately the implementation of this guidance will take different forms because of these different understandings. As Scwandt (1998) posits, perhaps epistemological assumptions are the most significant factor to consider when deciding on methodology and methods.
To summarise this point, what has been presented in the preceding sections are the different ontological and epistemological assumptions in existence. In exploring the implementation of IPC guidance in Uganda, the ontological position of relativism and epistemological position of subjectivism were coherent with my personal view, the area of interest and the research aim.

4.4 Research Paradigms

The term paradigm was first introduced by Thomas Kuhn (1962) in his seminal work, 'The Structure of Scientific Revolution' (Kuhn et al., 1970). Kuhn defines paradigm as a philosophical way of thinking. Guba and Lincoln (1994, p.105) see a paradigm as “a basic system or worldview that guides the investigator”. However, McGregor and Murnane (2010, p.419) define a paradigm as a “set of assumptions, concepts, values, and practices that constitutes a way of viewing reality”. On their part, Saunders et al. (2009) use the term 'philosophy' instead of 'paradigm' and define it as the researcher's worldview or assumptions guiding the research. Whilst acknowledging the different definitions that exist, the one that is preferred and that is used for this thesis is;

“A set of commonly held beliefs and assumptions within a research community about ontological, epistemological, and methodological concerns” (Johannesson and Perjons, 2014, p.167).

Guba and Lincoln (1994) contend that paradigm issues are crucial, and no inquirer should go about the inquiry business without being clear about what paradigm informs and guides their approach. This choice of paradigm sets down the intent, motivation and expectations for the research. However, Fazlıoğulları (2012) argues that paradigms are restrictive in respect of their philosophy and general perspectives. Patel (2012) adds that their limitation is an inherent broad perspective but highlights that they emphasize cultural and individual aspects. Mackenzie and Knipe (2006) further stress that paradigms are important as they define the researcher’s philosophical orientation,
perspective, thinking, or set of shared beliefs that influence what should be studied, how it should be studied, and how the results of the study should be interpreted.

There are various classifications and categorisations of research paradigms in the literature. Some authors and researchers have classified research paradigms into three; positivism, interpretivism/constructivism and critical theory (Fazlıoğulları, 2012; Scotland, 2012). Conversely, Guba and Lincoln (1994) classify paradigms into four; positivism, post-positivism, constructivism and critical paradigm. While, Mackenzie and Knipe (2006) on their part also suggest a four-type model of classification comprising positivist/post-positivist, interpretive/constructivist, transformative and pragmatic. A recent position by Saunders et al. (2019) classifies paradigms into five; positivism, critical realism, interpretivism, post-modernism and pragmatism.

Kuhn (1970) stresses that since paradigms are not of a common theoretical language, they cannot be compared. Thus, no paradigm can be considered better or superior to the others. As Okesina (2020) posits, the choice of which paradigm to use is based on the researcher’s motivation, orientation, the worldview of knowledge or research aims. Based on this argument, the following sections review three familiar paradigms, positivism, interpretivism and constructivism, that were considered in this study.

4.4.1 Positivist Paradigm

The positivist approach, often referred to as the scientific approach, "applies scientific methods of natural science to study human activity using objective inquiry" (Delanty, 2005, pp.10–11). Pertinent to this approach is the belief that natural sciences are the best way to study the social world. The belief is that the social world can be studied the same way as the natural world, with human behaviour regarded as passive, controlled and determined by the environment (Albon and Mukherji, 2009). It is rooted in the ontological assumptions that truth and reality are free and independent of the viewer and observer and on the epistemological premise that knowledge can be tested empirically (Seale, 2004; Mackenzie and Knipe, 2006). This approach assumes that an independent, objective reality exists and that this can be observed empirically.
Therefore, what counts as knowledge is only what can be perceived by the individuals’ senses (Blaikie, 2007). Similarly, (Delanty, 2005) points out that anything that cannot be observed cannot be validated and ultimately will not be taken as the truth in a positivist approach.

As such, positivist research adopts an approach that values direct observation and measurement and is deductive with the primary goal of predicting results, testing a theory, or establishing relationships between variables (Tuli, 2011). In this type of research, ideas, concepts, theories, or hypotheses are a starting point with methods such as experimental, randomised control trials, quasi-experimental, correlational and causal-comparative often applied to produce generalisable knowledge (Delanty, 2005; Mertens, 2015). Consequently, this approach has been widely used within human sciences, including medicine, to conduct experimental research.

Despite this, this approach has been challenged, with Corry et al. (2019) pointing out that the notion of an independent reality and the resulting unbiased observation and study of this realism does not lead to a sufficient comprehension of a social phenomenon as reality is socially constructed by different actors within their contexts. Popper (1959, 2002) also argues that absolute truth can never be reached; therefore, we look for the probability that a fact is actual instead of arising by chance. However, Popper did not discount positivism entirely but acknowledged its limitations. Further, there exists the claim that positivism is self-contradictory because it is not by itself a natural happening independent of the viewer or observer (Quinn, 1980a). To this end, it could be established that despite positivist claims of impartiality, it simply investigates happenings or occurrences formed by the researcher (Howell, 2013). As Gadamer (1975) cited in Scott and Usher (2001) contends, it is impossible to separate oneself as a researcher from the historical and cultural context, which subsequently influences individual beliefs. This defines what is observed and the outcome. As a result, these arguments led to the development of other philosophical approaches such as post-positivism, interpretivism and constructivism/constructionism.

Given that the research aims to explore a social phenomenon that is implementation and considering the researcher’s ontological position as a relativist, the positivist...
approach was not appropriate for this study. Therefore, this thesis will focus on interpretivism and constructionism, discussed in the section below.

4.4.2 The Interpretivist and Constructivist Paradigms

The two most significant notions contrasting to positivism are interpretivism and constructivism or constructionism. Ponterotto (2005) opines that these are related research approaches characteristic of a particular philosophical worldview that one cannot partition an objective reality from the person experiencing, processing, and labelling the reality. Murphy (1997) adds that these approaches argue that knowledge and reality do not have an objective or absolute value and align with the relativist ontology, which assumes multiple, apprehendable, and equally valid truths. As such, realities are constructed with the actor or participant interpreting and forming this reality based on their experiences and interactions with their environment (Corry et al., 2019). On the epistemological continuum, these align with subjectivism, which assumes that the researcher and the researched are co-creators of meaning or reality (Schwandt, 1994). Proponents argue that the ultimate goal of these two approaches is to understand the complex world of lived experience from the point of view of those who live it (Hollinshead, 2006).

Although often confused and used interchangeably in the literature, there is a distinction between interpretivism and constructionism/constructivism. Schwandt (1994) asserts that interpretivism, constructionism and constructivism routinely appear and are used interchangeably in social science; however, users' intent often shapes their particular meanings. Firstly, interpretivism is more of a means of gauging what people understand within the institutions or groups in which they participate (Ryan, 2018). It has its roots in the philosophical traditions of hermeneutics and phenomenology, and the German sociologist Max Weber is generally credited with being the main influence (Chowdhury, 2014). Chowdury (2014) adds that interpretivists look for meanings and motives behind people’s actions, for example, behaviour and interactions with others in society and culture. Consequently, “these meanings can be read or identified not only
in written or verbalized interpretable 'texts' or stated accounts of things, but within the whole realm of human behaviour and interactivity” (Winthrop 1991, 147). As Chen et al. (2011, p.131) put it, “people create and associate meanings as they interact with the world around them”. Ultimately, interpretivist research aims to understand phenomena under study through the researcher accessing and interpreting these meanings (Schwandt, 1998).

Constructionism and constructivism borrow from and blend heavily with the earlier ideas under interpretivism (Schwandt, 1998). Proponents of constructionism and constructivism assert that reality is formulated in the mind of the individual rather than it being an outwardly single entity (Steffe and Gale, 2009). According to Crotty (1998, p.43), “meaning is not latent and discoverable but constructed”. Thus, constructivists and constructionists generally hold that most significant meanings are constructed socially by human beings as they engage with the world they are communally conscious of. Therefore, research under these approaches attempts to reconstruct the world variably from specific, multiple and changing perspectives (Chen et al., 2011). The findings of constructivism research are themselves a literal construction of the research process. Thus, the process begins with participants’ concerns and unfolds through iteration, analysis, critique, reiteration and reanalysis, which leads to the construction of findings (Hollinshead, 2006).

To summarise this point, although they share some similarities, a distinction has been made between interpretivism and constructivism / constructionism. However, for this thesis, a distinction between constructivism and constructionism should also be made since these are often used synonymously in some literature. For example, Cupchik (2001) and Crotty (1998) note that, although both constructivism and constructionism endorse a subjectivist view of knowledge, constructivism opines knowledge and reality are constructed within an individual’s mind while constructionism believes knowledge and reality are constructed through discourse. As such, constructivists focus on what's happening within the minds or brains of individuals, while constructionists focus on what's happening between people as they join together to create realities. For constructivists, the reality is the product of the human mind which is developed socially;
as their developers change, the reality also changes (Hollinshead, 2006). For this reason, the researcher should come very close to what is examined as much as possible. As such, constructivism emphasizes the subjective interrelationship between the researcher and participant through the co-construction of data, with meaning constructed by the researcher. As an implicit part of constructivist inquiry, the researcher reports and makes sense of the uniqueness discovered in each new setting under study (Lincoln et al., 1985). Therefore, as part of the research endeavour rather than an objective observer, the researcher’s values must be acknowledged by themselves and by their readers as an inevitable part of the outcome (Appleton and King, 1997). Conversely, constructionists focus on the “collective generation of meaning as shaped by conventions of language and other social processes” (Schwandt, 1998, p.240). Therefore, in constructionist inquiry the researcher and the participant co-construct the meanings or interpretation of the findings.

Given this distinction, it is important to stress that the position adopted in this thesis is constructivist. This study sought to explore how HCWs understood IPC guidelines and how this influenced their decisions in implementing IPC guidance through interpreting data co-constructed by the participants and the researcher.

Just like the positivist stance, the approaches discussed have been challenged, particularly along the lines of subjectivity. Nudzor (2009) argues that because of issues of subjectivity, often contradictory and inconsistent explanations are produced and would need to be advanced to explain social phenomena (Krauss, 2005). On the contrary, Zaman (2016) argues that ultimately all knowledge produced by research is interpreted subjectively, underpinned by political and different ideologies, thus disputing the objectivity stance taken by the positivist approach.

Furthermore, Pawson and Tilley (1997) are critical of the constructivist stance because it cannot consider the social world as more significant than the individual perception of it. Instead, they suggest that people operate in a social world where some aspects, mainly structural and institutional, exist independently of people's thinking. Wainwright (1997, p.1265) supports this position, suggesting that "the powers of social structures
cannot be reduced to those of individuals”. Pham (2018) adds that this paradigm targets understanding current phenomena rather than focusing on the problems related to the empowerment of individuals and societies. Therefore, as Mack (2010) notes, this implicitly neglects the issues of power and agency, which are essential features of society. This specific limitation has potentially led to the role of critical inquiry in further enhancing the practicability of research (Al-Riyami, 2015). However, this is not discussed in this thesis.

In summary, interpretivism, constructivism and constructionism have been explored. Additionally, arguments against these approaches have been presented. However, as there is no superior approach, Mackenzie and Knipe (2006) call for a middle ground when choosing an approach to studying certain phenomena. Ultimately, the appropriateness and usefulness of a particular approach will be intimately tied to the nature of the research question. Consequently, the choice of methodology for the current study is explained in the following sections.

4.4.3 Choice of Research Paradigm

Although the researcher’s academic grounding has primarily been in public health with a positivist approach, working as a public health professional in rural community settings gave the researcher a different perspective on the world. From this experience, the researcher believes realities extend beyond facts. Realities are constructed by people, with different meanings being real for different people; therefore, there is no absolute truth. From the perspective of this research, there is no single truth regarding how IPC guidelines are implemented. Therefore, this reality needs to be constructed by participants, interpreted by the researcher and used to discover the underlying meaning and reasons for behaviour and ultimately understand the implementation process.

With the researcher's ontological assumption as relative where knowledge or truths are not absolute and epistemology as subjectivism that there exist multiple realities, in keeping with this, the study adopted a constructivist approach. This is because the multiple realities of participants need to be understood, as these multiple perspectives
affect the implementation process and its success. The study focuses on understanding the process of implementation from HCWs’ perspectives. This research focuses on ontological questions such as how participants understand and give meaning to IPC guidance, which explores why and how IPC measures are implemented. Identifying and understanding the realities of IPC guideline implementation as perceived by health care professionals reveals the "underlying patterns and order of the social world" (Morgan, 1980, p.609) regarding this phenomenon. These patterns and orders provide insight into guideline implementation practices and considerations. The end goals of this research are two-fold. The first goal is to inform policymakers of the extent to which implementation has been achieved while generating a theory to explain the process. The second is to provide evidence that can be leveraged to develop more effective implementation strategies, if required. Therefore, a constructivist approach was adopted to provide valuable insights into how the implementation of IPC guidance is achieved in resource-constrained settings.

4.5 Methodological Considerations

The choice of paradigm, approach and research method is best determined by the research aims and questions (Saunders, Bristow, et al., 2019). Brown and Dueñas (2020) emphasise that achieving linearity between the research purpose and data collection methods is vital, no matter which research paradigm is adopted. Thus in the current study, the choice of the constructivist paradigm led to the adoption of qualitative research methods. As qualitative research is about uncovering different perspectives, qualitative methods in constructivist research provide a means to interpret, explore and discover new concepts and constructs (Reeves, Kuper, et al., 2008). As Ponterroto (2005) put it, in a constructivist research paradigm, qualitative methods are incorporated to empower the research participants to be co-investigators in the study. Therefore, it was crucial to ensure that issues concerning methodology are delineated for consistency. In seeking a research methodology that would provide an ontological and epistemological fit with the researcher’s position, the use and application of grounded theory was explored. Additionally, a critical analysis of different methodologies, namely phenomenology, ethnography, case study and grounded theory
under the constructivist paradigm (Guba and Lincoln, 2005) was conducted before a decision was made.

To begin with, phenomenology is a research design that explores the lived experience of the phenomena of interest as described by participants (Creswell and Poth, 2018). As such, this design gives a better understanding of meanings attached by people and allows the researcher more freedom during the interview to explore the essence of others' experiences (Choy, 2014). Critiques have argued that this methodology is mostly descriptive and not sufficiently interpretative (Brocki and Wearden, 2006; Tuffour, 2017). Crotty (1996) further argues that phenomenology is descriptive and not critical and offers little in understanding the phenomena under study. Similarly, Greening (2019) adds that while phenomenology provides consciousness, it does not provide reasons or rationale behind the phenomena of interest. For these reasons, phenomenology was not appropriate for fulfilling the aim of this study which was to understand the implementation process and generate a theoretical explanation for the process to be able to provide useful evidence to policy makers on factors that affect implementation.

Secondly, ethnography from anthropology and sociology, studies the shared patterns of behaviours, language, and actions of an entire cultural group in a natural setting over a prolonged period (Creswell and Poth, 2018). Reeves et al. (2008) contend that ethnography provides additional domain knowledge, an overall view of complex settings that would otherwise be difficult to obtain, and different perspectives of practices from various stakeholders for the topic under study. Creswell (2018) adds that it has the unique strength of involving the researcher, the research process and the research, making it a potentially ideal method for undertaking research where the community and its members interact (Creswell, 2007). However, Harmmesely (2019) argues that the researcher’s marginal status, arising from the fact that they seek to be both insider and outsider, hinders the full understanding of how participants experience their world. He further adds that in ethnography, there is a failure to attend to what are the most distinctive features of the issue being investigated. Additionally, Amuomo and Odoyo (2020) point out that this method of inquiry is often time-consuming. As such, it was considered not feasible due to time constraints for data collection in Uganda. Further,
ethnography places great emphasis on description, providing insights into observed phenomena in new and revealing ways (Hammersley, 1990). As the purpose of the current study was to generate a theoretical explanation rather than provide a description, this design was considered not appropriate for the present study.

Closer attention was paid to the case study design. Yin defines a case study as;

“An empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (2009, p.18)

In case study design, the researcher develops an in-depth analysis of a case, often a programme, event, activity, process, of one or more individuals bound by time with data collected using a variety of data collection procedures (Creswell and Poth, 2018). To this end, a case study offers a means of investigating complex social units consisting of multiple variables of potential importance in understanding the phenomenon. Anchored in real-life situations, the case study results in a rich and holistic account of a phenomenon. It offers insights and illuminates meanings that expand its readers' experiences (Ridder, 2017). These insights can be constructed as tentative hypotheses that help structure future research; hence, a case study plays a vital role in advancing a field's knowledge base (Crowe et al., 2011). However, critics such as Gerring (2004) argue that even though case studies are common, there is a lack of clarity and no real consensus on what a case study is about, how to conduct that form of research concretely and what results can be obtained from it. Teegavarapu et al. (2008) further argue that, although case studies are frequently exploratory, they do not have an end goal of developing a theoretical explanation but rather a description of the object of interest. Heale and Twycross (2018) add that a case study design is employed to gain an in-depth understanding of the situation and meaning for those involved in part to be able to create a thick description to convey what the reader would have experienced if they had been present. Taking these arguments into account and bearing in mind that the current study aimed at developing a theoretical explanation of the processes
involved in implementing IPC guidance within the context of low resource settings, it was decided that this design was not appropriate for the study aim.

Therefore, in seeking a research methodology that would provide an ontological and epistemological fit with the researcher’s position and research paradigm of constructivism, while taking into account the study objective of generating a theoretical explanation to provide useful evidence to policymakers on factors that affect implementation, a grounded theory methodology was considered the most appropriate. This is discussed in detail in the next section. Additionally, the ability to aid conceptualisation as a basis for constructing one’s theory, be it substantive or formal, also led to this choice of a grounded methodology (Charnaz, 2006). By transcending descriptive detail towards an abstract conceptualisation that can be applied to any relevant situation, grounded theory was particularly suited to exploring the implementation of IPC guidance generating a theoretical explanation for the processes involved in the implementation. Furthermore, as an inductive methodology, it is ideally suited to exploring new ground where there is little known about phenomena in a substantive area, as was the case in the implementation of IPC guidance at health facility level in Uganda as identified in the literature review (Ralph et al., 2015).

4.6 Grounded theory

Grounded theory is a research methodology initially developed by Barney Glaser and Anselm Strauss in 1967 with the publication of *The Discovery of Grounded Theory*, for inductively generating theory through progressive identification and integration of categories of meaning from data (Glaser and Strauss, 1967). However, before anything else, it is important to clarify what grounded theory means. For purposes of this thesis, the following definition has been adopted.

“Stated simply, grounded theory methods consist of systematic, yet flexible guidelines for collecting and analyzing qualitative data to construct theories ‘grounded’ in the data themselves” (Charmaz, 2006, p.2)
Grounded theory provides an explanatory framework for understanding the phenomenon under investigation. The researcher analyses data by constant comparison, initially of data with data, progressing to comparisons between their interpretations translated into codes and categories and more data. This constant comparison of analysis grounds the researcher in the data and leads to the final conceptualisation and theorising of the phenomenon (Mills, 2006). By developing a theory, researchers can understand the social problem experienced by a group of participants and how they act to deal with it (Mediani, 2017). This has seen grounded theory embraced across several disciplines, particularly healthcare and education (Creswell, 2007).

However, the increasing popularity of grounded theory came with a substantial divide amongst the co-creators and early scholars of the methodology (Gary, 2013). The divide between the two original authors was due to disagreements on the aims, principles, and procedures associated with the implementation of the method culminating in two versions: Glaserian/Classic grounded theory and Straussian grounded theory. Both of these versions begin with a similar process of open coding for all possibilities in the data. This, however, is where the similarity ends (Glaser, 1992). Whereas classic grounded theory progressively focuses theory development on a core category that has emerged directly from the data, Straussian grounded theory follows an open coding procedure with axial coding, in which the researcher applies a coding paradigm to identify conditions, context, action/interactional strategies, intervening conditions and consequences (Strauss and Corbin, 1990).

Strauss and Corbin (1990) offered specific procedures and frameworks, while Glaser (1978, 1992) prioritised the creative analytic process and trust in emergence. To add to this, Glaser (1992, 1978) recommends that the researcher suspend pre-existing knowledge from literature or professional/personal experience to ensure an open mind, free of any influences. He asserts that reviewing literature should be suspended until the theory has emerged. On the contrary, Strauss and Corbin (1990) recommend using literature at every study stage. They contend that the appropriate use of pertinent
literature is beneficial in revealing gaps, inspire questions, guide theoretical sampling and providing insights.

Initially, the systematic approach offered by Strauss and Corbin (1990) attracted proportionally more attention than Glaser’s, particularly in nursing and health care, where researchers embraced the practical and procedural nature of this grounded theory (Cutcliffe, 2005). However, this approach has recently been increasingly subject to widespread criticism (Bryant and Charmaz, 2010). In particular, Glaser contested the complicated coding instructions, claiming that the researcher is effectively “forcing” the data into “preconceived” concepts in order to coerce a theory (Glaser, 1992, p.3). He asserts that this serves to “interrupt the true emergence” of a theory and, as a consequence, the “true nature of the data is lost forever” (Glaser, 1992, p.4). Likewise, Charmaz adds that the Straussian grounded theory encompasses an excessive “maze of techniques” (Charmaz, 2000, p.512). Charmaz asserts that axial coding results in “awkward scientific terms and clumsy categories”, which detract from participants’ experiences and muddles analysis with excessive jargon (Charmaz, 2000, p.525). Several contemporary grounded theorists have supported Charmaz’s and Glaser’s criticisms and argued that the “densely codified operation” of Straussian grounded theory is excessive (Kenny and Fourie, 2015, p.1278). However, Strauss and Corbin dispelled these criticisms and argued that the prescribed stages are critical to dispel the researcher’s prejudices and preconceptions which they inevitably bring to and develop throughout the study (Strauss and Corbin, 1990). They further highlight that this model assists, rather than hinders, the researcher as it facilitates a systematic analysis of data, allowing the researcher to relate concepts in a highly accurate, convincing, and complex capacity.

However, Corbin’s successive publications relaxed the mechanical Straussian coding convention and refashioned the underlying philosophical assumptions (Corbin and Strauss, 2008). This reformation by Corbin moved the Straussian grounded theory methodology toward constructivist grounded theory.

On the other hand, criticism of the work of the classic grounded theory has been centred around the absence of attention to the philosophical position informing the
methodology. Glaser was hesitant about tying down what research paradigm classic grounded theory corresponds to (Glaser, 1992). However, he is generally cited as a critical realist researching within the post-positivist paradigm (Annells, 1996). Charmaz (2006) and Madill et al. (2000) argue that the classic grounded theory has implicit positivist assumptions infused within the pursuit of objectivity and the assertions of the researcher’s unobtrusive discovery of a latent grounded theory within the content of collected data. Subsequently, these authors stress the connotations of a realist ontology within classic grounded theory. Madill et al. (2000, p.4) further contend that this version represents a “soft positivism”, which proposes that the research entails a process of revealing or discovering pre-existing phenomena and the relationship between them. However, Glaser (2005b) maintains and dismisses specific philosophical or disciplinary positions applied to grounded theory.

On the other hand, some have argued that the philosophical position of Strauss arises from pragmatism (Corbin and Strauss, 2015). Perhaps as identified by Rakhmawati (2019), Strauss’ background led to the philosophical position of the Straussian grounded theory approach, which was influenced by pragmatism. However, in the third edition of the Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory, Corbin acknowledges an interpretivist paradigm; “I realize there is no one ‘reality’ out there waiting to be discovered” (2008, p.10). These arguments with regard to philosophical positions have continued to lead to different strategies and guidelines through the years, with a more recent one being the constructivist grounded theory developed by Charmaz (2006).

4.6.1 Constructivist grounded theory

Constructivist grounded theory, developed by Charmaz (2006), is an extension of the original grounded theory. In her book, Constructing Grounded Theory, Charmaz (2014, p.12) states that “constructivist grounded theory adopts the inductive, comparative, emergent and open-ended approach of Glaser and Strauss’s original version”. However, she is keen to add that the constructivist grounded theory answers criticisms raised about earlier versions, some of which are the objectivists’ views imbued in the earlier
Charmaz contends that “social reality is multiple and constructed and as such the researcher’s privileges and perspectives must be taken into account as part of the research process” (Charmaz, 2014, p.13). Therefore, this version rejects the notion of a neutral observer. Charmaz places emphasis on research as a co-construction that occurs under specific conditions. Through this, Charmaz recognises the subjectivity and the researcher’s involvement in the construction and interpretation of data. Thus, the research process is a dynamic interaction between the participant and the researcher, with the researcher’s views incorporated within the understandings that have been developed and shaped as more and more data is collected and analysed (Birks and Mills, 2015).

Additionally, Charmaz adds that this constructivist approach enhances researcher reflexivity and highlights flexibility while rejecting the structural application of Straussian grounded theory and mechanical application of Classic grounded theory (Charmaz, 2014). However, Glaser (2002, 2007) is critical of this approach as he contests that this remodeling of grounded theory has resulted in 'Qualitative Data Analysis' focused on accuracy rather than the origination of conceptual core variable analysis. He further adds that Charmaz’s notion of co-construction of interpretations between researcher and participant biases the results. Pertinent to his argument is that by using a constructivist approach, Charmaz “discounts the participant’s main concern in favour of the researcher’s professional concern” (Glaser, 2002, p.5)

“Constructionism is used to legitimate forcing. It is like saying that if the researcher is going to be part of constructing the data, then he/she may as well construct it his (sic) way.” (Glaser, 2012, p.31)

However, Charmaz argues that this co-construction is important because the researcher’s values and experiences are part of the final grounded theory and cannot be ignored or separated.

On the use of literature, Charmaz (2006) agrees with Strauss and Corbin (1990; 2015) but suggests that the literature should be compiled in a specific literature review chapter and worked in throughout the entire thesis. However, she advises delaying writing the literature review chapter until after data analysis to avoid getting 'drowned' in the
literature. Regarding this thesis, a literature review was carried out to reveal the gaps that existed in the implementation of the WHO IPC core components and to position this research within the broader body of literature on implementation of IPC guidance to confirm that no previous research which answers the study research question exists and to set the context of the study.

4.6.2 Choice of grounded theory approach and rationale

Perhaps the biggest challenge for researchers proposing to use grounded theory is navigating through the methodological maze to arrive at an informed decision about which version to use (Breckenridge and Jones, 2009). Kolb (2012) points out that many researchers appear to have avoided this challenge altogether by simply opting for an ambiguous mix of aspects from various versions without regard for the significant incompatibilities and contradictions between these methods. This pick-and-mix approach to grounded theory poses a challenge for novice researchers as they often struggle to stick to the fundamental principles (Birks and Mills, 2015). However, McCallin (2006) clarifies that individual researchers will respond to different versions in different ways. Therefore, this implies that while there is no one right approach, there is a right one for every researcher. Given the length and intensity of PhD study, selecting a methodology that reflects the research aims, individual researcher’s skills, philosophical position, preferences, and interests was vital.

Therefore, constructivist grounded theory was chosen to seek a research methodology that would provide an ontological and epistemological fit with the researcher’s position. Constructivist grounded theory aims to develop a detailed "understanding of the underlying social processes within a certain context" (Charmaz, 2014, p.13). In implementation, context is paramount as contextual cues can promote certain behaviours and subsequently foster or hinder implementation interventions (Nilsen, 2015). Therefore, the fact that the constructivist approach offers the ability to contextualize the data appealed to the researcher. Using a constructivist grounded theory approach allowed the researcher to focus on the underlying social processes that might affect the implementation of IPC guidance in the Ugandan context. This may not
have been immediately apparent but emerged over time as the data was analysed and theorized (Charmaz, 2006). Furthermore, Charmaz (2006, 2014) draws on the analytical power of both classic and Straussian grounded theory traditions but honours the flexibility of the researcher and participants, mutually co-constructing data.

Additionally, constructivist grounded theory also recognises the researcher’s values, perspectives and privileges and the fact that these affect research processes and thus encourage the use of reflexivity during the research process (Charmaz, 2006). According to Charmaz, the researcher cannot be wholly distanced from research participants and is therefore connected with participants and develops a greater understanding of the phenomenon under study with each person being interviewed. Therefore, as a constructivist researcher, personal values had a role to play in the research process, and as such, maintaining reflexivity was essential throughout the research journey. This is further discussed in section 5.10.3 and chapter 10, section 10.7.

4.7 Theoretical perspective: Symbolic Interactionism

Theoretical perspectives provide a complex and comprehensive conceptual understanding of phenomena (Reeves, Albert, et al., 2008). They serve to organise a researcher’s thoughts and ideas and make them clear to others. In deciding whether to use a theoretical perspective, the researcher considered their epistemological dispositions and the adopted research methodology. Charmaz (2014) recommends using theoretical perspectives as sensitising concepts; however, she cautions that there is no need to use them if they do not fit (Charmaz, 2014). Charmaz links symbolic interactionism as a theoretical perspective to her constructivist grounded theory. Salvini (2019) further supports this and posits that constructivist grounded theory exhibits epistemological and methodological consistencies with the methodological position of symbolic interactionism, as expressed by Herbert Blumer.
Although Mead (1934), cited by Reynolds and Herman-Kinney (2003), is credited with developing symbolic interactionism, he did not use the term. Instead, Blumer developed the term by which it is known today. Blumer defines it as an empirical social science perspective studying human group life and human conduct (Blumer, 1969). In trying to explain the nature of symbolic interactionism, Blumer contends that symbolic interactionism rests on three simple premises.

"Human beings act toward things based on the meanings that the things have for them . . . The meaning of such things is derived from, or arises out of, the social interaction that one has with one's fellows . . . These meanings are handled in, and modified through, an interpretative process used by the person in dealing with the things they encounter." (Blumer, 1969, p.2)

These premises highlight the importance of "meaning" in understanding human behaviour, interactions and social processes. To fully understand a social process, the researcher needs to grasp the meanings experienced by the participants within a particular context (Jeon, 2004). Rooted in this is the notion of 'self' as proposed by Mead (1934). Mead asserts that the 'self' needs to be appreciated as interacting with the social world. The person and the world cannot be understood in isolation because the 'self' is continually developed through interaction with other human beings. In other words, the 'self' is a product of social interaction, developed and refined through ongoing participation in society. This explains the nature of the 'self' as fluid rather than static (Carter and Fuller, 2016). From Mead's point of view, the 'self' consists of the subjective 'I' that is natural and not hampered by others, and the objective 'me' that sees 'self' as a reflection of what others see and what one sees when looking back at one's self. 'I' and 'Me' constantly communicate with each other before creating an act or behaviour (Chamberlain-Salaun et al., 2013).

Although many other authors continue to link grounded theory methodology with symbolic interactionism (Charmaz, 2014; Annells, 1997; Morse, 2001), Glaser has been critical of this, arguing that grounded theory is an inductive method not linked to any theoretical perspective and can use any type of data. He contests that the increasing use of symbolic interactionism in grounded theory is down to the perspective dominance of
qualitative research today (Glaser, 2005b). Glaser warns this kind of takeover puts limitations on the type of data collected and how it’s analysed. However, Glaser is not entirely against the use of theoretical perspectives in grounded theory but rather the linking of grounded theory to the roots of symbolic interactionism. He advises researchers to be open to any perspective but not rigidly fixed to symbolic interactionism. He contends that a good theoretical perspective will help qualitative researchers orient themselves to the worlds they study but does not specify what they will find (Glaser, 2005b). Ultimately, the grounded theory research process is not objective but an interwoven process that integrates the phenomenon under study with the study participants and the researchers' perspectives and interpretations (Salvini, 2019).

In considering symbolic interactionism, Glaser’s arguments were acknowledged. However, with Charmaz writing in detail about how symbolic interactionism and constructivist grounded theory are a good fit in her book "constructing grounded theory", coupled with careful thinking and reading about the significance of symbolic interactionism in understanding how individuals know about their world and what they believe to be important, a decision was made to use symbolic interactionism in this study. Linking this to the current study, the main aims were to describe and conceptualise the processes involved in implementing IPC guidance and develop an explanatory theory for these processes. The concept of 'Self' as constructed through social interaction holds special relevance for this study to explore how the HCWs will interpret their identities and their roles as guideline users within the context of their interactions with each other and in the broader healthcare setting. While the focus may initially appear to be on the process, in this study, concern also lies with their deeper personal experiences and the meaning that these experiences hold for them in making decisions regarding the use of IPC guidelines. The application of symbolic interactionism in this thesis is detailed in chapter 5, section 5.4.2
4.8 Summary

This chapter has presented a detailed account of the methodological decision-making process that informed the development of this thesis. It presented arguments for and against ontological and epistemological perspectives, clarifying the philosophical assumptions underpinning this study.

Grounded theory methodology and other methodologies have been critically evaluated, and a critical approach to constructivist grounded theory has been justified amongst different variations of grounded theory. It is argued that what has been presented is an internally consistent approach to the research where underpinning assumptions have been explored and made explicit.

Furthermore, the chapter has also offered the theoretical perspective of symbolic interactionism to guide the methodological design needed in the application of the grounded methodology establishing the context for the next chapter, which will explore details of the method and how the research was conducted.
CHAPTER FIVE: METHODS: DOING GROUNDED THEORY

5.1 Introduction

This chapter discusses the implementation of the research method of grounded theory and demonstrates the development of the writer’s understanding of the method in order to advance and progress the research aim. It begins with identifying ethical considerations and how these were addressed and later discusses the details of data collection, analysis and development of the theory. Given the iterative nature of grounded theory, there is inevitably an element of referring back and forward during the discussion of different aspects of the method. Excerpts from findings are presented in this chapter as Charmaz (2014) advises that these should be embedded in the analysis to show how the final category was developed and to maintain an audit trail.

5.2 Ethical Considerations analysis

Before beginning data collection, it was necessary to consider and address any ethical issues that could arise during the process.

Although ethical issues are present in any kind of research, the nature of qualitative research means these are different from those in quantitative research. They are considered more complex since this type of research is more intrusive and personal, with a more significant role in the researcher-participant relationship (Angelica et al., 2000). Therefore, issues raised by this kind of research cannot be solved solely by applying abstract rules, principles or guidelines (Sanjari et al., 2014). This is because most guidelines for the ethical conduct of research with human participants are written from a biomedical perspective for quantitative research (Beauchamp and Childress, 2013). To this end, it is important to explicitly address any potential ethical issues that may arise in a qualitative study. As such, the three dimensions of ethics in qualitative research suggested by Boydell (2007) were used to guide this research; procedural ethics, ethics in practice and relational ethics, together with the ethical principles of...
informed consent, confidentiality, privacy and anonymity, benefit and non-maleficence (Goodwin et al., 2020; Beauchamp and Childress, 2013)

To start with, procedural ethics involves seeking approval from the relevant ethics committee to undertake research involving human participants who assess the potential harm and benefits of the research to the participants. To this end, ethical approval was initially obtained from the Glasgow Caledonian University School of Health and Life Sciences Research Ethics Committee (HLS/NCH/18/031) (Appendix VII). Approval and clearance (MRRH-REC IN-COM 047/2019) was then obtained from the Regional Referral Hospital Research & Ethics Committee (RRHREC) in Uganda (Appendix VIII). As a legal requirement for all persons and organisations carrying out systematic investigations of any form in Uganda, authorisation (HS424ES) was obtained from the Uganda National Council for Science and Technology (UNCST) with no changes suggested at this level (Appendix IX). As the researcher was based in the UK and in this context, healthcare professionals are not usually given any incentive to participate in research, therefore, no compensation was proposed to be given to research participants. However, as a recommendation by the local IRB RRHREC and in accordance with the required contextual practices in Uganda, payment of 20,000 Uganda shillings (£4.5) was made to each participant as compensation for their time and 5,000 Uganda shillings (£1.1) towards airtime costs incurred when contacting the researcher.

Many ethically important moments can arise during the process of data collection that were not initially anticipated, such as participants feeling discomfort when responding to specific questions, participants revealing vulnerability and deciding how far to probe a difficult situation. The dimension of ‘ethics in practice’ deals with these types of issues. However, the unpredictability of qualitative research coupled with very little conceptual work to draw upon for this dimension means that these issues were managed as they arose. As such, the researcher ensured that participants maintained the right not to answer any questions that made them feel uncomfortable or to stop the interview without any consequences to them.
The relational ethics dimension deals with issues that arise from the researcher-participant relationship and how this influences the research process. For example, being an outsider as a PhD candidate, some participants viewed the researcher as an expert in the research area. This might have contributed to a tense atmosphere with some participants, which may have affected their accounts. In keeping with this dimension and the ethical principles of informed consent, anonymity and confidentiality, all participants were provided with written information highlighting the purpose and voluntary nature of the study, what it would involve for them, any risks or benefits, and specifically how data would be managed to protect their confidentiality as specified in the participant information sheet (Appendix X). This was further emphasised and explained to each participant at the beginning of each interview, making them aware that only the researcher and supervisory team would have access to this information (Masic et al., 2014).

Additionally, the researcher's identity and the supervisory team, including contact information, were provided to all participants. Participants were then asked to sign a form confirming informed consent before participation and their right to withdraw from the study at any time. However, no participants who consented withdrew from the study. Furthermore, in keeping with the ethical principle of non-maleficence, efforts were made to ensure participants were protected from undue intrusion, distress, indignity, physical discomfort, personal embarrassment, or psychological or other harm by giving them the right to choose an appropriate interview venue (Stevenson et al., 2015). A respectful relationship between the researcher and the participant during the interview was established through building rapport, active listening and giving participants enough time to share their accounts and experiences.

Data collected from participants were anonymised with steps taken to protect their identity, ensuring no personal identifying information was linked to data or reporting. This was done by removing names from the transcripts and pseudo names used when reporting findings. Additionally, participants were assured that data collected would only be used for study purposes and no information would be reported to their manager or any authority. Any personal contact details were held separately from the data and used to arrange participation only and destroyed after data analysis. Principles of the
General Data Protection Regulation (2018), Data Protection Act (2018), and the Data Protection and Privacy Act of Uganda (2019) as well as good research governance were adhered to. All data was held securely on a password-protected university network drive, accessible only to the research team.

5.2.1 Recruitment and access

Getting access to people or data for research can require soliciting cooperation from other individuals, associations, organisations, or government agencies before the researcher asks for consent from human subjects (Goodwin et al., 2020). These permissions and approvals are used to communicate and verify the cooperation between an organisation and the researcher (Goodwin et al., 2020; University of Phoenix, 2020). It was, therefore, essential to gain the necessary access permissions.

To this end, permission was obtained from regional referral hospital (MRRH-REC IN-COM 047/2019), and administrative clearance was granted by the District Health Office (CR/220/1) (Appendix XI). The researcher then held a one-on-one meeting with the Principal Nursing Officer (PNO) to request permission to speak to staff and formally introduce the researcher to potential participants on an individual basis. This was important in the Ugandan context, as participants within these contexts expect formal introductions via senior colleagues rather than distributing flyers and email invites. This helped build rapport and enhanced participants' willingness to engage in the study (LeBaron et al., 2015). An explanation of the study was given to the PNO, and the researcher distributed participant information sheets to all potential participants as dictated by theoretical sampling decisions (see section 5.3.2). Participants were asked to contact the researcher via phone, email or in person if they were interested in being part of the study, in line with the ethical principle of informed consent. It should be noted that although the PNO introduced the researcher to staff, it was then up to participants to contact the researcher directly so that there could be no sense of coercion to participate from either the researcher or from the PNO as a senior staff member.
5.3 Overview of Sampling

Sampling in grounded theory is distinctly different from sampling in other types of qualitative studies. While in other qualitative studies, sample sizes and sampling techniques can be predetermined before data collection, this is not the case in grounded theory, with sample size not apparent until theoretical saturation has been achieved (Jamshed, 2014). With the overall aim of building a theory through the construction of categories from the data, sampling in grounded theory takes two stages; initial sampling and theoretical sampling. Initial samples are chosen based on the researcher's knowledge of the phenomenon and inclusion of those most likely to be able to provide relevant data (Mccrae and Pursell, 2016; Birks and Mills, 2015). However, initial sampling only provides a starting point which should later be followed by a theoretical approach (Glaser, 1978).

Initial sampling followed by theoretical sampling is a central feature of grounded theory and differentiates this methodology from other qualitative methodologies (Charmaz, 2014; Glaser, 1978). Charmaz (2014, p.199) describes theoretical sampling as “a process that involves starting with data, constructing tentative ideas about the data and then examining these ideas through further empirical inquiry”. This is in line with the original work by Glaser and Strauss (1967), who posit that theoretical sampling should continually be directed by the emerging theory, following up leads as they arise in the data and progressively focusing on data collection in terms of who is sampled and what is asked to refine and integrate the theory. Theoretical sampling is iterative and involves seeking and gathering data based on emerging themes (Mccrae and Pursell, 2016; Breckenridge and Jones, 2009). It is intimately intertwined with the abstraction of description into theory and is essential to discovering and refining categories and their properties and suggesting relationships between concepts (Breckenridge and Jones, 2009). However, Morse (2008) cautions that theoretical samples should not be static, and the selection and sequence of sampling should be justified.

As such, the initial sampling utilised a purposeful sample of frontline healthcare workers involved in implementing and applying IPC guidance at different levels working at Mbale Regional Referral Hospital. This was followed by theoretical sampling that involved
selecting individuals and asking questions based on emerging concepts. The significance of this is explained by (Glaser and Strauss, 1967, p.61), who posit that “the success of theoretical sampling lies in reaching theoretical saturation”, which is the point at which additional data collected does not yield any further properties to affect the presentation of a substantive area. This explains why the study sample size could not be set at the beginning but was intended to be determined when theoretical saturation was achieved (Baker and Edwards, 2012). However, Weiner (2007) cautions that saturation should be a matter of judgment and consider the practical resources available for the research, including money and time.

5.3.1 Initial sampling

As purposive sampling was utilised, deciding who to interview in the first phase of data collection was important, especially since the researcher was a student in the UK and the study site was in Uganda. To inform the initial sample, the researcher examined the structures and roles of staff involved in IPC in Uganda from the Ministry of Health headquarters down to the facility level (Appendix XII). The researcher and the supervisory team decided that data would be collected from a Regional Referral Hospital first, as this was the main hospital in the area with a more comprehensive range of departments and thus would provide insightful data to begin the data collection. Regarding who to interview first, a decision was made to interview as many people on the hospital IPC committee as possible as they would be knowledgeable about the research area.

5.3.2 Theoretical Sampling

Theoretical sampling took over from an early purposive sampling approach as it guided the researcher on where to go and shaped further data collection (Charmaz, 2014). The process began with the researcher asking, 'What group of potential participants should be turned to next in the data collection process? And for what theoretical purpose?' (Glaser and Strauss, 1967, p.47). As constructivist grounded theory is premised on classic grounded theory principles, these questions by Glaser and Strauss (1967) were used to
guide further data collection. Therefore, the characteristics of successive samples were determined by theoretical relevance at a particular stage in the research.

Following transcription and initial analysis of the first interview with the Senior Infection Control Nurse, the researcher decided it was necessary to interview other members of the IPC committee to further explore data from the first interview. However, a review of the committee membership revealed that all IPC Committee participants were senior nurses (n=3) who were also nurses in-charge of wards with administrative responsibilities and unique challenges. Yet, the process of implementation of IPC guidance involved more than just these senior nurses. So the next stage of theoretical sampling sought to get views and understanding of IPC implementation from other staff members, including staff nurses and junior staff involved in providing clinical care.

Having interviewed IPC Committee members and ward-based nurses and with the researcher being responsive to the data, it was noted that none of the participants interviewed was a doctor. Therefore, a conscious decision in response to the data was made to interview doctors to elicit insights on how this different professional group understood and responded to IPC guidance.

Following ongoing comparative analysis of the collected data, findings revealed another group of HCWs, student nurses, involved in health care delivery. Although under the supervision of senior staff, they played an essential role in the application of IPC guidance in patient care. Therefore, views from this group were also collected.

Further analysis revealed that the implementation process involved inter-department cooperation. This involved more than just delivering clinical care from clinical staff but also other supporting departments and staff. This led the researcher to sample a participant from the microbiology department as it is one of the departments that supported IPC implementation.

Furthermore, interviews conducted as a result of the theoretical sampling were used to add additional interview questions or revise the original interview guide. New interview questions were added, and the existing questions were expanded and improved upon, following constant analysis. This is further discussed in section 5.4.2.
5.4 Data Generation

Through his statement 'All is data', Glaser (1998, p.145) recognises that grounded theory can use any type of data, for example, transcripts from interviews and focus groups, field notes, memos, journals, diaries, questionnaires, surveys, scholarly literature, government and organisational policy documents. However, data vary in quality, relevance and usefulness for interpretation; therefore, the right type of data needs to be collected. The usefulness of the data will depend on the researcher's ability to discern this data (Charmaz, 2006). Ultimately, different data collection tools have been used in grounded theory research, either in combination or isolation. Charmaz (2006) contends that any data collection technique can suffice provided it elicits the right data to answer the research question. Nonetheless, it is also important to choose a technique to guide the first initial data collection phase.

As grounded theory attempts to understand the perceptions and behaviours of participants from their perspectives, interviews were used to generate relevant data. Although focus group discussions are appropriate for grounded theory, with added benefits of generating discussion about a research topic that requires collective views and the meanings that lie behind those views, the practical aspects of getting HCWs off their busy schedules in a group at the same time rendered this option unfeasible (Acocella, 2012; O.Nyumba et al., 2018). Participant observations as a data generation method have been discussed in grounded theory as they allow for a deep understanding of participants' behaviours and interactions (Birks and Mills, 2015; Sedano et al., 2017). The researcher considered attending an IPC committee meeting to elicit information through observation. However, these meetings were not regular and only happened when there was a need and availability of IPC committee members. Since the researcher spent a limited amount of time in Uganda (the study site), it was impossible to arrange this observation. Therefore, this thesis used one-on-one interviews with HCWs to elicit participant perspectives about the phenomenon.
5.4.1 Conducting Interviews

Interviews are attempts to understand the world from the subject’s point of view, to unfold the meaning of peoples’ experiences, and to uncover their lived world before scientific explanations (Sayrs, 1998). Primarily, three types of interviews are commonly used in health research; structured, semi-structured, and unstructured interviews. The primary difference among them is the amount of control the interviewer has over the encounter and the aim of the interview (Doody and Noonan, 2013).

According to Stuckey (2013), structured interviews are fully controlled by the interviewer, who possesses power and, as such, gives the interviewee less room to be flexible. Because of this, this type of interview was rejected for use in this study as the study aimed at co-constructing the data with the study participants. On the other hand, unstructured and semi-structured interviews are closely related. Rubin and Rubin (2005) describe these two sets of interviews as coming from the same family but differing in approach. However, the difference highlighted is that in semi-structured interviews, the researcher often requires more specific information and, as such, will develop preliminary questions to guide the interview, whereas, for an unstructured interview, the researcher suggests the topic with the interviewee allowed to answer in the way they wish (Rubin and Rubin, 2005; Gill et al., 2008).

The use of semi-structured and unstructured interviews is a recognised common data source in grounded theory and allows for in-depth exploration of specific topics or experiences with techniques similar to those used in other qualitative studies (Charmaz, 2006; Birks and Mills, 2015). The value of interviewing in grounded theory is evidenced by the extensive number of studies that rely on it as a principal data generation method (Birks and Mills, 2015). However, the overall aim of studying the process and developing theoretical explanations sometimes raises potential interview dilemmas. For example, Dey (2008) posits that some interviewers may concentrate on emerging categories without paying enough attention to how questions concerning these emerging categories affect research participants. However, Charmaz (2014) conveys that the collaborative elements, particularly those that deal with the co-construction of data embedded in the constructivist grounded theory, resolve this kind of dilemma.
Comparing and contrasting these two types of interviews revealed that both unstructured and semi-structured interviews are congruent with the grounded theory methodology. However, due to the broad nature of IPC, the use of semi-structured interviews allowed the researcher to narrow the focus of the interviews to questions more relevant to the research aim. Additionally, one of the central features of grounded theory is concurrent data collection and analysis, which allows the researcher to define questions for consequent data collection and pursue questions significant to the research aims (Glaser and Strauss, 1967; Glaser, 1992). Therefore, the use of semi-structured interviews fitted with the tenets of grounded theory methodology and allowed for exploration and clarification of comments made by the respondent.

Since directing and paying close attention to the interviewees during an interview can be demanding, it was important for the researcher to develop their interview skills. The researcher conducted three trial interviews with research colleagues within the university and sought feedback from the supervisors and the interviewees while reflecting on the interview experience. These pilot interviews allowed the researcher to practice and develop their interviewing techniques, particularly the probing techniques. They also helped the researcher to value the importance of giving participants time to explain their accounts.

5.4.2 Development of the interview guide

To assist in the interview process and as per requirement by the RRHREC, a topic guide was developed, as shown in Appendix XIII. Symbolic interactionism guided the development of the initial topic guide. In doing this, three tenets of symbolic interactionism were applied, and these were;

- Self: The concept of self was used to develop questions exploring participants’ identity and roles, for example, "Can you tell me about yourself and your role at this health facility?"
• Object: The concept of an object was used to develop questions that explored IPC and how participants understood this, such as, "Can you tell me about IPC and what this means to you?"

• Social interaction: This was used to develop questions that explored influences on IPC guidance and understanding of the decision-making process, such as "How do you make decisions about which IPC guidance to use?"

The topic guide was not comprehensive and contained only a number of general issues that covered understanding the meaning of IPC guidance, decision-making, and factors influencing these decisions. This gave participants the power to determine how much personal information they shared and at what point. In practice, some participants went straight to their own experience, while others started by considering the questions at a broad level. Furthermore, the topic guide did not remain static but was theoretically developed as the interviews progressed with some questions added such as, 'How does your experience affect how you follow IPC guidelines?', 'Where do the guidelines come from?'. 'How does support from hospital management influence your decisions?', 'How does support from external organisations influence how you implement IPC guidance?'. Further questions added as the data collection and analysis progressed are shown in the revised interview guides in appendix XIV

5.4.3 Interview process, concurrent data collection and analysis

Although the initial plan, as advised by the IRB authorities in Uganda, required the researcher to gather data from facilities at more than one level and to elicit views from a diverse range of participants, including those at lower level healthcare facilities this was not achieved as the global COVID-19 pandemic led to border closures, travel restrictions and lockdowns which meant that the researcher was unable to travel for subsequent data collection trips. This meant that the researcher had to make modifications to the original data collection plans. To this end, interviews were conducted between October 2019 and November 2019 with staff at the Regional Referral Hospital, adhering to the general grounded theory principles of theoretical sampling, concurrent data analysis and constant comparative analysis (Charmaz, 2014).
During the interviews, it was important to create conditions under which participants would be comfortable sharing their experiences and as such, participants were asked to choose the interview locations. At the onset of each interview, each participant was assured of confidentiality and could withdraw or terminate the interview at any time should they wish. The interviews lasted between 15 minutes and 1 hour and were digitally recorded and fully transcribed by the researcher. During the interviews, it was important not to constrain the participants but to give them time to talk, limiting researcher participation to questioning, reflective listening, and clarifying statements. The questions were asked in a non-directive manner to meet the study’s principal aim of learning about the interviewees' opinions.

Data collection and analysis took place in alternating sequences and were guided by the grounded theory methodology of concurrent data collection and analysis (Glaser and Strauss, 1967; Charmaz, 2014). The researcher aimed for correct grounded theory concurrent data collection and analysis, however, the practicalities meant this was not always possible. The researcher had to schedule interviews opportunistically, for example, the researcher had to accept two interviews in one day to accommodate willing participants in a very restricted time frame. The researcher, therefore, had to modify the standard grounded theory technique by doing a brief analysis of interviews when it was possible to do so through making field notes (appendix XV) and memos of initial thoughts on emerging concepts based on listening to recordings. A more detailed analysis was then done at a later stage. This is further discussed as a potential limitation in the discussion chapter.

However, these initial findings from the brief analysis helped shape the questions for subsequent interviews. After each interview, notes were made on the researcher's perspective on how successfully the interview approach had been, in order to capture important observations of participants within their social context. This allowed the researcher to further improve their interview technique. Additionally, interview recordings and transcripts were reviewed to ensure accuracy. Transcribing helped the researcher to become immersed in the data and to begin the analytical process.
5.5 Data management and analysis

An important decision to make is how to manage the enormous amount of data that will be generated through the research process. Foley and Timonen (2015) posit that qualitative researchers, including grounded theorists, may use a number of ways to manage their data, including computer-assisted software such as NVivo, Atlas.ti, Microsoft office processing software and mind map applications. However, Wietzman (1999) cautions that although these are convenient in organising, sorting and linking large amounts of data, they do not perform the thinking of the grounded theory researcher who codes, categorises, conceptualises and theorises the data; ultimately, the actual analysis still needs to be done by the researcher.

Drawing from this, NVivo was used to organise (appendix XVI), sort and store the data, while mind-maps, diagram sketches (appendix XVII), and sticky notes were used to assist in visual conceptualisation during analysis. The researcher did the analysis following the constructivist theory process (Charmaz, 2006, 2014). It was conducted in a systematic, non-linear fashion using the constant comparative technique of analysis where data collection, coding and analysis occur simultaneously. Although the analysis and results are reported in what appears to be defined stages of a linear process, in reality, this process was non-linear. New data, concepts, ideas, and propositions were constantly compared with previous data during each data analysis phase.

5.5.1 Memo writing

The coding process is often punctuated by memo writing. Clarke (2005, p.85) defines memos as "intellectual capital in the bank". The importance of memos in grounded theory is emphasised by Glaser (1992, 1978), who asserts that there will be no strong theory unless the researcher starts and continues writing memos. Charmaz (2014, p.164) calls it the "pivotal intermediate step" between data collection and writing drafts. Through memo writing, the researcher narrates ideas about codes and their
relationships as they go through the analytical interpretation of the data and, consequently, explore, explain, and theorise emergent patterns. As such, memos may “vary in subject, intensity, coherence and theoretical content” (Birks and Mills, 2015, p.11) but should never be disposed of even if they do not seem helpful since the researcher can never anticipate when a memo will be important. Therefore, writing memos is an integral part of the grounded theory process. It serves as the methodological link through which the researcher transforms the data into theory and helps maintain an audit trail, thus improving the rigour of this research (Lempert, 2010; Birks and Mills, 2015). For the current study, memos were used to maintain an audit trail that enhanced the study's rigour and were used to communicate with the researcher’s supervision team about the research process (Birks and Mills, 2015).

In the early stages, the researcher wondered how and what they would memo; however, after reading through Birks and Mills (2015), the researcher started to write memos right from making the decision on the initial interview participants. This process continued into the coding process. The researcher wrote memos (appendix XVIII) after every interview, after each transcription and during analysis. To facilitate data analysis and theory development, the researcher used various techniques during this memoing process. These included mind maps, diagrammatic sketches, MS office write-ups, and physical notes in a journal.

### 5.6 The coding process

Coding is "the process of naming segments of data with a label that simultaneously categorises, summarises and accounts for each piece of data" (Charmaz, 2014, p.111). It is a core process in grounded theory that sets a relationship between the researcher and the data and forms the foundation of grounded theory development (Bryant and Charmaz, 2010). Charmaz asserts that "coding requires the researcher to ask analytic questions of the data gathered which enhances understanding of the phenomena studied and directs subsequent data gathering towards analytic issues" (Charmaz, 2014, p.109). Holton (2010) highlights that this process is not a one-off step but a continuous part of the overall analytic process. Therefore, understanding the various aspects of the
coding process is essential in conceptualisation. Generally, there are at least two types of coding in any grounded theory, but these vary from version to version (Holton, 2010). Considering that this study adopted a constructivist version, the coding steps of constructivist grounded theory were used; initial and focussed coding.

5.6.1 Initial coding

Initial coding involves studying data fragments to reveal analytical issues and generate as many ideas as possible early in the analytic process. This involves naming each word, line, and segment of data and should be kept close to the data (Charmaz, 2006). Charmaz contends that this process "continues the researcher's interaction with participants during data collection but most importantly brings the researcher into an analytic space" (Charmaz, 2014, p.109). To generate open codes, Glaser (1978, p.57) and Charmaz (2014, p.116) recommend asking a set of questions which include; 'What is the study made of?', 'What do the data suggest?', 'From whose point of view' and 'What theoretical category does this incident indicate?'. These questions guided the researcher during the initial coding process. It was important to remain open to exploring whatever theoretical possibilities that can be discovered in the data as these open codes were provisional, and some were improved, changed or reworded to fit the data as the analysis progressed.

The initial coding process was challenging as this was the researcher's first experience using grounded theory. At times, concerns arose about coding consistency and the large number of codes generated. However, Charmaz (2006), in her book "Constructing Grounded Theory", suggests the use of sensitising concepts to help researchers start to code the data, as these concepts offer a starting point for initiating analysis. To this end, sensitising concepts from symbolic interactionism that included; action, meaning, process, and identity were used to start the initial coding process. However, as more interviews were coded and the researcher moved on to focused coding, symbolic interactionism was discontinued as these concepts were found to be limiting. From that point onwards, the use of gerunds that denote action was followed. Transcripts were coded line-by-line, sentence-by-sentence or paragraph-by-paragraph to make sense of
the data and facilitate the emergence of preliminary codes through examination of the data (as shown in appendix XIX). The preliminary codes were re-visited, with each transcript coded. This entire process was done using NVivo 12, as shown in (appendix XX)

The transcription and coding of interviews generated a whole host of codes and memos, with each transcript generating between 35 – 80 codes (appendix XIX). To facilitate effective coding and ensure the codes reflected the data rather than forcing the data, initial codes were kept simple and precise. The memos documenting early findings and codes were developed. At this stage, these were brief and often revisited, revised and expanded upon to generate further memos as more analysis was conducted while developing and later refining the emerging theory.

5.6.2 Focused coding and beyond

Initial coding is subsequently followed by focused coding, where the researcher seeks to identify the codes that are related conceptually and those that are dominant. Focused coding involves using the most significant or frequent codes developed during initial coding to sieve through and analyse large amounts of data (Charmaz, 2014). It requires deciding which initial codes make the most analytic sense to categorise the data further. These codes are more conceptual than the initial line-by-line and incident-by-incident codes (Glaser, 1978). They add meaning to the data and advance theoretical development.

Focused coding was used to move across interviews and compare participants' experiences, actions, and interpretations. This process determined the adequacy of the earlier codes, and some codes were subsequently renamed to improve their fit. For example, 'being in charge' was renamed 'taking charge', and 'support from administration' was renamed 'getting support from administration' as these provided more of an action (gerunds) rather than a theme. However, in the early stages of analysis, grouping codes together was avoided in an effort not to force an interpretation
of meaning too early. However, after the sixth interview, initial codes (Appendix XXI) were reviewed, refined, sorted and grouped into focused codes of meaning.

5.7 Constant Comparison Method

The coding process is not a straight linear process but rather an iterative process that involves going back and forth through the data (Charmaz, 2014). The constant comparative method combines systematic data collection, coding, and analysis with theoretical sampling to generate a theory that is integrated, close to the data, and expressed in a clear form (Kolb, 2012). During this process, data was continually processed, analysed and coded. This involved doing initial and focused coding multiple times combined with theoretical sampling, saturation and memo writing. This allowed for theory generation. The constant comparative method was used throughout all stages of analysis to recognise similarities and differences in the data, refine emerging concepts, progress the emergence of conceptual data, and compare the final analyses with relevant theoretical and research literature.

5.8 Category Development and Theoretical Development

The development of categories was made possible by making constant comparisons as described in the previous section and writing theoretical memos (Appendix XXII) about the analysis, as shown in figure 5. To this end, focused codes were constantly compared, integrated and conceptualised toward a more abstract level (Appendix XXIII).
While reviewing the codes, it became clear that some focused codes easily formed categories. In developing categories, patterns in actions or concepts presented were sought rather than detailing the behaviour (Glaser and Strauss, 1967). The researcher explored each major focused code, examining the situations in which they appeared, when they changed and the relationships between them. This process was possible through sorting memos, re-examining data and reflecting on possible theoretical explanations to identify categories.

Further memoing and constant comparisons facilitated the continual refinement of categories and subcategories. They helped determine which categories could be subsumed by others, which could stand alone, and how they fit together. For example, the data revealed that HCWs encountered challenges while ensuring IPC implementation. This same idea was used across the different focused codes with the help of techniques like diagramming and tabling techniques to reorder and refine the major categories (Figure 6). However, this was time-consuming as categories were constantly renamed or changed with new categories added. For example, by going back and forth comparing data, these were revised as shown in figure 7. Making decisions was revised to ‘Recognizing the importance of IPC’, manoeuvring was revised to ‘overcoming challenges’, facilitating was turned into a new category; ‘Enabling
conditions’ while a new category, ‘encountering challenges’ was created. The memo in table 15 evidences this process.

Figure 6: ‘Developing’ Categories
This memo deals with coming up with new meaningful categories and re-labelling old categories. As I started writing the storyline I noticed that the developed categories; Maneuvering, Facilitating, Making Decisions and Playing a role, are not bringing out the participants’ concerns and telling this story in a coordinated way. So, I have decided to go back to the data and make comparisons with these already developed categories. Following this process, I am suggesting the following changes;

- Since making decisions is based on being aware of guidelines, understanding IPC and feeling towards guidelines, this should form a new category called ‘Recognising the importance of IPC’
- I am keeping manoeuvering as a sub-category but creating a new category ‘Overcoming challenges’
- Facilitating represents enabling factors so I feel ‘Enabling conditions’ as a category would be a better fit.
- The main concern of participants is the amount of challenges they come across, I feel its best to represent this as a category so I am creating a new category ‘Encountering Challenges’

MEMO: 12.05.2021
Furthermore, with continued analysis, subcategories were developed under these categories as shown in figure 8. For example, under recognising the importance of IPC, being aware of guidance and making sense of guidance were developed as subcategories. Playing a role got two sub-categories; identifying self and taking responsibility, under encountering challenges two sub categories, individual and organisation challenges, were developed. While overcoming challenges; got a sub-category; manoeuvering with two strategies HCWs used to overcome challenges; collision avoidance and turning.

**Figure 7:** Refined categories
5.8.1 Emergence of the core category

The researcher's initial purpose was to understand the implementation process of the IPC guidance and how HCWs made decisions regarding this process. However, as the study progressed and the researcher got to grips with the grounded theory principles, they learned to focus on the participants' concerns.

Right from the beginning of the analysis, it was apparent during the open coding process that encountering challenges and finding ways to overcome them was a concern for HCWs. However, conceptualising this problem was a little more time-consuming. Initially, the idea that HCWs were concerned with 'making do' with their situations is explained in the memo in table 16. This seemed alluring because of the context they operated in, particularly in low resource settings. At this point, making do appeared to be a four-phase process that entailed playing a role, enabling, manoeuvring and making decisions.
Making Do is an emerging theoretical abstraction through which healthcare workers ensure that they practice infection prevention and control. Making Do occurs because of the numerous challenges healthcare workers encounter. These may be encountered through shortage of resources, delay in delivery of material and overcrowding among others.

One of the ways of making do is through maneuvering. Healthcare workers may maneuver in two ways;

1. Turning: Which means they go around the challenge after encountering it for example through improvising
2. Collision Avoidance: Which involves coming up with solutions before encountering challenges such as delegations of duties among others.

MEMO: 06.05.2020

Table 16: Memo: More light on "Making Do"

However, following advice from the supervisory team, the researcher immersed themselves in understanding and utilising theoretical coding to aid in further conceptualisation, as detailed in section 5.8.1.1. This involved the researcher exploring the data iteratively with the already developed categories and sub-categories during this process. Making Do was revised to ‘striving’ while manoeuvring was changed to improvisation with new sub-categories such as on-demand improvisation replacing turning and collision avoidance re-labelled as planning for the future, as reflected in the memo in table 17.
I am writing this memo after completing my first thesis draft. After receiving feedback on my draft, I was forced to revisit my data to further conceptualise and refine some of my categories for better clarity. At this point, as discussed, striving is a better fit to explain the process that HCWs go through. Additionally, manouevering is being revised to Improving or improvisation. Improvisation implies the strategies HCWs employed to overcome their challenges. The sub-categories of turning and collision avoidance are being revised to on-demand improvisation and planning for the future improvisation.

MEMO: 02.01.2022

Table 17: Memo: Revising manouevering

5.8.1.1 Theoretical coding

Glaser (1978, p.72) introduced theoretical coding as a way of conceptualising 'how substantive codes may relate to each other as hypotheses to be integrated into a theory. According to Charmaz (2014, p.150), theoretical coding is a sophisticated level of coding that follows codes that have been selected during focused coding. She emphasises that theoretical codes help researchers theorize their data and focused codes. They conceptualise how focused codes are related and move the analytic story in a theoretical direction.

As mentioned earlier, the researcher tried to understand the use of theoretical codes through reading the literature. However, the use of theoretical codes was not a straightforward process as the researcher was constantly reflecting on how these could be applied to the findings as the memo in table 18 shows;
Clarity was gained while reading "The Grounded Theory Perspective III: Theoretical Coding" by Glaser (2005a) and comparing how the different theoretical coding families related to the study data, a number of relevant codes were identified and are detailed in chapter 6 as they relate to the study findings.

5.8.2 Theoretical Sensitivity

From the literature, theoretical sensitivity is an abstract concept, intangible in nature. However, Birks and Mills (2015, p.58) define it best by proposing that "it is the ability to recognise and extract elements from the data that are relevant to the emerging theory". This definition highlights the importance of systematically working out concepts and hypotheses from the data and the research process. This means the researcher should try as much as possible not to contaminate the theory with preconceived ideas by maintaining an analytic distance, tolerating regression and confusion and trusting in preconscious processing and conceptual emergence (Holton, 2010). Several authors
(Reay et al., 2016; Birks and Mills, 2015; Higginbottom and Lauridsen, 2014) have cautioned that novice researchers find it challenging to develop theoretical sensitivity.

As the researcher identified themselves as a novice researcher, particularly in grounded theory, efforts were made to develop theoretical sensitivity throughout the process. This was achieved by positioning themselves in the research, writing memos throughout the study, regularly consulting the supervisory team, and reading literature in the study area and literature from the founders of the three grounded theory variations explained in the methodology chapter. Although the researcher's professional knowledge and experience acted as sources of theoretical sensitivity, reflexivity was considered throughout the study to avoid being "blocked" by previous experiences, further discussed in section 5.10.3 and chapter 10, section 10.7.

5.8.3 Theoretical Saturation

Data generation in grounded theory research should ideally continue until subsequent data gathering yields no new information, and further generation would not add anything useful to the study (Glaser and Strauss, 1967; Strauss and Corbin, 1990; Charmaz, 2014). Theoretical saturation occurs when no new categories, properties or relationships emerge during analysis. After 13 interviews, a core process emerged that was subsequently developed into the core category. Although sufficient data was collected to develop the theory during this first field trip, theoretical saturation may not have been achieved as this was to be undertaken during further data collection trips. However, the global coronavirus (COVID-19) pandemic led to international border closures and restrictions, making it impossible to collect more data and complete the PhD study within the required time frame, therefore the study was modified as discussed below.

5.9 Modification of the study due to COVID-19 pandemic

Prior to the pandemic, this PhD study aimed to explore the implementation of IPC guidance at the health facility level in Uganda to understand the processes involved. To
achieve this, a qualitative research study following the grounded theory methodology was adopted, and interviews with staff as guideline users were conducted. Data collection was conducted between October 2019 – November 2019 from 13 participants, with ongoing data analysis between October 2019 – March 2020. Following this analysis, the second round of data collection, as dictated by further theoretical sampling, was scheduled between March 2020 – April 2020. However, this was halted when the pandemic escalated in Uganda and the UK.

Consequently, it was not possible to collect further data as it became apparent the pandemic was unlikely to improve in the next six months, and the amount of data that had been collected would need to be supplemented. The decision to modify the study was made, and it was decided to supplement the data by adding another objective, as noted below. Decisions regarding this change were made in consideration of the methodology and aimed to maintain as much similarity to the original research plan as possible

- to apply behaviour change theory by undertaking an analysis of identified factors which may present as barriers and enablers to the implementation of IPC guidance and to make preliminary recommendations for intervention design

The methods associated with this additional objective are explained in chapter 8.

5.10 Rigour

Evaluating and ensuring the quality of research are essential considerations for researchers and practitioners appraising evidence to inform their practice or research (Baillie, 2015a). Evaluation is discussed in detail in chapter 10, section 10.3.1. Therefore, the focus of this section will be on rigour and how this was ensured throughout the research process.

It is argued that rigour is a subset of quality. A review by Gill and Gill (2020) on the use of the term rigour in research, (discussed further below), found that in majority of the articles, rigour and research quality were closely associated. In turn, they contend that
rigour is the source of quality, although it might also be argued that rigour and quality
are deemed to be synonymous. In an attempt to define quality, Nowell and Albrecht
(2019) conceptualise it as an inquiry that addresses a significant gap in the literature in
a manner that advances our general understanding of a broader phenomenon through
the use of a method appropriate to the nature of the research question” (2019, p.352).
As such, Charmaz (2006) argues that it would be possible to produce methodologically
rigorous research that did not meet the other quality criteria, such as relevance. Having
said that, rigour remains important and should go beyond the sound application of
methods to include other dimensions of quality, such as relevance (discussed in chapter
10).

A review on the use of the term rigour in research found no standard definition of rigour
as the term is frequently used without definition (Gill and Gill, 2020). According to
Reynolds (1971), cited in Ryan-Nicholls and Will (2009), rigour is the use of logical
systems shared and accepted by relevant scientists to ensure agreement on the
predictions and explanations of the theory. This early definition highlights important
attributes of rigour arising in a predominately positivist discourse. As a result, there
continues to be considerable debate concerning rigour in qualitative research and
whether this should be similar to, parallel to, or distinct from those of quantitative
research. For purposes of this thesis, a more contemporary definition by Nowell and
Albrecht (2019) was adopted;

“Rigour, then, can be conceptualized as the appropriate execution of a research
method. Put simply, if quality is the what, rigour for our purposes becomes the how”
(2019, p.352)

Ballinger (2004) suggests that the assessment of rigour in qualitative research should
transcend conventional standards. Additionally, Finlay (2006) and Tracy (2010) argue
that criteria used in qualitative research should differ from those applied to quantitative
research and have called for the use of different techniques to promote rigour during
the qualitative research process. They add that agreed criteria for quality in qualitative
research can establish a common understanding between researcher and reader and be
helpful to people who are learning research methods. However, Rolfe (2006) cautions
that a single set of criteria cannot be applied across because of the variety of methodologies. Therefore each methodology should be assessed on its merits. Different authors have proposed several techniques, tools, and criteria; some are presented below.

Lincoln and Guba (1985) provide criteria for assessing rigour using the concept of trustworthiness which includes credibility, confirmability, dependability and transferability. They later added a set of criteria concerning the authenticity of the research, which encompasses fairness and the requirement that the research leads to increased understanding and action (Guba and Lincoln, 1989). They link these criteria with traditional criteria for the quality of quantitative research. As a result, these criteria have been criticised, with Long and Johnson (2000) pointing out that these criteria essentially have the same meaning as traditional quantitative criteria.

Another attempt to articulate quality in qualitative research has been made by Ballinger (2006), who suggests four considerations rather than criteria or standards that researchers can use to reflect on the quality of their research. These include coherence between the study's aims and design, evidence of systematic and careful research that concurs with the chosen methodology, convincing and relevant interpretation and the researcher's role. Meyrick (2006) also avoids stringent criteria by suggesting two core principles of quality in qualitative research; transparency, which involves the disclosure of the research, and systematicity, which involves systematic data collection with any deviation explained and justified.

Baillie (2015) collates some techniques that can enhance rigour in qualitative research; reflexivity, peer debriefing, prolonged engagement in research settings, triangulation, member checking, examining negative cases, rich description and audit trail. However, they caution that specific techniques may be more relevant to some research studies than others, depending on the context and methodology used, so criteria should not be applied rigidly. Rather than using predetermined and rigid criteria, three techniques, peer debriefing, audit trails and reflexivity from Baillie's (2015) list, were applied to ensure and enhance rigour in this study, as they offered flexibility to use what was practical and relevant. These are discussed in the following sections.
5.10.1 Peer debriefing

Peer debriefing involves scrutiny by a peer researcher, who can support and challenge the researcher (Baillie, 2015). However, Houghton et al. (2013) argue that peer debriefing is disputable because the analysis is individual and unique. While Sandelowski (1993) adds that as reality is multiple and constructed in the interpretative and constructivist paradigm, no two researchers will produce the same findings. Nonetheless, Houghton et al. (2013) acknowledge that such external scrutiny promotes credibility in findings. As such, in this study, the researcher shared their transcripts, list of codes and findings at every stage with their academic supervisory team, who critiqued and provided feedback whilst not imposing an alternative interpretation. Another technique of peer debriefing used in this study involved presenting the method and early results at research group seminars, where feedback was received from a wider group of colleagues.

5.10.2 Audit trail

The disciplined abstractions of qualitative studies that culminate in their final results are seldom displayed visually, nor are the many steps carried out as data collection moves forward to the study’s descriptions, explanations, and conclusions (Barusch et al., 2011). Barusch further emphasize that some of these steps remain indistinct and intuitively known to investigators (Barusch et al., 2011). Therefore, Morse (2015) advises that the management of data sources and their interpretations should be described as much as possible to strengthen rigour. In an audit trail, the researcher keeps records of all stages of their research, their decisions and the thinking behind them (Baillie, 2015). This study fulfilled this by keeping memos during data collection and analysis, as evidenced in the methods chapter and appendices VIII, XXII and XXIII. The researcher also kept a reflective journal/diary that included reflections after each interview, decisions made at each data collection step, and a record of the data analysis thought process. Examples of these are attached in appendix XVIII and XXIII.
5.10.3 Reflexivity

Jack et al. (2014, p.1) define reflexivity as a "generalised practice in which researchers strive to make their influence on the research explicit to themselves, and often to their audience". Reflexivity has become such an essential component of qualitative research today that it has become a requirement for quality appraisal and research reporting guidelines (Finlay, 2002; Probst, 2015). Pillow (2003), however, cautions that reflexivity can be misused to imply that issues of bias and misunderstanding have been adequately addressed just because the researcher is aware of them. While Finlay (2002) adds that reflexivity is sometimes a distraction, focusing on the researcher's internal processes and shifting attention away from the studied people or phenomenon. However, through this process of maintaining reflexivity, the researcher consciously recognises and addresses their effect and influence on the research, which enhances the rigour of the research. Probst (2015) adds that reflexivity ensures accountability and enhances personal growth and the quality of the knowledge generated as well as the researcher's well-being.

Therefore, it is crucial to be self-aware during the research process and explicitly reveal this in the write-up. As such, reflexivity is an expectation in all qualitative research, grounded theory included (Charmaz, 2014).

Within the grounded theory methodology design, it has been argued that, to a certain extent, reflexivity is considered to be acknowledged (Piran et al., 2003; Annells, 1997). For example, by allowing the researcher and the study to react to changing circumstances and emergent themes and adapt to fit them, communication with participants about their thoughts and opinions should, in theory, ensure ethical treatment and awareness of the researcher's presence (Jack et al., 2014). However, suggestions are that this does not go far enough in guaranteeing reflexivity in its practice, particularly with a focus on analytical procedures; it appears there is very little attention that is given to the social processes that influence the generation of data and thus the social construction of knowledge (Hall and Callery, 2001). Taking this into consideration, extra steps were taken to ensure reflexivity throughout this study, such as keeping a reflective diary where thoughts about the researcher's values, interests and
assumptions were kept alongside field research notes. In addition, writing memos ensured the reflective process was ongoing through data gathering. Engaging in critical reading of grounded theory papers within and beyond just nursing research ensured that the researcher was aware of the variety of paths of the grounded theory research process. Further details are explored in the personal reflection section in chapter 10, section 10.7.

5.10 Summary

This chapter detailed the applied methods of undertaking a grounded theory study and the learning achieved through engaging in the research process. It is a method that was challenging but satisfying through its power to turn an overwhelmingly complex amount of data into an organised theory. This happened sequentially, subsequently and simultaneously. The next chapter provides an accessible overview of the theory, utilising Charmaz’s approach to storylining.
CHAPTER SIX: OVERVIEW OF THE EXPLANATORY GROUNDED THEORY

6.1 Introduction

This study aimed to explore the implementation of IPC guidance at the healthcare facility level in Uganda and to develop a theoretical explanation for the processes involved in the implementation of the guidance within these settings.

This chapter presents a brief overview of the theory constructed from this study in anticipation of a more detailed presentation of results in chapter seven. This is presented through the use of a storyline. The use of a story is not unknown in research as it is commonly used in some qualitative methodologies (Birks et al., 2009). Over time, the use of stories in qualitative research has seen an evolution in the status of this strategy. However, using a storyline as an analysis technique is most commonly associated with the constructivist grounded theory (Charmaz, 2014). It is further supported by Birks and Mills (2009), who contend that a storyline serves two purposes in grounded theory; the production of the final theory and a means by which this theory is conveyed to the reader. Birks and Mills (2009; 2015) argue that a storyline in grounded theory can be used throughout the research process with the intent of constructing, integrating and making visible the final theory. The adoption and use of a storyline for this study was in line with constructivist grounded theory and was used to bring to life the developed theory and present it in a summarised lay form for the readers. Additionally, the intention of this was to provide a summary of the findings before going into further details in subsequent chapters.

The use of bold formats in this chapter was to identify the main categories of the substantive theory and italics to identify the relevant theoretical codes. However, before presenting the storyline, an identification of the relevant theoretical codes which describe the relationships between categories and that led to the development of the theory is presented.
6.2 Identified theoretical codes and the theory development

A number of theoretical codes were identified from the study’s data. Firstly, codes relating to conditions such as work environment emerged; for example, the context in which HCWs operated was mainly constraining; however, some enabling conditions existed. Secondly, strategies, such as actions taken to overcome constraints and other challenges, were evident, as well as consequences such as those of recognising the importance of IPC and encountering challenges. The coding family of identity also emerged from the data, as participants often identified themselves in their roles. However, the main theoretical code that emerged was asymptote. Glaser (2005a) identified this code as a model dealing with getting close but not quite getting there. This study shows that HCWs never achieved the desired IPC practice levels because of the numerous challenges (further explained in section 6.3). Lastly, the coding family of process also emerged and was conceptualised as 'striving'. In this study, participants followed a process of 'striving' to overcome the hurdles through different phases that allowed them to get close to the desired IPC implementation levels.

The systematic application of grounded theory methods and the process detailed throughout the previous chapter facilitated the emergence of a core category of asymptote and substantive grounded theory, Striving for improved IPC practice that created a conceptualised understanding of the data (Charmaz, 2006, 2014). The grounded theory developed in this study accounted for most of the relevant behaviour when participants were deciding how to implement IPC guidance.
6.3 The storyline

The substantive theory developed during this study was ‘Striving for Improved IPC Practice in a low resource setting’.

This grounded theory speaks to the primary challenges HCWs face in trying to achieve ideal IPC implementation in a low resource setting and how these challenges are overcome. It explains the patterns of meaning and actions that reflect participant experiences and explains the central social process in low resource healthcare settings that HCWs go through to mitigate challenges faced when implementing this guidance.

The participants' main concern is how to implement IPC measures amidst a plethora of challenges. Because HCWs recognise the need and importance of IPC, they try to incorporate the guidelines into their daily practice, but the required level of implementation is never quite achieved because of the challenges they face, as figure 9 illustrates.

To mitigate the impact of these challenges on IPC practice, HCWs adopt a process of ‘striving’, which they go through in implementing IPC guidance to achieve safer healthcare in a low resource context. There are always challenges or complexities in these contexts, such that an ideal state of full IPC implementation is never achieved in reality. This constant striving but not quite getting there describes the concept, or theoretical code, of asymptote, discussed further in the following section.

6.3.1 Asymptote

Asymptote is one of the theoretical codes listed by Glaser (2005a, p.11), which is a model that deals with getting close to but not quite getting there. Additionally, this theoretical code illuminates a key point; the 'ideal state', or its construction, is not attainable by anybody. In this study, the ideal state is the required level of IPC practice for fully implemented IPC guidance. However, this perfect state of IPC practice functions in a
fashion similar to that of the asymptote(s) that some curving functions, in this case, IPC practice and ideal state, approach but never touch (Gipson, 2006). As illustrated in figure 9, enabling conditions and strategies from HCWs push IPC practice toward the ideal levels. However, challenges pull IPC levels away from the ideal levels, which means these two never meet, as in an asymptote. The basic process through which this is achieved is 'striving' and is discussed further in section 6.3.2. This explains the continuous struggles in trying to implement IPC guidance by HCWs. By highlighting this process, we can better comprehend the challenges and opportunities that exist when implementing IPC guidance in low resource settings.

Figure 9: Asymptote of IPC guidance implementation

6.3.2 The basic social process and stages of ‘Striving’ for Improved IPC practice in the implementation of IPC guidance

Striving conceptualises the basic social process through the phases or stages of recognising the importance of IPC, playing a role, encountering challenges and overcoming challenges (as illustrated in figure 10).
the component phases of this process, from the initial stages of deciding to incorporate guidance into practice, coming across challenges in the process and finally overcoming these challenges through experiencing some enabling conditions and applying specific strategies. Each of the main categories is associated with several concepts, which may be sub-categories or theoretical properties of the category. The sub-categories or properties illustrate the intervening contextual elements and interactions that influence how the IPC guidance is implemented. Additionally, although these phases or stages are presented in a linear form, they do not necessarily occur sequentially. They are interwoven facets of the overall struggle for ideal IPC practice within a healthcare facility in a low resource context.

**Figure 10:** The basic process of striving

**Recognising the importance of IPC** is at the foundation of the process. If HCWs understand the importance of IPC, they are more likely to accept, adopt and practice the required IPC guidance. However, they can only understand the importance of this guidance if they are made aware of this. This can be achieved through training, for example, Continuous Medical Education (CMEs), information from external organisations such as the WHO, Infectious Diseases Institute (IDI) and the government.
The consequence of this awareness is making sense of the guidance and, in turn, implementing IPC guidance.

In implementing the guidance, HCWs find themselves playing different roles in order to incorporate these guidelines into their practice and/or helping others to do so.

However, before taking up or playing these roles, individuals identify themselves, for example, being a doctor, being an in-charge nurse, being an IPC member or being a student intern. These role identity labels influence how participants take responsibility throughout the process. For example, being an IPC member meant that they are responsible for overseeing the implementation of the guidance within the hospital through conducting audits, giving feedback and attending IPC meetings. Doctors felt that in executing their roles, they have a unique function of advocating for IPC while being an in-charge nurse meant that they were responsible for the safety of the ward including both patients and entire staff, attending IPC meetings and passing on IPC information to their staff within the wards. The senior nursing staff felt that in addition to providing clinical and patient care, they are responsible for supervising junior staff like interns and nursing officers, to ensure that they applied the guidance within their work. Staff nurses felt that their role in the process involves providing supportive supervision to student interns. In contrast, the student interns felt that they are responsible for applying the right IPC practices while delivering patient care.

However, as HCWs play these different roles, they encounter challenges presented within these contexts at different levels. These can be conceptualised within a typology of either individual challenges such as negative attitudes by some staff or organisational level challenges such as resource constraints (shortage of HCWS & finances, intermittent supply of water, infrastructural challenges, delay in delivery of IPC supplies), lack of training & orientation, lack of support supervision from either national or local levels, and a lack of voice.
Conversely, within the same context, there are enabling conditions which facilitate the implementation process, for example, management support, the presence of an IPC committee, having reminders, having support supervision, having CMEs, an organised environment and teamwork & cross-organisational collaboration.

As a consequence of encountering these challenges, HCWs are forced to come up with strategies to overcome these challenges. These strategies are enacted through improvising, involving on-demand improvisation and/or planning for the future. On-demand improvisation is unplanned and happens when individuals are faced with the need to identify just-in-time solutions to overcome challenges. Planning for the future involves anticipating a challenge and drawing up a solution before encountering this challenge. If these are applied effectively, then implementation of IPC guidance comes closer to ideal levels.

6.3 Summary

HCWs working under low resource constraints face many challenges in trying to deliver safe health care. However, they ingeniously develop different strategies to implement IPC guidance, achieving near required levels in their various roles. As the storyline has outlined, the implementation of IPC guidance is never perfectly achieved because of the challenges encountered. In short, implementing IPC in such contexts involves striving to do the best one can. Having given an overview of the theory, a more detailed exploration of the component parts is presented in chapter seven.
7.1 Introduction

This chapter presents the grounded theory generated from data analysis using techniques described in chapter 5. It lays out a description and explanation of the categories and their associated properties, which emerged from the participant data. It explains the developed theory, which represents the main contribution to new knowledge in this thesis.

This study aimed to generate a theory to explain the process through which HCWs ensure effective implementation of IPC guidance in a low resource setting. The grounded theory presented here explains the main concerns of HCWs and how they are resolved, describing the process and strategies HCWs use to ensure effective implementation of IPC guidance. The substantive theory, 'Striving for improved IPC practice', represents a four-phase process: Recognising the importance of IPC, Playing a role, Encountering challenges, and Overcoming Challenges. The data also presented an additional contextual category; Enabling conditions which include factors that facilitated implementation. The evolving nature of the theory is discussed, as is how each of the categories are related and integrated. Just like in the previous chapter, bold formats are used to identify the categories and sub-categories, while italics are used for theoretical codes. The theoretical codes conceptualise how the categories relate to each other and are integrated into a theory. While reporting findings, participant identification has been anonymised using numbers and broad generic roles, e.g., participant 1, nursing officer. Additionally, the data extracts used in this chapter are direct quotes from the participants, including grammatical errors, and no changes were made, but clarity was offered in some areas using square brackets.
7.2 The basic social process of striving

"..you know there is a time when you really feel you want to do the best to really score 100%, but you are weighed down by those challenges which sometimes make it difficult". (Participant 5, Senior Nursing Officer)

The quote above summarises this study’s main finding, how HCWs constantly strive to implement IPC guidance but never attain ideal levels because of the challenges these low resource contexts present. Therefore, ‘striving’ embodies the core concerns of HCWs and the strategies they use to ensure the best possible implementation of IPC guidance. It represents the core category within the substantive theory, while the theoretical code of asymptote (explained in chapter 6, section 6.3.1) conceptualises and integrates the process and strategies that HCWs engage as illustrated in figure 11.

Asymptote

Figure 11: Components of the asymptote as conceptualised in the study

Striving means ‘trying very hard to achieve something’ (Oxford Dictionary: English, UK). In the context of this study, striving meant efforts and attempts to implement IPC
guidelines despite the difficulties. An example of striving to implement IPC guidance against all odds is reflected in the following quote from the study:

"As an individual, you strive to do the right thing; you don't easily give up. You keep pushing" (Participant 1, Nurse In-charge)

Striving is, therefore, a social process about how HCWs implement IPC guidance amidst a myriad of challenges ensuring that they come as close as possible to ideal IPC implementation levels. This involves recognising the importance of IPC, playing a role, encountering challenges and overcoming challenges. As highlighted in the literature review, theory-based research is scarce within IPC implementation in these contexts. The intention here is that through privileging the voices of participants' (IPC guideline users) in this study, a more meaningful account of the process and strategies employed by HCWs in implementing IPC guidance could be conceptualised.

The following sections will now detail the process, starting with the first phase, recognising the importance of IPC.

7.3 Phase 1: Recognising the importance of IPC

The findings in this category reflect how participants perceived the benefits of IPC and how this influenced their desire to incorporate IPC guidelines into their daily work. As a condition for implementing IPC guidance, it was fundamental for participants first to recognise the importance of IPC. Participants believed IPC was important in their work in protecting them and the patients from infections, as the following quotes illustrate.

“..infection control is key because I may be having my infection, and I don’t have to transfer it to the patient”. (Participant 11, Nursing Officer)

“To me, IPC means a patient should come to hospital, be treated for what they come and not get any other infection from the hospital and likewise, we, the
health workers, shouldn’t be picking infections from the hospital or from the patient.” (Participant 10, Nurse Intern)

Recognising the importance of IPC occurred in two ways; being aware of IPC guidance and making sense of IPC guidance (Figure 12).

Figure 12: Sub-categories for recognising the importance of IPC

7.3.1 Being aware of IPC guidance

Raising awareness of IPC guidance was done through training or having Continuous Medical Education (CMEs) akin to Continuous Professional Development (CPD) training for senior staff members and IPC committee members. As observed in the data, training of the parties involved was regarded as the initial task of the implementation process. These trainings were offered by the government (Ministry of Health) or other partner organisations like the Infectious Disease Institute (IDI) and Regional Health Integration to Enhance Services in Eastern Uganda (RHITES-E), as the quotes below depict.

“[It] all starts with the ministry of health, yeah. Then [moves] to the hospital, and then they come to us through CMEs”: (Participant 12, Doctor/Medical Officer)
“They [IDI] train in-charges, sometime about two years ago, they trained us in infection prevention and control and then from then they kept supporting us.” (Participant 1, Nurse In-charge)

Support from organisations like IDI facilitated the adoption of another training method; cascading. Using this method, these trained in-charge nurses were then expected to train the other staff, as highlighted by the following quotes.

“If an in-charge has been trained on infection control guidelines, we expect that in-charge to give the knowledge to the students, to the doctors, to the cleaners, and we move as a team.” (Participant 2, Infection Control Nurse)

“So when you finish training, you come back and also train these other staff at the lower level.” (Participant 1, Nurse In-charge)

This was usually done through meetings, as highlighted in the following excerpts.

“All units also have meetings. Infection prevention and control is one of the things that [is] never miss in these meetings.” (Participant 5, Senior Nursing Officer)

“...as a member of the IPC, I always put [IPC training] it on our monthly meeting agenda”. (Participant 6, Lab technologist)

Another way cascading training was delivered was through clinical instructions, as evidenced by the following quote.

"...you just have to be strict, and sometimes you reach a point where you have to tell them (junior staff) to learn by force and giving strict instructions. If you don't do this, the challenge will come back to you." (Participant 13, Midwife)
Student nurses and interns also became aware of IPC guidance through orientation and posters around the wards and through induction from staff nurses, as the quotes below depict;

“...there are posters of hand washing, at the bins how to dispose of and they label what goes in the different bins” (Participant 10, Nursing Intern)

"Orientation sort of differs depending on the in-charge of that unit, but the in-charge we had in [one] department, she was so good, for example when we reached [the ward], she welcomed us, we moved around, she told us how to do infection control." (Participant 9, Student)

However, there were some barriers to raising awareness, particularly through CPD, for example, the lack of motivation for trainers as captured in this quote;

"But what has demoralised us a bit is lack of funds. IDI used to give 100,000/- to whoever conducted CME like if I conduct CME and write a report to IDI, I would get 100,000/- but not now. " (Participant 2, Infection Control Nurse)

Although within the Ugandan context, an infection control nurse is expected to monitor IPC practices in the health facility, establish and communicate existence of outbreaks of infectious diseases and take interim control measures, sometimes they may be required to organise and conduct training, as evidenced in the quote above. Further, the quote above touches on potential barriers and enablers to the implementation process; however, this is discussed in detail in section 7.4 under the ‘encountering challenges’ category.

7.3.2 Making sense of IPC guidance

As a consequence of participants becoming aware of IPC guidelines, they had to make sense of it and its relevance. Participants made sense of this guidance in two ways; firstly; based on personal relevance of the guidance to the them, and secondly, from an
objective sense where guidance was viewed as being relevant to the entire organisation and patients, as the following quote perfectly sums up;

"Ohhhhh, first of all, I see what is really going to help me and the patient I am offering care to. That's when I decide what I will do for the good of the patient and the good of my health" (Participant 8, Nursing Officer)

Some participants felt that if guidance was essential in protecting them from infections, they were more willing to integrate these into their daily work. This was often based on the personal feelings of the participants; for example, one participant stated that;

"[If] the patient [has an infection], I have to take care of myself so as not to contract any other infection from the patient, and that's number one". (Participant 11, Nursing Officer)

For other participants, the importance of IPC guidance was viewed with an objective lens; for example, guidelines were considered as being 'right' and having overarching importance in the delivery of safe healthcare, as this quote by a participant shows;

"I don't think there is a need to make decisions if the guidelines are there, like if you know that you are going to carry out an operation, you have to scrub, and that's part of you, and you know that if you don't scrub the end result may be sepsis". (Participant 12, Doctor/Medical Officer)

Therefore, it emerged that being aware and making sense of IPC guidance led to an understanding of the importance of IPC and, consequently, improved the willingness of HCWs to integrate this guidance into practice.

However, not all HCWs were willing to implement the necessary guidance even if they understood the benefits of IPC. Some participants’ responses indicated that they believe that some HCWs do not bother practising the required IPC guidance even though they had the knowledge, as summed up in the following quotes;
“People may even have the guidelines, but they don’t refer to them.” (Participant 6, Lab Technologist)

"Of course, some have negative attitudes, they don’t want to change, they think, some of the guidelines are tiresome, they want shortcuts." (Participant 1, Nurse In-charge)

However, this attitude could be caused by other factors, for example, lack of motivation and work overload, which are reported in section 7.5

7.4 Phase 2: Playing a role

Following the appreciation of the significance of IPC in protecting them and their patients from infections, HCWs were more eager to implement IPC guidance. However, implementing IPC guidance involved participants playing different roles. Therefore, this category describes some of the roles participants played and how participants came to play these roles, as illustrated in figure 13.
The roles participants played resulted from how they identified and labelled themselves, such as being a doctor, being an IPC member, being an in-charge, being a senior nurse and being a student or intern. Participants took on different responsibilities in the implementation process with these role labels. For example, doctors felt their role in this process was advocating for IPC, as this participant quote illustrates.

"The role of the doctor, for example, me, I keep reminding myself and others the benefits of infection control and prevention." (Participant 4, Doctor/ Medical Officer)

This was supported by a nursing staff through the following quote.

“"In fact, they [doctors] are supposed to [be] advocates." (Participant 3, Nurse in charge)
Further, participants who were members of the IPC committee took on responsibilities like overseeing IPC practices within the hospital, conducting audits and giving feedback, making decisions regarding IPC measures for the hospital and attending IPC meetings. Since all the nurse in-charges were also members of the IPC, they also passed on this information to their staff through ward meetings. Additionally, the nurse in-charges felt that, since they were in charge of wards, they had an extra responsibility of ensuring safety for their patients and staff, with one participant mentioning that they see themselves as “a mother” who has to ensure all people under their guardianship are safe from infections. These responsibilities are reflected in the following quotes.

“I am like the mother, the housemaid of the home. Hmm, I guard them. I guard the community against the infections, I guard the students against infections to them, and then I protect the patients, I prevent nosocomial infections from the students to the patients and attendants and also the community which we look after.” (Participant 3, Nurse in-charge)

“So I supervise all these people to see that the standards of infection prevention and control are taken care of, and they meet the standards according to the WHO guidelines.” (Participant 5, Senior Nursing Officer)

Additionally, nursing officers or staff nurses felt that they were responsible for supervising students or student interns, as this quote illustrates.

“When the students come, they don’t know, they can mix up things unless you take [supervise] that student step by step that’s when you will ensure they do the right thing, but very few are interested. You have to follow their every step, for example, if they are doing this and that you have to follow them and even [show them] where and how to dispose wastes whether it’s in highly infectious bin or noninfectious bins.” (Participant 13, Midwife)
While students or interns felt that their responsibility in the implementation process was practising the right IPC measures and in the right way, as noted from the following quote from a student participant.

“We do the right thing [practising IPC measures] because at a certain point it can come back to us, for example, if you put sharps where gloves are supposed to be, of course sometimes nurses come and complain and tell us to pick them.” (Participant 9, Student)

This was further supported by a nurse who felt that by following and practising the required IPC guidelines, students were playing their role in the implementation process, as noted in the quote below.

“They [students] role is to see that whatever is presented and taught to them is implemented in the right way. It is carried on correctly. So they take that responsibility of doing the right thing at the right time.”(Participant 8, Nursing officer)

7.5 Phase 3: Encountering challenges

Although participants took on different responsibilities to ensure IPC guidelines were incorporated into their routine work, they spoke of their difficulties in implementing guidelines within the hospital, portraying them in a manner that seemed to suggest they see these challenges as characteristics within the environment. These challenges were categorised into a typology of either individual-level or organisational-level barriers that led to contextual challenges (Figure 14). This section presents the identified challenges, in turn, with illustrative quotes from the participants.
7.5.1 Organisational Challenges

Participants reported working in a context of significant organisational challenges that were externally created and were usually beyond the participants’ control. Four challenges were identified in the narratives constructed by the respondents; resource constraints, lack of support supervision from either national or local levels, lack of training and orientation, and a lack of voice. A participant clearly articulates this.

"...there are challenges, for example, maybe we lack these alcohol disinfectants as they are not there, but you know we are in an institution where you can't purchase things for yourself, and you have to rely on the institution to provide them. If they are not available, you have to wait until they supply”. (Participant 12, Doctor/Medical Officer).
The challenges are further detailed in the following sections:

### 7.5.1.1 Resource constraints

The predominance of resource constraints was one of the main challenges arising from the data. The respondents gave an account of the challenges associated with limited finances, shortage of HCWs, intermittent water supply, infrastructural challenges and delay in delivery of IPC materials and equipment. These, in turn, limited their capability to properly implement the guidance as they would have wished.

To start with, limited finances were one of the biggest challenges. As a condition for IPC implementation, there is a need for resources; however, these resources require finances. Due to limited finances, participants experienced a scarcity of resources needed to implement IPC guidance, for example, PPEs, cleaning materials, training, and bins for waste. Existing government funding was insufficient to ensure that these items were available as required, as well as other implementation activities such as training. The participants below explain further the difficulties with funding availability and how this affected implementation.

“Then another challenge is also having no resources, as I said. We don’t really get enough resources, materials especially because of financial resources, the finances are not enough, so we are constrained there.” (Participant 1, Nurse In-charge)

"What I am trying to [say] is there is no funding. there are no funds allocated for IPC activities". (Participant 6, Lab Technologist).

"...but now when there are no things to use, there is nothing I can do - I am there to implement according to the available resources, but when there is nothing there, I have nothing to do [nothing I can do]". (Participant 8, Nursing Officer)
It was also found that a scarcity of human resources was problematic when implementing the guidance. A shortage of HCWs complicated the situation and made it harder to practice IPC measures. Because of this, the health facility experienced a high patient-to-HCW ratio, so HCWs often got overwhelmed. This was particularly evident in some departments; for example, the emergency ward often overflowed with patients, with fewer staff. Consequently, such a department needed more IPC materials and more personnel, all of which were scarce. Participants spoke of feeling overwhelmed, often due to staff shortages, lack of time and being under pressure due to a high workload, which was used to explain why gaps in practice occur, as demonstrated in the following excerpts.

"But due to overworking and due to understaffing, some people are not compliant with that [required infection control measures]." (Participant 2, Infection Control Nurse)

“Well, for example, in casualty [emergency ward] really sometimes you want to follow the guidelines, but you notice you can’t follow those guidelines because of the number of patients and few staff. Casualty [A&E] many times runs out of gloves, and it runs out of even alcohol hand rub because of the many patients to see. So, you find that infection prevention in this ward is really messed up.” (Participant 4, Doctor)

“We have mass casualties and high numbers of patients and it becomes more and more difficult to manage hygiene and infection control with a huge number of patients.” (Participant 12, Doctor)

Further, a lack of consistent supply of water also affected implementation. Water is a key ingredient in enhancing IPC measures, as it is used in both hand hygiene and hospital cleaning. As the hospital was located away from the city, there were problems with
having a steady water supply. This meant that participants were unable to practice proper hand hygiene, and the cleaning of the hospital was often compromised.

“For example…. recently we had no running water in the maternity ward, how will we then make sure that people (HCWs) wash their hands after touching patients, after palpating mothers.” (Participant 13, Midwife)

Similarly, there were some infrastructural challenges, such as buildings requiring maintenance, and the layout and space within the hospitals presented challenges to IPC implementation. Additionally, inadequate bed capacity for the number of patients resulted in overcrowded wards; beds were too close together, and patients had to occupy other available spaces, such as mattresses in the corridors and on the ward floors. As a consequence of this overcrowding, regular cleaning was problematic. A ward nurse said that it was difficult to clean the rooms according to required standards because of this, as evidenced by the quote below.

“We have very many patients, patients are very many and, because of this it is difficult to properly clean the ward” (Participant 11, Nursing Officer)

The hospital buildings also lacked an isolation unit and cohorting rooms for infectious patients, further complicating the implementation process, as a participant points out below.

“The only problem we have, that we don’t have an isolation unit for any infection in case it’s a bad one” (Participant 3, Nurse In-charge)

The data also revealed setbacks created because of delays in delivering the required IPC supplies. As noted by participants, the hospital is supposed to get the required materials delivered by a centralised government authority; however, there were often delays in getting these requirements.
“So National Medical Stores is supposed to purchase for us what we need. But sometimes there are delays.” (Participant 5, Senior Nursing Officer)

“They aren’t very consistent because the government is supposed to provide these things [IPC materials], but [it] can take months without receiving these resources” (Participant 4, Doctor).

“But they [Ministry of Health] can provide us [with IPC requirements] and then after sometime it’s out of stock, whatever they have provided is out of stock. Then we have to go back to zero almost [having nothing]. If they were providing [IPC materials] regularly, then I think we would really control the infections.” (Participant 8, Nursing Officer)

7.5.1.2 Lack of support supervision from either the national or local levels

Certain organizational challenges acted both as drivers for implementation and as barriers. On the one hand, support supervision was cited as an enabler or facilitating factor in the implementation (described in section 7.5). The term ‘support supervision’ was an in-vivo code used to mean a facilitative approach to supervision that promotes mentorship, joint problem-solving and communication between supervisors and supervisees. The lack of support supervision was cited as a barrier to implementation. According to the findings, there was often an absence of support supervision at different levels;

Firstly, the lack of support supervision was experienced through an absent national IPC committee. Although the policy documents indicate the presence of a national IPC committee, participants spoke of how they had never seen or had anyone from that committee come to provide any support supervision. The function of a national IPC committee is to develop and update relevant policies and procedures, ensure adequate supplies to carry out satisfactory IPC practices, implement IPC training programs for all
staff and offer support supervision. However, one participant, a nurse in-charge and a member of the hospital IPC committee notes that the national IPC committee was absent and never provided any support supervision, as summed up in the following quote;

"The government doesn’t give us support supervision. There is nothing. Those people [national IPC committee] are just there in words." (Participant 3, Nurse In-Charge/IPC committee member)

At the facility level, nursing staff felt that if they had support supervision, it would ease the implementation of the guidance as there would be an opportunity to make certain things clear during these supervision conversations; for example, advice would be given on the spot, and some challenges would be addressed at that moment in time. A lack of support supervision meant that participants did not get an opportunity to get clarity on some IPC issues that arose during their routine practice

“If they [IPC committee members] would really supervise us regularly or provide those materials regularly, especially the things that we use to prevent infections in the hospital, it would be perfect [help us].“ (Participant 13, Midwife)

On the other hand, student interns felt that supervision was important in helping them understand how IPC is practised; however, they did not get the proper supervision as the participant alludes below;

“We are supposed to practice under supervision, but much of the time, we don’t have supervision.” (Participant 10, Nurse Intern)

7.5.1.3 Lack of training and orientation

Participants, especially students, interns and junior staff, identified the lack of training and orientation as a barrier to taking up a more significant role in implementation. This
challenge resulted in an information gap, as a student intern narrates in the quote below.

"Nobody has taught me anything to deal with infection prevention and control or tried to correct me in terms of infection prevention and control". (Participant 10, Nurse Intern).

“Training doesn’t happen, they tell you to learn from the people you are seeing that are able to do it.” (Participant 9, Student)

The lack of training and orientation is likely linked to a scarcity of personnel and limited funds. Due to insufficient funds and a shortage of HCWs, the organization lacked the capacity and resources to conduct regular training. This was corroborated by two participants in the following quotes.

“As I said, [lack of] financial resources at times make it [hard] in a way that fewer people are trained.” (Participant 1, Nurse In-charge)

“It [scarcity of personnel] affects [us] because one person cannot continue giving CMEs …. We need to share knowledge and skills together.” (Participant 2, Infection Control Nurse)

Although other implementing partners or organisations like IDI stepped in to offer training, this was not always regular and usually targeted senior staff members, as the two following quotes reveal;

“So far, they [IDI] train in-charges in infection prevention and control.” (Participant 1, Nurse In-charge)
“They [IDI] have been so good. They are the ones that trained us but back in 2017.” (Participant 2, Infection Control Nurse)

7.5.1.4 A lack of voice

Being acknowledged as a contributor in making decisions regarding guideline implementation can be very satisfying for HCWs as this builds up trust that helps advance IPC practice. However, participants, particularly the lower cadre staff, felt that sometimes the top management in the organisation did not allow them the space to present their challenges and make suggestions. This ultimately curtailed their efforts in implementing the required IPC measures. As participants below note, this lack of opportunity meant they were not included in conversations about decisions regarding the guidelines.

"They limit us, and at times, people may not want to talk and really say what is wrong. Like somebody to bring out clearly what is wrong and what can be done to improve. The top people may not give you a chance to talk about what is wrong and what can be done to improve on that" (Participant 8, Nursing Officer)

“You keep quiet, because you cannot blame big people [management and senior members] because also, they could be having their challenges.” (Participant 7, Nurse In-charge)

The above challenges were interwoven and often interrelated; usually, one caused the other or was a consequence of another. For example, a shortage of HCWs caused a work overload by health personnel. Additionally, a lack of finances caused a scarcity of IPC materials or items, which ultimately affected how HCWs practised IPC measures. A lack of a steady supply of water also meant that there was an increased need for ABHR, further stretching the already limited funds.
The interrelation among these challenges is summed up in the participant quote below;

"There is no support supervision because there is no money; they tell us there is no money completely." (Participant 3, Nurse In-charge)

In summary, organisational challenges appeared to be the main contextual barrier to participants’ failure to implement the guidance properly. However, some individual challenges explored in the next section also contributed.

7.5.2 Individual Challenges

When new strategies are implemented, it requires all practitioners, such as doctors, nurses, and other staff, to make changes in their daily routines to some extent. However, the data revealed that persuading some individuals to adopt this IPC guidance was challenging. Personality can be a barrier to adopting guidelines, with some professionals saying that they are practising the required IPC measures when they are not. For example, participants mentioned that some staff had negative attitudes toward IPC guidance and, as a result, did not make the required conscious effort to practice the recommended IPC measures or did what was contrary to the recommended guidelines, as reflected in the following quotes

"Some people may have the knowledge, but because of the poor attitude, they will just throw rubbish anywhere". (Participant 6, Lab Technologist)

"Yes, there are places that you find people with negative attitudes. So if a person has a negative attitude towards doing something, you are not going to change that person quickly. Even when you call for the meeting, such are the people who will say "that doesn't help me" and they won't show up or even if they come, they behave like we are wasting time, such a person will remain mute in the
One of the respondents, who happened to be a doctor, highlighted that some practitioners, such as doctors, did not get involved in implementation. As highlighted in the following quote, the attitude of such individuals towards new changes was negative, even if they valued the importance of guidance.

“I have noticed that because some doctors don’t care where they dump their rubbish as long as there is a dustbin, they will always dump it there. So they don’t do waste segregation.” (Participant 4, Doctor/Medical Officer).

This is corroborated by another participant, a senior nursing staff member.

“However, the doctors are very poor at hand hygiene, very poor, and yet they know what to do.” (Participant 3, Nurse In-charge)

In summary, recognising the above challenges led participants to appreciate the significance of these in the implementation of IPC guidance. As a result, participants were more likely to be proactive in finding strategies to ensure IPC guidance was implemented, as summed up in the quote below.

"As an individual, you strive to do the right thing, you don’t easily give up. You keep pushing". (Participant 5, Senior Nursing Officer).

7.6 Enabling Conditions

While all participants talked about the challenges that existed within the environment, the context also presented some enabling conditions that participants felt facilitated the implementation process. These are summarised in figure 15 below.
Participants frequently discussed management as having an impact on the success of IPC implementation, especially because they were responsible for overall planning for hospital requirements. The excerpts below evidence how participants valued building a strong relationship with the hospital management.

“We try to maintain a good relationship with the hospital management. We have regular meetings and discuss together what we need.” (Participant 2, ICN)

“When it comes to administration [Management], there are the ones that drive this entity, so if I am lacking this, like I have mentioned water, there is no way I can look for water, so they come up as the administration, they know how they talk to the police to see to it that water is delivered, that’s how administration comes in and when we talk of this waste,.... they make sure that they contract someone to carry away that waste to someplace.” (Participant 7, Nurse In-charge)
In addition to the good relationship and the support from management, participants felt that an effective IPC governance structure was also critical to successful IPC implementation. Participants placed great value on having an IPC committee. They felt that an IPC committee offered direction, made decisions, conducted audits of IPC in the hospital and made sure all the IPC supplies were available by making requests to management, as highlighted in the following excerpts. These were critical in easing the implementation process.

"The committee is basically an overseer of safety practices in the lab and in the hospital and also overseeing the planning, budgeting and then also makes sure that people are implementing what you want them to do" (Participant 6, Lab Technologist)

“They [IPC committee] request materials on our behalf like detergents which we use in disinfection. They decide on what we use and what’s purchased in the hospital.” (Participant 7, Nurse in-charge)

However, although the presence of an IPC committee was important, each staff member had a personal responsibility to play in implementing IPC guidance, as reflected in the quote below;

“I feel like when you are competent, you are able to do things the right way because if you are able to do things the right way at least to prevent infections, for example, you can say that I am not going to use the same gloves on different patients, I am not going to bin gloves with blood stains in black bins which are supposed to be for papers, you don’t have to wait for the committee [IPC] in order to practice these things.”(Participant 9, Student)
Conversely, **having reminders** acted as an enabling condition for implementation as it served as an effective memory jogger for people who might otherwise forget, as this participant reveals.

"*Being a human being, we really need to be reminded on what we are supposed to do, much as we know we can be busy and forget to implement or do it the way it supposed to be done*" (Participant 8, Nursing Officer)

Reminders were either handwashing posters around sinks and on notice boards, colour-coded and labelled waste bins or through colleagues nudging each other. These were crucial in easing the implementation process, as highlighted by the participant below.

"*If you see a poster, you ask yourself what information am I supposed to get out of the poster?*" (Participant 9, Student)

“*Also being flexible, so if I am here with my colleague and I see them doing what is contradicting the guidelines, I remind them.*” (Participant 7, Nurse In-charge)

However, reminders did not always trigger IPC practice since sometimes these were ignored, as the following excerpt illustrates.

"*Okay, if someone can read, they are okay and effective, but ....last time I saw the sister [Senior Nurse] was struggling with students, she was like, “Don’t you see that those are used bottles and are not supposed to be dumped in that place”, the poster was there, but the person was putting them [dumping used bottles] in something else*." (Participant 10, Nurse Intern).

In addition to having reminders, most participants referred to the benefits of **having support supervision** as part of their working practices. The benefits that participants recounted as a result of this supervision provided an opportunity to fill in gaps in
information, particularly regarding IPC guidance and checking that they were appropriately following the right IPC measures when delivering care. This positively impacted participants' attitudes and, in turn, enhanced implementation. The following excerpts highlight how participants viewed the benefits of supervision.

“We have supervisors in the hospital who keep moving around, help us solve problems and also encourage us to improve on infection control” (Participant 13, Midwife)

“They [IPC committee members] supervise us and give us the things we use but most importantly its information which they provide to us during these sessions that is helpful” (Participant 8, Nursing Officer)

However, some participants highlighted that offering support supervision was a personal motivation as they enjoyed sharing their skills and knowledge with other staff. This was noted among participants who held more senior roles in the health facility, as in the quote below;

"It’s taken long, but IDI, once in a while, they call me to go supervise in hospitals. Like last year they sent me to supervise in Moyo, Katakwi and Kaberamaido on infection control and prevention. After supervision, I give them CME. So that is morale-boosting” (Participant 2, Infection Control Nurse)

Having Continuous Medical Education; these were trainings that the facility and other external organisations offered to HCWs akin to CPDs. Participants saw these trainings and educational programmes as the trigger for changing practice and crucial for effective IPC implementation. Participants felt that having CME helped them understand different topics or concepts of IPC and, consequently, improved practitioners’ knowledge of IPC, which allowed them to practice IPC better. The interviewees stated
that effective and regular training of the employees is crucial for effective IPC implementation, as noted in the following quotes.

“CMEs are on anything that we think is beneficial to infection prevention and control. Sometimes they can also [include] the standard precautions during these trainings.”(Participant 3, Nurse In-charge)

“Once we are taught these things [IPC], we know these things, and once we know about these things, we will always practice them.”(Participant 4, Doctor/Medical Officer)

Furthermore, an **organised environment** positively impacted the implementation of IPC guidance. An organised environment was one where every material or item was in a specified place. The consequence of an organised environment was an increased likelihood of practising IPC. Participants felt that having an organised environment was important in ensuring effective implementation of IPC guidance as it increased productivity and ensured consistency. For example, an organised environment meant that everyone knew where the necessary IPC materials were kept and enabled an easy workflow, as summed up in the following quote.

“For example, if I put alcohol hand rub in its right place, I will not fail to use it during my workload; if the tap is already there, I will not fail to wash my hands because of workload. So even our bins, if they are set in place, it will not affect me” (Participant 13, Midwife)

“In our operation room, we make sure the room is well arranged with everything in the right place, for example, alcohol hand rub and a tap and soap in the right place.”(Participant 12, Doctor/Medical Officer)

One of the approaches used to ensure an organised environment and improve the quality of care in the health facility was the 5S approach which stands for sort, set in
order, shine, standardise, and sustain. Its importance is summed up in the quotes below:

"Of course, we have what we call 5S; we make sure we are sorted, so we arrange our things with infection control [in mind]. We are sorted every day, and that's the way we start every morning, so even if you get an overload of work during the day. So we are already sorted with infection control" (Participant 13, Midwife)

"5S tools are in place, you know that we have given you materials, for example, this is the black bin, and this is the type of waste that should go there, this is the yellow bin - this is what should go there, a red bin - this is the type of waste that can go in there" (Participant 7, Nurse In-charge)

Being part of a team and working with other organisations was highlighted as having a positive impact on implementing the required IPC guidelines as it helped bring all stakeholders together to overcome barriers such as training and supply shortages. Working together occurred either within the different care wards, departments or with other external organisations and helped facilitate the implementation of IPC guidance. The importance of working together across different departments is captured in the following quote.

“Of course, infections don’t know whether you belong to this unit or another unit; you must all play a role. You are fighting to score into the same goal, which is you want to prevent infections. That’s why we hold the inter-unit competitions because if you are not doing what is supposed to be done, it can easily affect someone else in another unit directly. Like for example neonatal ward, it’s too packed. It can take about 50 neonates in a small space. Therefore if they don’t prevent infections there, they will end up here and increase the workload. Also, if I don’t tighten the infection prevention and control, of course, the children will go and come back with further infections. One unit can affect all units. That’s why
we must work together. If I come and spot a problem in your unit, I will tell you what's wrong. We work very much together basically" (Participant 3, Nurse In-charge)

Additionally, the microbiology laboratory worked with all units to ensure that samples were tested, results were processed in a timely manner, and the working environment was safe, as the following quote depicts.

“The lab, microbiology lab specifically contributes a lot because we want to see whether the environment we are working in is safe. We try to process all samples in the required time. Also, at one point, we did some swabbing of different places, i.e. door handles, worktops, benches where patients sit, the theatres, and Labour suites, we went picking samples using our swabs and cultured them, and then we came up with the results.” (Participant 6, Lab Technologist)

In addition to the government and management, the hospital also received extensive support from other organisations like IDI and RHITES-E. Such strategic alliances helped facilitate implementation, for example, by providing training to HCWs, supervision and, in some cases, providing supplies. The respondents had very positive perceptions of these partnerships, as summed up in the following quotes.

"We are only lucky that we have some implementing partners (IPs) that support the hospital, others support the lab while others support the hospital like RHITES-E. RHITES-E supports the whole hospital, so if there is a shortage on the other side (National Medical Stores side), they come in like these bin liners you are seeing. All of these were supplied by RHITES-E. Also, other IPs like IDI also come in. That's how we are able to close that gap" (Participant 11, Senior Nursing Officer)

“They [IDI and RHITE-S] support us for workshops, they send us for workshops to know more about infection prevention, and also they do support supervision as an institution.” (Participant 1, Nurse In-charge)
Besides collaborating with non-government organisations, since the hospital did not have an isolation unit, they worked with the district health office, particularly during outbreaks like cholera, to ensure proper isolation, as depicted in the quote below from the infection control nurse.

“When we receive a patient with cholera, we usually inform the District Health Officer because we don’t have an isolation place here. From here, we take them to a place called Namatala Health Centre, which is usually where they are.”
(Participant 2, Infection Control Nurse)

All of the above collaborations aided in ensuring the effective implementation of IPC guidance.

7.7 Phase 3: Overcoming Challenges: Improvising

This category depicts activities and strategies participants engaged in to overcome the barriers they faced and how these influenced the implementation of IPC guidance. Although the complexity of the barriers, with so many moving parts, often made strategizing to overcome challenges a difficult task, participants went against all odds to beat these barriers. This was done through improvising. Improvisation occurred in two ways; on-demand improvisation or planning for the future improvisation, as illustrated in figure 16.
7.7.1 Improvising

Improvisation happens in critical or challenging situations as a source of resilience to address emergent problems. In this study, improvisation was a means of resolving situations where resources were unavailable, or other challenges were encountered. Participants had to practice the required IPC measures with less equipment, supplies, or staff. These resource constraints and disruptions appeared to motivate participants to improvise by coming up with ingenious solutions to these challenges.

7.7.1.1 On-demand improvisation

This type of improvisation was unplanned, and individuals were faced with the need to identify just-in-time resources and other strategies to overcome challenges as they were encountered. These on-demand behaviours were reflected in different ways, as detailed below.
Firstly, a lack of consistent water supply was solved by providing ABHR to those areas with a problem of water shortage or those that usually received a lot of patients. Additionally, water was provided via trolleys to allow for proper hand hygiene during such times. The nurse in charge below explains how the hospital provided ABHR and water via trolleys.

“I mean at times when we have no running water, so they brought this alcohol hand rub and usually some water in trolleys in some areas” (Participant 7, Nurse In-charge)

However, if there was a shortage of ABHR, this was prepared locally at the hospital. In the following excerpt, the ICN highlights how they used the technique of preparing alcohol locally at the health facility to overcome the challenge of a shortage of ABHR.

"....and when it’s not there [ABHR], or when the government has not supplied us, then our hospital prepares it locally. And this locally made alcohol hand rub was approved by IDI, because it’s them that trained us” (Participant 2, Infection Control Nurse)

Further, a nurse in-charge elaborates how the ward she was responsible for overcame the challenge of having a shortage of sharp boxes and having small boxes for sharps.

"Sometimes you find people have improvised like these boxes for sharps, they are the ones which are brought by the WHO, but they are too small for the wards. In some wards, one box can fill up, so you find that in such places they get any other bigger box, cover it very well and leave a hole where you can drop your sharp and that can [work] for some time say a week” (Participant 7, Nurse In-charge).

Improvisation also involved creating new or extending existing approaches to care that use alternative resources. For example, in cases of incompatible guidance or recommendations for these particular contexts, participants were able to adapt the guidance as a participant below says;
"We are supposed to air [key instruments] dry them after sterilisation through the autoclave. But if the clinic has 60 patients on the day and we have few instruments so what we do is after washing, we dry them, and we boil them instead of autoclaving" (Participant 5, Senior Nursing officer)

These extensions of existing standards showed how participants were sensitive to and acknowledged cues within the environment to provide care that is responsive to the challenges in that setting.

Furthermore, although not an ideal solution, participants had to ask patients for help during times of scarcity. Patients were often asked to buy their key IPC materials, as summed up in the following quotes:

"You tell the patient or their relatives to buy since you don't have gloves and you want to help somebody." (Participant 11, Nursing Officer)

"...so I would run around either to borrow something to use or to look around or to send a patient to go and buy for themselves" (Participant 8, Nursing Officer)

Exploitation of networks or alliances through working with other organisations enabled participants to solve some of the problems of shortages of supplies. For example, there was a lack of an isolation unit during outbreaks of infectious diseases like cholera. The hospital was able to overcome this challenge by working with the district health office, which offered them an isolation unit at a lower-level health facility. Other examples of utilising these alliances are exemplified in the excerpts below, which detail how they sourced assistance from the university laboratory, RHITES-E and the police to solve different challenges.

“In the case of lack of materials to use in the laboratory, the Busitema University Laboratory carried out tests for the hospital” (Participant 6, Lab Technologist).
“For example, we lacked a general rubbish pit, in fact, our rubbish pit was possible because of RHITES-E when we wrote they came to help us. Also, they provide us with some PPEs sometimes” (Participant 2, ICN)

“For example, there are times when ...police vehicles ferrying water here to see that the hospital tanks are filled, and people can be availed with water.” (Participant 13, Midwife)

The IPC committee tried to solve a lack of supervision by having smaller committees at the ward level that were responsible for providing supervision at the ward level on behalf of the committee.

“Okay, down the ward, we also have small committees or work improvement team committees which assist us in offering the support supervision needed” (Participant 1, Incharge)

The use of mobile-based tools such as “WhatsApp” platforms with colleagues was important in sharing information and as a meeting engagement platform in cases when members were too busy to convene the necessary meetings. By working in online contexts with peers, participants were able to ensure a flow of information with minimal resources and equipment and, in turn, fostering implementation.

“Sometimes when we don’t have one [monthly meeting], especially when all of us are busy, we usually link up on a WhatsApp platform to ask what could be [a] problem that month and we then exchange information and solutions to address ongoing infection prevention issues.” (Participant 2, ICN)

However, not all participants were able to improvise, as these challenges constantly weighed them down, and they often chose to stay silent, as the quotes below highlight.

"So there isn’t much I can do because ....maybe I feel agitated, I don’t want to rub big people the wrong way, I ...keep quiet" (Participant 7, Nurse In-charge)
"I do what I can, and I leave them for the next person because I will not force myself to do otherwise, for example, when there are no gloves, I will not just touch the patients like dressing wounds until I get what I am supposed to use” (Participant 8, Nursing Officer)

7.7.1.2 Planning for the future improvisation

This dimension of improvisation related to dealing with challenges with the benefit of preparation through thought, planning and action. It happened when participants anticipated a challenge way ahead of time and drew up a plan to avoid these challenges.

Firstly, the inevitability of resource demands and shortages associated with these contexts required senior leadership, particularly IPC committee members, to ensure resource availability through a strategy termed planning for a rainy day. This occurred in anticipation of shortages and stock-outs. For example, these participants often stocked up on some IPC supplies during times of glut. These stockpiles helped participants go through periods of scarcity and shortages, as reflected in this quote;

"We have our small office for IPC where we keep at least some things for an emergency like detergents and gloves" (Participant 5, Nurse In-charge)

However, not all participants could use this strategy as IPC materials were always in short supply, and even meeting daily demand was a problem. This strategy was utilised by IPC committee members and nurse in-charges who were responsible for ensuring supplies in the respective wards.

Further, although the health facility provided an opportunity to train students as part of a broader collaboration between the hospital and the schools, by having students, the hospital filled gaps as a result of a shortage of HCWs. As the following quote illustrates, these students played a significant role in ensuring the implementation of IPC measures and delivering care.
“Although they [students] are here to practice and to learn the hands-on practice, they also help us cover in some cases when the nurse is so busy.” (Participant 11, Nursing Officer)

“There is nothing we can do about that [staff shortage], so students are part of that [solution]. We train them, and they work with us.” (Participant 3, Nurse In-charge)

In anticipation of work absences, IPC committee members and nurse in-charges often delegated duties to other staff members, for example attending meetings or trainings. Through this, they were able to ensure continuity in the flow of information and that there was no leadership gap during times of absence.

"So periodically they have CMEs that any member of the lab can go and present, of course with my guidance, not necessarily only me but any other person can go and present in that IPC committee meeting on my behalf" (Participant 6, Lab Technologist)

“In case I am absent, I delegate some members who can then decide to meet to discuss some crucial issues and provide solutions during the time I am away” (Participant 3, Nurse In-charge)

In summary, through improvisation, as noted in this category, participants were able to provide a substitute or supplementary solution for a formally required resource or for the replacement of required resources that were more easily accessible within their environments. Consequently, this enhanced the implementation of IPC guidance within these settings.
7.8 Summary

This chapter has explored the substantive grounded theory through a detailed account of the findings. The formal grounded theory proposes the theoretical construct of *asymptote*, which explains that although full IPC implementation is never achieved, efforts are made by HCWs to reach as close to these levels as possible. The process of 'striving' has been illustrated by four main phases: Recognising the need for IPC, Playing a role, Encountering challenges and Overcoming challenges. This process occurs in an organisational context that presents both barriers and enablers. These categories have been discussed in detail, demonstrating the theory's characteristics (properties). How each category connects to the core category and basic social process of striving has been examined using evidence from the data collected. The next chapter applies behavioural theory to further expound and enhance understanding of this process.
CHAPTER EIGHT: BEHAVIOURAL ANALYSIS

8.1 Introduction

As detailed in the methodology chapter, this study employed a grounded theory approach. In choosing grounded theory, the researcher did not want to impose a framework on the research but instead let a theory emerge from the findings. However, after data analysis and development of an explanatory model for the implementation process of IPC guidance grounded in the experiences of the guideline users, specific barriers and enablers to the process became clear. As such, in a departure from previous grounded theory studies, and partly as a consequence of the COVID-19 pandemic disruption to the original study plan, an additional stage involving behavioural analysis was conducted. This enabled further interrogation of the findings in order to determine which of these influencing factors could be targeted in developing interventions to enhance the implementation of IPC guidance in low resource contexts within a similar setting as this study. This behavioural analysis examined barriers and enablers to the desired behaviour (implementation of IPC guidelines) and applied selected behaviour change theories to make preliminary recommendations in relation to the broad categories of intervention functions that might be helpful.

As Fischer et al. (2016) note, effective implementation of guidelines often requires a change in behaviour at a team, individual or organisational level. Therefore, assessing barriers and facilitators to the uptake of evidence, or the performance of the desired behaviour, is a fundamental component of the successful planning or evaluation of any implementation process. However, barriers and enablers often vary between professional groups, organisations, healthcare settings and contexts and frequently cannot be generalised (Moore et al., 2017). For that reason, using behaviour change theory to explore potential barriers and facilitators prior to the design, or implementation, of intervention, allows for it to be tailored to each specific context.

The chapter begins with exploring the importance of theory in the implementation process, considers relevant behaviour change theories, justifies the use of the selected
theoretical framework, and details the results of mapping of the barriers and enablers identified in the current study to the chosen theoretical frameworks.

8.2 Importance of theory in implementation

There has been debate regarding the necessity of using theory-informed behaviour change interventions. Proponents of the use of theory, such as Eccles et al. (2005), argue that theory is essential to identify the mechanisms of behaviour change and to use these underlying mechanisms to guide the development of behaviour change interventions prospectively. Francis et al. (2009) add that knowledge translation theory is needed to develop testable interventions, determine explicit causal pathways of the determinants of behaviour change, and provide a map for other researchers to follow. Furthermore, Davidoff et al. (2015) expound that explicit application of theory could shorten the time needed to develop interventions, optimise their design, identify context conditions necessary for their success, and enhance learning from those efforts.

However, critics argue that until the value of theory has been empirically proven, it is not essential to use theory to guide the development of interventions, and a common-sense approach is sufficient (Greenhalgh and Wieringa, 2011). Boulton et al. (2020) add that there is a possibility of being led astray by apparently attractive theories that may be partial, inappropriate for the context or flawed. Oxaman et al. (2005) further espouse that there is a need for less theorizing, less jargon, and more simple logic, common sense, and empiric evidence. Gabbay and Le May (2016) argue that a related concept of mindlines should instead be adopted, whereby tacit guidelines are internalised and collectively reinforced based on interactions with literature, clients and colleagues. However, the common-sense and mindlines approach often results in interventions that, while attractive in concept, are not clear about the specifics of the desired behaviours, the social and technical processes they seek to alter, and how the proposed interventions might achieve their hoped for effects in practice (Davidoff et al., 2015). Overall, theory-based behaviour change interventions tend to be more effective than those developed using an empirical or pragmatic approach solely and are advised
(Michie et al., 2014). Therefore, a behavioural analysis of study data was conducted to make theory-based recommendations targeting the most influential factors (barriers and enablers) identified in this study that would affect the implementation of the IPC guidance within these settings.

Many theories continue to be applied to implementation processes or behaviour change interventions with the aim of improving practice within which these behaviours occur. Since behaviour change interventions can be targeted at individuals, social groups, and organisations, there are different types of behaviour change theories that best suit each approach. According to Nilsen (2015), these can be divided into classic and implementation theories, which may then be incorporated into different models and frameworks. While classic theories such as Theory of Diffusion, Theory of Reasoned Action and Social Cognitive Theory originate from areas outside of implementation research, particularly psychology; implementation theories such as Normalization Process Theory have been developed by implementation scientists for the specific purposes of understanding implementation processes. In addition, determinant frameworks such as Consolidated Framework for Implementation Research and the Promoting Action on Research Implementation in Health Services (PARIHS) framework aim to further explore the effects of implementation efforts on outcomes and may or may not incorporate theory (Nilsen, 2015).

Although the number and use of theories is constantly expanding, further highlighting the importance of these in implementation and behaviour change studies, no single theory can explain or predict all variances in health professionals' behaviour. Fernandez et al. (2019) assert that it is unlikely that one theory can sufficiently explain all influencing factors and provide guidance to address them; thus, multiple theories are often used. Consequently, two multilevel approaches, the Theoretical Domains Framework (TDF) (Francis et al., 2012), which integrates the numerous behaviour change theories available, and the Behaviour Change Wheel (BCW) (Michie et al., 2014), designed to create a link from identification of determinants of behaviour (using the TDF) to the mapping of appropriate behaviour change techniques (BCTs) to inform interventions, are discussed below.
8.2.1 Theoretical Domains Framework (TDF)

The TDF is an integrative theoretical framework that has been applied across a wide range of populations to help further understand the factors influencing behaviour and behaviour change (Atkins et al., 2017). The framework was developed using a consensus approach to bring together and combine 33 theories that included psychological, organisational and action theories into one integrated framework by a group of health psychology theorists and health service researchers (Michie et al., 2005). Following its development by Michie and colleagues in 2005, the TDF was validated and refined to include 14 domains adopted for this study (table 19). Michie et al. (2005) contend that applying these domains enhances understanding of the behaviour change processes inherent in the implementation of evidence-based practices. These domains provide a coherent and structured way of organising explanations of why behaviours either do or do not occur, hence the TDF serves as a precursor to subsequent wider intervention development processes (Cane et al., 2012). Because of this, it has found widespread use, even among non-psychologists, and is therefore suitable for public health professionals to ensure they adopt a theoretically informed approach to understand behaviour and intervention development (Phillips et al., 2015).
<table>
<thead>
<tr>
<th>Domain</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td>An awareness of the existence of something</td>
</tr>
<tr>
<td><strong>Skills</strong></td>
<td>An ability or proficiency acquired through practice</td>
</tr>
<tr>
<td><strong>Social/professional &amp; role and identity</strong></td>
<td>A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting</td>
</tr>
<tr>
<td><strong>Beliefs about capabilities</strong></td>
<td>Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use</td>
</tr>
<tr>
<td><strong>Beliefs about consequences</strong></td>
<td>Acceptance of the truth, reality or validity about outcomes of a behaviour in a given situation</td>
</tr>
<tr>
<td><strong>Reinforcement</strong></td>
<td>Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus</td>
</tr>
<tr>
<td><strong>Intentions</strong></td>
<td>A conscious decision to perform a behaviour or a resolve to act in a certain way</td>
</tr>
<tr>
<td><strong>Goals</strong></td>
<td>Mental representations of outcomes or end state that an individual wants to achieve</td>
</tr>
<tr>
<td><strong>Memory, Attention and Decision Processes</strong></td>
<td>The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives</td>
</tr>
<tr>
<td><strong>Environmental Context and Resources</strong></td>
<td>The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives</td>
</tr>
<tr>
<td><strong>Social Influences</strong></td>
<td>Interpersonal processes that can cause individuals to change their thoughts, feelings or behaviours</td>
</tr>
<tr>
<td><strong>Optimism</strong></td>
<td>The confidence that things will happen for the best or that desired goals will be attained</td>
</tr>
<tr>
<td><strong>Emotion</strong></td>
<td>A complex reaction pattern, involving experiential, behavioural and physiological elements, by which the individual attempts to deal with a personally significant matter or event</td>
</tr>
<tr>
<td><strong>Behavioural regulation</strong></td>
<td>Anything aimed at managing or changing objectively observed or measured actions</td>
</tr>
</tbody>
</table>

**Table 19:** The TDF version used for this study. Adapted from Cane et al. (2012)

Additionally, the TDF is such a versatile tool that it continues to be used within various contexts in health research and intervention development (Atkins et al., 2017). Its foundation in behaviour change promotes the development of theory-informed tailored interventions that aim to improve healthcare outcomes. It also allows researchers to identify and design interventions systematically, allowing for clear rationales of research methodology and potentially replicable results (Francis et al., 2012; Phillips et al., 2015). Critics, however, argue that it is a descriptive framework rather than a theory and has been further criticised for having isolated theoretical construct domains, which do not specify the relationships between theoretical domains and thus cannot generate a
testable hypothesis (Francis et al., 2009). However, Atkins et al. (2017) clarify that rather than providing explanations of how change occurs, the TDF is supposed to provide a theoretical lens through which to view the cognitive, affective, social and environmental influences on behaviour.

Despite these limitations, the TDF has become a dominant framework for categorising the types or domains of factors that may act as potential mediators of behaviour change. Over 200 papers have been published using the TDF since its introduction in 2012 (Atkins et al., 2017). Thus, there is compelling support for using the TDF as an overarching framework in developing theory-informed behaviour change interventions (Atkins et al., 2017). While there is still research needed on the effectiveness of implementation interventions and whether interventions based on the TDF are more effective than those that have not used this framework, it has proven useful in helping understand the barriers and enablers to behaviour change within a particular context (Atkins et al., 2017). By identifying these relevant barriers and facilitators, TDF domains can be linked to implementation techniques so that appropriate behaviour change interventions can be systematically selected (Cane et al., 2012). For these reasons, this study chose the TDF to systematically categorise the identified barriers and enablers to IPC guidance implementation. Further, TDF domains, when matched with the elements from the BCW (discussed in the next section), allow the specification of broad intervention functions that correspond to the underlying barrier or facilitator.

8.2.2 The Behaviour Change Wheel and COM-B Model

The Behaviour Change Wheel (BCW) was developed as a behaviour system designed to link from identification of determinants of behaviour (using the TDF) to the mapping of appropriate behaviour change techniques (BCT) to inform interventions. According to Michie et al. (2014), the BCW serves as a guide for how interventions can be developed using a theory by encouraging designers to consider a full range of intervention options and to select the most promising through a systematic evaluation of theory and evidence. At its centre is the Capability, Opportunity, Motivation and Behaviour (COM-B) model, which forms the hub of the BCW (see figure 17). This model proposes that
behaviour is a result of an interaction between three components: capability, opportunity, and motivation (Michie et al., 2014). Capability can be psychological, for example, knowledge about IPC or physical such as skills required for practising IPC; opportunity can be social, for example, group influences towards understanding IPC or physical, for example, resources needed for IPC implementation. By modelling opportunity in this manner, Michie et al. (2011) argued that the role of context in behaviour change is accounted for. Therefore, for someone to engage in a particular behaviour (B) at a given moment, they must be physically and psychologically able (C) and have the social and physical opportunity (O) to do the behaviour. Finally, motivation (M) covers basic drivers and automatic processes; it can be automatic or reflective, for example, beliefs about the benefit of IPC (Michie et al., 2014) leading the individual to want or need to do the behaviour more than any other competing behaviours at that moment (in this case practising the required IPC measures) (Barker et al., 2016).

These COM-B components are then linked to nine intervention functions (see Table 20) of the BCW, such as education and training, that can be used to potentially alter the behaviour. At the wheel’s outer edge are policy categories such as environmental/social planning and legislation that promote organisational change at a broader level. The distinction between interventions and policies was made by Michie et al. (2011), who
noted that an intervention with a particular target behaviour could be enabled by differing policies. Therefore, the BCW theorises that once a problem has been identified and context has been taken into consideration, these intervention functions and policies may be implemented to try and change behaviour. The BCW is thus dynamic, rather than being linear in nature, permitting interactions both within and between layers; for example, education can also be associated with capability (Mayne, 2017).

<table>
<thead>
<tr>
<th>Intervention function</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education</strong></td>
<td>Increasing knowledge or understanding</td>
</tr>
<tr>
<td><strong>Persuasion</strong></td>
<td>Using communication to induce positive or negative feelings or stimulate action</td>
</tr>
<tr>
<td><strong>Incentivization</strong></td>
<td>Creating an expectation of reward</td>
</tr>
<tr>
<td><strong>Coercion</strong></td>
<td>Creating an expectation of punishment or cost</td>
</tr>
<tr>
<td><strong>Training</strong></td>
<td>Imparting skills</td>
</tr>
<tr>
<td><strong>Restriction</strong></td>
<td>Using rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours)</td>
</tr>
<tr>
<td><strong>Environmental restructuring</strong></td>
<td>Changing the physical or social context</td>
</tr>
<tr>
<td><strong>Modelling</strong></td>
<td>Providing an example for people to aspire to or imitate</td>
</tr>
<tr>
<td><strong>Enablement</strong></td>
<td>Increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Policy categories</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication/marketing</strong></td>
<td>Using print, electronic, telephonic, or broadcast media</td>
</tr>
<tr>
<td><strong>Guidelines</strong></td>
<td>Creating documents that recommend or mandate practice. This includes all changes to service provision</td>
</tr>
<tr>
<td><strong>Fiscal measures</strong></td>
<td>Using the tax system to reduce or increase the financial cost</td>
</tr>
<tr>
<td><strong>Regulation</strong></td>
<td>Establishing rules or principles of behaviour or practice</td>
</tr>
<tr>
<td><strong>Legislation</strong></td>
<td>Making or changing laws</td>
</tr>
<tr>
<td><strong>Environmental/social planning</strong></td>
<td>Designing and/or controlling the physical or social environment</td>
</tr>
<tr>
<td><strong>Service provision</strong></td>
<td>Delivering a service</td>
</tr>
</tbody>
</table>

Table 20: The COM-B framework and behaviour change wheel. Adapted from Michie et al. (2014)

As noted in the previous section, the TDF has since been added to the BCW to help unpack COM-B further and allow deeper exploration of the barriers to and facilitators of change. As De Leo et al. (2021) points out, using the TDF in conjunction with the COM-B/BCW model of behaviour provides a more detailed structure for behavioural
analysis, with the TDF used to categorise factors impacting the uptake of a behaviour of interest, while the COM-B/BCW facilitates the mapping of these factors to corresponding interventions. As such, the COM-B intends to facilitate the selection of interventions most likely to overcome identified barriers and leverage the identified enablers to behaviour change (Michie et al., 2011). Therefore, the COM-B model of behaviour provides an excellent theoretical approach for designing complex behaviour change interventions, as it considers all the individual determinants of behaviour, making it easier to identify appropriate interventions (Mayne, 2017).

Therefore, the application of TDF, COM-B, and BCW to this study would allow the identification of appropriate BCTs to improve IPC implementation in the context of the current study. BCTs are observable, replicable, and irreducible components of an intervention designed to alter or redirect causal processes that regulate behaviour. For example, a technique is proposed to be an active ingredient, such as feedback, self-monitoring and reinforcement (Michie et al., 2013). However, the current study will not go quite as far as proposing specific active ingredients of interventions as intervention design is beyond the aims of this study, but would be a recommendation for further research. To summarise, the TDF, together with the COM-B and BCW model, were used in this study, first to categorise the identified barriers and enablers to IPC implementation according to the TDF domains and second to use BCW to inform the identification of possible areas for interventions to address these barriers and enablers. The following section describes the implementation of the TDF, BCW/COM-B as applied in this study.

8.3 Mapping barriers and enablers to the TDF domains and BCW COM-B components

The mapping of barriers and enablers was a 3-step process described below.

Step 1: First, simple content analysis identified barriers and enablers to implementation of IPC guidance within each of the grounded theory categories, as displayed in table 21.
<table>
<thead>
<tr>
<th>GT CATEGORY</th>
<th>BARRIERS</th>
<th>ENABLERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognising the importance of IPC</td>
<td>Lack of inclusive trainings and orientation</td>
<td>Training for senior staff and IPC committee members</td>
</tr>
<tr>
<td></td>
<td>Lack of motivation for trainers</td>
<td>Having meetings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Orientation and posters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceived benefit of guidance</td>
</tr>
<tr>
<td>Playing a role</td>
<td></td>
<td>Identifying self: role in IPC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Taking responsibility</td>
</tr>
<tr>
<td>Encountering challenges</td>
<td>Shortage of finances</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shortage of HCWs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lack of consistent supply of water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infrastructural challenges</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Delay in delivery of IPC supplies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lack of training and orientation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lack of support supervision from national and local levels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A lack of voice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor attitude from some staff</td>
<td></td>
</tr>
<tr>
<td>Enabling conditions</td>
<td></td>
<td>Support from management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Having an IPC committee</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Having reminders</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support supervision</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Having CMEs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organised environment</td>
</tr>
<tr>
<td>Overcoming challenges</td>
<td></td>
<td>Team work and cross-organisational collaboration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preparing ABHR locally</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adapting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asking patients to buy their own supplies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use of mobile based tools</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Having Students</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Delegation of duties</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Working with other organisations</td>
</tr>
</tbody>
</table>

**Table 21**: Identified barriers and enablers to the implementation of the IPC guidance
Step 2: Each identified barrier or facilitator was mapped against multiple TDF domains through an iterative process, as table 22 shows.

Step 3: The TDF domains were further analysed using the COM-B and BCW approaches (Michie et al., 2014). Here, TDF domains were matched to appropriate COM-B components, associated intervention functions, and policy categories for each barrier and/or enabler (see Table 22). As Michie et al. (2014) point out, the BCW model is not linear in that components within the behaviour system interact with each other, as do the functions within the intervention layer and the categories within the policy layer. Therefore, this model was implemented as such. This enabled the identification of possible recommendations to improve IPC guideline implementation within this context, without moving to the more detailed specification of BCTs for intervention design.
<table>
<thead>
<tr>
<th>GT CATEGORY</th>
<th>BARRIERS</th>
<th>ENABLERS</th>
<th>Description</th>
<th>TDF Domains</th>
<th>COM-B/BCW component</th>
<th>Intervention functions/policy categories</th>
<th>Examples of recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognising the importance of IPC</td>
<td>Lack of inclusive training and orientation</td>
<td>Training for senior staff and IPC committee members</td>
<td>The training helped improve knowledge of IPC. However, the training wasn't inclusive as it targeted senior staff and IPC members leaving out other staff</td>
<td>•Knowledge •Skills</td>
<td>•Psychological capability •Physical capability</td>
<td>•Modelling •Training</td>
<td>Provide information about the latest guidelines and updates to any guidelines through continuous professional development</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Training needs analysis to tailor training for different groups</td>
</tr>
<tr>
<td></td>
<td>Lack of motivation for trainers</td>
<td></td>
<td>The lack of motivation for trainers, particularly the unavailability of incentives, meant that information wasn't passed on</td>
<td>•Goals •Reinforcement</td>
<td>•Reflective motivation •Psychological capability</td>
<td>•Incentivization •Coercion</td>
<td>Providing rewards to trainers Coercive strategies are less helpful</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Having meetings</td>
<td>Information wasn't passed on through meetings</td>
<td></td>
<td>•Knowledge •Social Influences</td>
<td>•Social opportunity</td>
<td>•Enablement</td>
<td>Leveraging these communication processes to pass on information to staff</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Orientation and posters</td>
<td>Students, nurses and interns became aware of IPC guidance through orientation and posters and</td>
<td>Students, nurses and interns became aware of IPC guidance through orientation and posters and</td>
<td>•Memory, attention and decisions processes •Behaviour regulation</td>
<td>•Physical opportunity</td>
<td>•Education</td>
<td>Professional detailing through continuous professional development</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td>GT CATEGORY</td>
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<td>Description</td>
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<td>COM-B/BCW component</td>
<td>Intervention functions/policy categories</td>
<td>Examples of recommendations</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>notices around wards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived benefit of guidance</td>
<td>Understanding the benefit of IPC guidance helped improve the willingness of members to accept and practice the required IPC measures</td>
<td>•Beliefs about consequences</td>
<td>•Psychological capability</td>
<td>•Persuasion</td>
<td>Strengthening this through information provision and constant communication about the benefits of following guidelines and the harms of not following guidelines, for example, through facilitated workshops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Playing a role</td>
<td>Identifying self as playing a role in IPC</td>
<td>Participants identified and labelled themselves such as being a doctor, being a mother</td>
<td>•Professional role and identity</td>
<td>•Automatic motivation</td>
<td>•Modelling</td>
<td>Peer expert to discuss roles and responsibilities</td>
<td></td>
</tr>
<tr>
<td>Taking responsibility</td>
<td>As a result of role labels, participants took on different responsibilities in the implementation process</td>
<td>•Professional role and identity</td>
<td>•Automatic motivation</td>
<td>•Enablement</td>
<td>Continue to provide the required tools for HCWs to continue playing their roles and responsibilities, particularly ensuring a steady supply of IPC supplies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GT CATEGORY</td>
<td>BARRIERS</td>
<td>ENABLERS</td>
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</tr>
<tr>
<td>Encountering challenges</td>
<td>Insufficient funding</td>
<td>A shortage of finances meant that participants were unable to get all the required IPC supplies</td>
<td>• Environmenta l context and resources • Physical opportunity</td>
<td>Enablement</td>
<td>Lobbying the government and hospital management to allocate more funds to IPC activities and obtain formal commitment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shortage of HCWs</td>
<td></td>
<td>A shortage of HCWs led to a work overload and being overwhelmed</td>
<td>• Environmenta l context and resources • Physical opportunity</td>
<td>Enablement • Incentivisation</td>
<td>By recruiting more HCWs Introducing bonuses for overtime Working with schools to avail more students for cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of consistent supply of water</td>
<td></td>
<td>Intermittent supply of water led to challenges in practising proper hand hygiene as well as proper cleaning of the facility</td>
<td>• Environmenta l context and resources • Physical opportunity</td>
<td>Environmental restructuring</td>
<td>Provision of ABHR during times of water shortages. Providing tanks for water storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infrastructural challenges</td>
<td></td>
<td>Buildings were old, often requiring regular maintenance. Inadequate bed capacity led to</td>
<td>• Environmenta l context and resources • Physical opportunity</td>
<td>Environmental restructuring</td>
<td>Change infrastructure through provision of extra buildings, creation of isolations and cohorting spaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GT CATEGORY</td>
<td>BARRIERS</td>
<td>ENABLERS</td>
<td>Description</td>
<td>TDF Domains</td>
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<td>Examples of recommendations</td>
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</tr>
<tr>
<td></td>
<td>Delay in delivery of IPC supplies</td>
<td>Overcrowding, with some patients sleeping on floors</td>
<td>The facility experienced delays in receiving supplies from the government, which meant that they often lacked essential materials during certain times</td>
<td>• Environmental context and resources</td>
<td>• Physical opportunity</td>
<td>• Enablement • Environmental restructuring</td>
<td>Provide regular supplies of requirements to enable HCWs to implement IPC guidelines as required Planning ahead through delivering extra supplies to act as buffer stock</td>
</tr>
<tr>
<td></td>
<td>Absent National IPC committee</td>
<td>Although the policy documents indicate the presence of a national IPC committee, participants spoke of how they had never seen or had anyone from that committee coming to provide any support</td>
<td></td>
<td>• Professional role and identity • Social influences</td>
<td>• Social opportunity</td>
<td>• Environmental restructuring • Communication</td>
<td>Organizational changes to increase collaboration among HCWs and IPC members with the National IPC committee Establish channels to improve communication between the facility IPC and the National IPC Committee</td>
</tr>
<tr>
<td>GT CATEGORY</td>
<td>BARRIERS</td>
<td>ENABLERS</td>
<td>Description</td>
<td>TDF Domains</td>
<td>COM-B/BCW component</td>
<td>Intervention functions/policy categories</td>
<td>Examples of recommendations</td>
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<td></td>
<td>Lack of training and orientation</td>
<td></td>
<td>A lack of training and orientation, particularly for the interns, students and new staff, meant that they experienced a gap in knowledge, and this impeded their efforts in trying to implement the required measures</td>
<td><strong>Knowledge</strong></td>
<td><strong>Physical opportunity</strong></td>
<td><strong>Training</strong></td>
<td>Tailored training developed through a training needs analysis. Increase the frequency of CMEs</td>
</tr>
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<td></td>
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<td></td>
<td><strong>Psychological opportunity</strong></td>
<td><strong>Modelling</strong></td>
<td></td>
<td>Peer experts to discuss the content of guidelines and highlight organisations that endorse it</td>
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<tr>
<td></td>
<td>Lack of support supervision</td>
<td></td>
<td>A lack of supervision meant that participants didn’t get an opportunity to get clarity on some IPC issues that arose during their routine practice</td>
<td><strong>Behaviour regulation</strong></td>
<td><strong>Social Opportunity</strong></td>
<td><strong>Modelling</strong></td>
<td>Through the continuous provision of audit and feedback</td>
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<td><strong>Social influences</strong></td>
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<td></td>
<td>Use of online platforms to provide solutions or act as brainstorming spaces</td>
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<td>GT CATEGORY</td>
<td>BARRIERS</td>
<td>ENABLERS</td>
<td>Description</td>
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<tr>
<td>Lack of voice</td>
<td>The lack of space to make suggestions meant that some participants were excluded from conversations about decisions regarding guidelines</td>
<td>•Social influences</td>
<td>•Social opportunity</td>
<td>•Enablement •Service provision</td>
<td>Provide suggestion boxes around the facility to encourage ideas from staff Establishing support services within the facility</td>
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<tr>
<td>Poor attitude from some staff</td>
<td>Some participants did not make the required conscious efforts to practice or follow the recommended guidelines even if they were aware of the guidelines</td>
<td>•Intentions</td>
<td>•Psychological capability • Reflective motivation</td>
<td>•Persuasions •Modelling •Coercion</td>
<td>Through the use of strict rules for non-compliant staff. Having reminders to trigger non-complaint staff into following guidelines continuously Peer experts to discuss the content of guidelines and highlight organisations that endorse it Creating an expectation of punishment or cost for HCWs not adhering to recommended guidelines</td>
<td></td>
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<td>GT CATEGORY</td>
<td>BARRIERS</td>
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<td>Description</td>
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<tr>
<td>Enabling conditions</td>
<td>Support from management</td>
<td>Management had an impact on the success of guidance implementation as they were responsible for overall planning and budgeting. A strong relationship with hospital management was highly valued</td>
<td>• Social Influences  • Environmental context and resources</td>
<td>• Social opportunity  • Reflective motivation</td>
<td>• Communication</td>
<td>Strengthen communication channels between HCWs and management to maintain this relationship through town hall meetings</td>
<td></td>
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<tr>
<td>Having an IPC committee</td>
<td>Effective IPC governance structure through the presence of an IPC committee was critical to successful IPC implementation as they provided oversight and feedback</td>
<td>• Professional role and identity  • Social opportunity</td>
<td>• Modelling</td>
<td>Create IPC champions</td>
<td></td>
<td></td>
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<tr>
<td>Having reminders</td>
<td>Having reminders served as an effective</td>
<td>• Memory, attention and decisions processes  • Physical opportunity</td>
<td>• Persuasion</td>
<td>Strengthening this through provisions of more posters, notices and charts</td>
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<td>GT CATEGORY</td>
<td>BARRIERS</td>
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<tr>
<td>Support supervision</td>
<td>Supervision provided an opportunity to fill in gaps in information, particularly regarding IPC guidance</td>
<td>•Social Influences  •Behaviour regulation</td>
<td>•Social opportunity  •Reflective motivation</td>
<td>•Modelling</td>
<td>Peer expert to discuss the content of guidelines</td>
<td></td>
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<tr>
<td>Having CMEs</td>
<td>These trainings and educational programmes were a trigger for changing practice and crucial for effective IPC implementation</td>
<td>•Knowledge  •Skills</td>
<td>•Social opportunity</td>
<td>•Education  •Training</td>
<td>Strengthening this through the provision of more regular CMEs and other options for CPDs  Having protected time for training for HCWs</td>
<td></td>
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<tr>
<td>Organised environment</td>
<td>Having an organised environment was important in ensuring effective implementation of IPC guidance as it increased productivity and</td>
<td>•Goals  •Physical opportunity  •Physical capability</td>
<td>•Environmental restructuring  •Regulation</td>
<td>Strengthening this by having marked areas or storage for IPC equipment  Standardization of ward layouts</td>
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<td>GT CATEGORY</td>
<td>BARRIERS</td>
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<td>ensured consistency</td>
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<td></td>
<td>Teamwork and cross-organisational collaboration</td>
<td></td>
<td>This helped bring all stakeholders together to overcome barriers such as training and supply shortages</td>
<td>Social Influences</td>
<td>Social opportunity</td>
<td>Enablement</td>
<td>Strengthening stakeholder interrelationships and developing resource-sharing agreements</td>
</tr>
<tr>
<td>Overcoming challenges</td>
<td>Preparing ABHR locally</td>
<td></td>
<td>This helped solve the challenge of a lack of water and a shortage of ABHR</td>
<td>Skills</td>
<td>Physical capability</td>
<td>Enablement</td>
<td>Training</td>
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<tr>
<td></td>
<td>Adapting</td>
<td></td>
<td>Participants were sensitive to and acknowledged cues within the environment to provide care that is uniquely responsive to the challenges in</td>
<td>Beliefs about capabilities</td>
<td>Physical capability</td>
<td>Enablement</td>
<td>Environmental restructuring</td>
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<td>GT CATEGORY</td>
<td>BARRIERS</td>
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<td>Description</td>
<td>TDF Domains</td>
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<td></td>
<td>that setting through adapting some components of IPC guidance</td>
<td>• Environmental context and resources</td>
<td>• Social opportunity • Physical opportunity</td>
<td>• Environmental restructuring</td>
<td>Social restructuring Having a buffer stock to use during such times</td>
</tr>
<tr>
<td>Asking patients to buy their supplies</td>
<td></td>
<td></td>
<td>Patients were often asked to buy their key IPC materials, which helped overcome challenges such as delays in delivery of IPC supplies and shortages</td>
<td>• Environmental context and resources</td>
<td>• Social opportunity • Physical opportunity</td>
<td>• Environmental restructuring</td>
<td>Social restructuring Having a buffer stock to use during such times</td>
</tr>
<tr>
<td>Use of mobile-based tools</td>
<td></td>
<td></td>
<td>By working in online contexts with peers, participants were able to ensure a flow of information with minimal resources and equipment, in turn fostering the implementation</td>
<td>• Environmental context and resources</td>
<td>• Physical opportunity</td>
<td>• Enablement</td>
<td>Strengthening the use of information technologies, for example, online meeting platforms, to increase capability and facilitate practice change among IPC members and other HCWs</td>
</tr>
<tr>
<td>GT CATEGORY</td>
<td>BARRIERS</td>
<td>ENABLERS</td>
<td>Description</td>
<td>TDF Domains</td>
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<tr>
<td>Having Students</td>
<td>By having students, the hospital filled gaps as a result of a shortage of HCWs</td>
<td>• Social Influences</td>
<td>• Social opportunity</td>
<td>• Enablement</td>
<td>Strengthening working relations and partnerships with educational institutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delegation of duties</td>
<td>To ensure continuity in the flow of information as well as ensuring that there was no leadership gap during times of absence</td>
<td>• Social Influences</td>
<td>• Social opportunity</td>
<td>• Modelling</td>
<td>Through shadowing IPC committee members</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working with other organisations</td>
<td>This helped bring all stakeholders together to overcome barriers such as training and supply shortages</td>
<td>• Social Influences</td>
<td>• Social opportunity</td>
<td>• Enablement</td>
<td>Strengthening stakeholder interrelationships and developing resource-sharing agreements Promote network weaving</td>
<td></td>
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</tbody>
</table>

**Table 22:** TDF domains matched to COM-B/BCW components and intervention functions
8.4 Discussion of behavioural analysis

8.4.1 Identified TDF domains significant to the implementation of IPC guidance

The mapping of barriers and enablers to the TDF framework resulted in 46 domain assignments across the different influencing factors. For this study, the frequency of the domains is reported as a proxy for the level of significance in regard to the implementation process, although it is acknowledged that frequency counts should not necessarily be taken as an indicator of importance in qualitative research. As such, all but one domain (optimism) were represented, but to varying extents, with the most frequently occurring and most important TDF domains being social influences (10) and environmental context and resources (10). The next frequently identified domains were knowledge (4), skills (4), professional role and identity (4), and behavioural regulation (4). While memory, attention and decision processes (2), goals (2), beliefs about capabilities (2), beliefs about consequences (1), intentions (1), emotion (1) and reinforcement (1) were the least frequently identified domains.

Environmental context and resources served as the biggest hurdle to achieving full implementation of IPC guidance. For example, resource constraints like limited finances negatively impacted motivation and self-efficacy to perform IPC within the current study, with the physical environment also presenting major challenges. Supportive social influences served as the next most important influencing factors providing a positive influence on IPC practice behaviour, and the lack of such influences was a barrier. Further, knowledge and skills acted as both barriers and enablers. The knowledge of guidelines gained specifically through meetings or training played an important role in ensuring that this guidance is properly implemented within these contexts. However, the lack of this among HCWs served as a barrier. Memory, attention and decision processes, as well as behaviour regulation, had a positive influence on the implementation of the guidance, for example, having reminders served as a memory jogger that triggered HCWs into practising the recommended IPC measures. At the same time, beliefs about capabilities acted as enablers. For example, HCWs believed they were best placed to implement IPC guidance by taking responsibility as dictated by their
professional roles and identity. This positively impacted their perceived ability and confidence in their ability to follow IPC guidance. For example, they were able to adapt guidelines to their context and were able to make ABHR locally. However, professional role and identity also acted as a barrier in cases where some people did not play their respective roles, for example, the national IPC committee members being absent.

Furthermore, beliefs about consequences acted as an enabler. Within this domain, HCWs’ perception of the benefits of following guidelines positively influenced their decision to practice the required IPC measures. For instance, a sense of protection against HAIs through practising IPC measures increased the likelihood of accepting and following the recommended guidelines. Additionally, where intentions, goals and reinforcement acted as a barrier, training for relevant HCWs to deliver brief behaviour change interventions that educate and persuade those showing hesitancy towards IPC practice should be considered. Lastly, the issue of emotions was also identified. The emotional impact of being overwhelmed by a heavy workload had a negative impact on the implementation of the guidance.

8.4.2 Identified COM-B/BCW components that relate to the identified TDF domains

Following the identification of the key influencing domains, the full set of these TDF domain assignments relating to the barriers and enablers were mapped onto the corresponding COM-B/BCW model to identify which components underlie implementation behaviours. All COM-B components were found to be important in the implementation of IPC guidance, with Opportunity (25) being the most frequently mapped component, followed by Motivation (9) and Capability (8). Both physical and social opportunities were found to be crucial in the implementation of IPC guidance. For example, HCWs were unable to follow guidelines because they lacked the physical opportunity to do so due to a shortage of IPC supplies. On the other hand, some HCWs were able to follow guidelines because of the available social opportunities, such as working with other organisations. Both automatic and reflective motivation were also found to be key determinants of IPC guidance uptake. For example,
motivation regarding beliefs about capabilities acted as an enabler to IPC practice among HCWs and automatic motivation regarding professional role and identity. Capability included both physical and psychological components. Some HCWs often failed to practice IPC measures as they lacked psychological capability in the form of knowledge and skills about guidance. While some HCWs were able to engage in IPC practice due to the presence of both psychological and physical capability, for example, beliefs about consequences that would benefit them if they practised the recommended guidelines.

In summary, this analysis suggests that capability, opportunity, and motivation play an important role in the uptake of IPC guidance and that these components are interrelated rather than independent. This is evident in the overlapping influence of many of the constructs in the mapping analysis. A number of intervention functions were identified to address the underlying influences and are presented in the next section.

8.4.3 Relevant intervention functions identified that can provide potential evidence-based and theoretically informed future intervention content

Across the BCW intervention function analysis of all the TDF domains outlined, the following intervention functions were identified as relevant to fostering the implementation of the IPC guidance within the study context; Enablement (n=13), environmental restructuring (n=7), modelling (n=8), training (n=5), persuasion (n=3), incentivisation (n=2), education (n=2), and coercion (2). With respect to policy categories, three categories were highlighted; communication (2), regulation (1) and service provision (1). However, Barker et al. (2016) note that one intervention function may serve more than one determinant; for example, as indicated in table 25, training can address the psychological capability and physical opportunity. Likewise, a single determinant can be addressed by more than one intervention function, i.e., psychological capability may be addressed using education, training or enablement. The link between these components and TDF is discussed in chapter 10, section 10.4.1 with
suggested recommendations that can be used to improve the uptake of the IPC guidance.

8.5 Summary

Although much remains unanswered in the field of implementation of IPC guidance in low and middle-income countries, it is widely accepted that concerted efforts to change practice to close this evidence-practice gap are necessary. As such, there is support for theory-based models and frameworks to guide implementation efforts. There is evidence that interventions are more effective when they are tailored to address known barriers and enablers (Whitaker et al., 2016). Therefore, barriers and facilitators to evidence uptake must be assessed in the specific population in which change is desired.

The two theory-based frameworks applied in this chapter are instrumental in designing implementation interventions, having emerged from a plethora of implementation models and frameworks. The TDF effectively categorises barriers and enablers for specific behaviours, and the BCW is helpful in selecting tailored intervention functions. TDF has been utilised in this study to map identified barriers and enablers to IPC implementation by individuals working in LMIC settings. The BCW was used to identify influential factors relevant to behaviour related to the implementation of IPC guidance, thereby suggesting which intervention functions can be used to enhance implementation. Therefore, notwithstanding the limitations of these frameworks, the TDF, together with the COM-B/BCW models, can usefully be applied by those wanting to develop behavioural interventions to address specific barriers and enablers to the implementation of the IPC guidance.

Following the steps of the behaviour change wheel, factors that might influence the implementation of IPC guidance were identified based on the findings from the grounded theory study conducted with HCWs in Uganda. Using the COM-B/BCW model, the analysis then identified potential drivers of the target behaviour in terms of
capability, opportunity and motivation. As shown in this chapter, it is possible to use these frameworks and models to identify levers and behaviours within IPC structures at health facilities which can be targeted to improve access and uptake of IPC guidance guidelines. In summary, the initial qualitative data analysis was carried out according to grounded theory procedures and developed a theoretical explanation for the implementation process of IPC guidance at a health facility within Uganda. The subsequent behavioural analysis identified potential mediators of target behaviour that could be leveraged to improve the uptake of IPC guidance to inform any future IPC implementation interventions in similar settings as the current study. Detailed recommendations to improve IPC practice are further laid out in the conclusion chapter.
CHAPTER NINE: DISCUSSION

9.1 Introduction

This qualitative grounded theory study aimed to explore the implementation of IPC guidance and to develop a theoretical explanation for the processes involved in the implementation of IPC guidance at healthcare facility level, specifically tertiary health centres in Uganda. A systematised literature review conducted at the beginning of the study between February 2018 and March 2018 to ascertain what research had been conducted on the implementation of WHO IPC core components revealed that although they were studies from Africa, none were conducted in Uganda. There was a dearth of evidence exploring IPC guidance at health facility level in low-income countries using a qualitative approach. These studies were of average quality, with weak designs and no theoretical underpinnings. With a lack of robust qualitative studies on the implementation of IPC guidance in low-income countries and a lack of theoretical underpinnings in those studies which were available, this PhD research study set out to contribute to the evidence that would narrow these gaps.

The findings of this study revealed the existence of barriers that HCWs experienced in their pursuit of IPC guidance implementation, as well as enablers that facilitated this process. The theoretical code that explained the implementation process was asymptote, which is a model for getting as close as possible but never quite getting there, and the process was conceptualised as 'striving for improved IPC practice'. This was a four-phase process; Recognising the importance of IPC, playing a role, Encountering challenges and Overcoming challenges. An understanding of all these phases helped explain how HCWs implemented this guidance in these contexts. Striving for improved IPC practice while accepting challenges may provide a model for addressing challenges, leveraging enablers and facilitating factors to better influence the implementation process of IPC guidance in these contexts.
The barriers and enablers identified from the grounded theory analysis were aligned to the domains of the TDF and then the COM-B framework, with capability, opportunity and motivation and identified as key influences in the implementation of IPC guidance. Capability barriers included lack of knowledge, skills, reinforcements and intentions. Opportunity barriers related to environmental context and resources, professional role and identity, social influences and behaviour regulation. Motivation barriers were related to intentions, for example, poor attitudes from staff. Conversely, capability enablers were related to specific aspects of the TDF domains of environmental context and resources and goals, while opportunity enablers were related to memory attention and decisions, behaviour regulation, goals and social influence. Motivation enablers were related to beliefs about capabilities and consequences, skills, environmental context and resources and professional role and identity. Despite experiencing difficulties, HCWs demonstrated high motivation and commitment to adhere to the recommended IPC practices, which manifested in improvisation when faced with severely constrained resources.

Following grounded theory analysis, a substantive theory was generated which identified striving as explanatory for the data. Literature related to striving and other concepts was then sought. Therefore, this chapter provides a discussion of the major findings, situating the generated grounded theory within the literature and discussing the broader evidence on the barriers and enablers to the implementation of IPC guidance and improvisation, showing how these findings build on existing understandings. The TDF findings are also compared to the extant literature, with the chapter concluding with implications of these findings for IPC practice.

### 9.2 Situating the theory of ‘Striving’ in the literature

In the modern world, striving is always part of our lives, as individuals are constantly bombarded by barriers that they have to navigate to reach goals. However, common assumptions around the use of striving tend to mask differing and complex
understandings. Several definitions of the term 'striving' exist. For example, the Oxford Dictionary defines it as 'to try very hard to achieve something' (Oxford Dictionary, 2015), while the Cambridge Dictionary (2020) expands on this and defines striving as 'to try very hard to do something or to make something happen, especially for a long time or against difficulties'. In line with these definitions, within the current study striving meant giving one's best to implement IPC guidance even when weighed down by challenges. This is echoed by Nilsson et al. (2019) in their phenomenological study aiming to understand how women with osteoporosis in Sweden strive to maintain their daily lives. Participants reported that striving to maintain their daily lives meant believing in themselves and their capabilities and not giving up. In comparing these definitions with the concepts emerging in this grounded theory, issues of 'action' and 'challenges' are highlighted by Nilsson, possibly hinting at a sense of responsibility similar to the current study in which participants took responsibility when implementing the IPC guidance, particularly when overcoming the challenges they faced. Although this was a phenomenological study in a different context exploring a different topic to the current study, it adds understanding to the concept of striving, as noted by the current study findings.

Striving is always done in the face of challenges, as revealed by the current study findings, such as a lack of resources, training, orientation and support supervision. For example, a grounded theory study; ‘From risky to safer home care: health care assistants striving to overcome a lack of training, supervision, and support’ by Swedberg et al. (2013), used multiple data sources to investigate the work experience of health care assistants in a local municipality in Sweden. The authors explored how healthcare assistants managed when delivering 24-hour home care to patients with substantial care needs. They found that healthcare assistants strived to overcome the challenges of lack of training, supervision and support to deliver safe care to residents through compensatory processes such as day-by-day learning; balancing relations with the patient; self-managing; and navigating the patient care system (Swedberg et al., 2013). The lack of training and supervision aligns to the results from the current study.
Secondly, as conceptualised by Swedberg and colleagues, striving is done against a backdrop of challenges, as in the current study with HCWs striving to overcome challenges in their quest to implement IPC guidance.

Further, this is echoed in a case study of dental professionals striving for healthcare in Sierra Leone by Ghotane et al. (2019). Ghotane and colleagues employed an interpretive phenomenological analysis of the views of key players who included dentists and other oral healthcare providers for oral health, the demands of the population, and challenges in the delivery of oral and dental care. Findings from this study revealed that despite challenges such as a lack of infrastructure resources, dentists continued to serve fellow citizens even during adversity, reflecting their loyalty and resilience in doing so through such circumstances (Ghotane et al., 2019). The challenges these professionals faced, such as a lack of infrastructural resources, are like those faced by the participants from the current study while implementing IPC guidance. Although the study samples from Ghotane et al. were dentists, which is different from the current study sample, the findings provide important evidence of striving to address healthcare needs in a low-income country with a similar context to the current study, which noted striving at the core of safe-health care delivery.

The evidence from these three studies (Swedberg et al., 2013; Ghotane et al., 2019; Nilsson et al., 2019), although generated from different study topics and settings, identifies challenges similar to the current study and conceptualises striving as doing something in the face of difficulties which is also emphasised in the current study. Analysis from the current study showed that HCWs had a strong will to improve IPC practice despite barriers in their way. The challenges, such as lack of resources, training, and support supervision, did not discourage them from trying to practise the recommended IPC measures. This is further discussed in section 9.3

Furthermore, the concept of 'striving'in this study, could be said to align with concepts of altruism, which is the performance of cooperative unselfish acts beneficial to others and a general willingness to go the extra mile in professional activities (Feldman, 2017).
Although there is a wide variation in the definition of altruism within the literature, common fundamental concepts are giving, sharing, cooperating, helping, and different forms of other-directed behaviour (Monroe, 1994). According to MacAskill (2015, pp.14–15), altruism is about asking, "How can I make the biggest difference I can?" and using evidence and careful reasoning to find an answer. By striving to implement IPC, we see HCWs displaying altruistic behaviour, such as buying their alcohol hand rub sanitisers to make a difference in the uptake and utilisation of IPC guidance for safe healthcare.

However, critics have argued against altruism, pointing out that all human action is ultimately motivated by self-interest. Human beings often seek to benefit others, but when they do so, it is because they regard helping others as a mere means to their good (Elgat, 2015; Krauss, 2005; Monroe, 1994). For example, in the current study, it could be argued that, by buying their ABHR, HCWs were acting in their interests, ensuring that infections are not transmitted to them and, in turn, to their families. Nietzsche states that because of this self-interest, altruism does not exist (Elgat, 2015). However, within the current study, altruism was demonstrated; for example, not only by going the extra mile to purchase their ABHR and improvising but in the repeated participant accounts of concern for patients, other staff and students. HCWs showed absolute resolve in observing and practising the required IPC measures.

Furthermore, ‘striving for improved IPC practice’ developed from this data has some similarities with extracts from Alfred Alder’s theory of striving for perfection or superiority (Adler et al., 1956). He proposed that human behaviour is driven by only one motivating force, ‘striving for success or superiority’. In his early theory, he used the term striving for superiority to describe psychologically unhealthy people who strive for personal superiority over others. However, over time, Adler’s understanding of “striving” evolved as noted through the various words he used like completion, mastery, perfection, and superiority to describe how humans seek to move from “the present situation, as observed and interpreted, to a better one, one that was superior to the present status” (Manaster and Corsini, 1982, p.41). Thus, striving for perfection or
superiority is the natural human desire to move from a perceived negative position to a perceived positive one (Watts, 2015). In relation to this study, it could be argued that some participants were striving to create a positive situation that would reduce HAIs through the successful implementation of IPC guidance. For example, nurse-in-charges are seen to act as ‘mothers’, with a duty of protecting their patients and staff against infections regardless of the circumstances through training, meetings, supervision of other staff, and practising recommended measures. Therefore, the importance of IPC guidelines for these participants is not contested; however, implementing them amidst an array of barriers proves the challenge. These barriers are discussed in the following section.

9.3 Barriers to the implementation of IPC guidance

There are many barriers to overcome before any evidence-based clinical guidance translates into an improvement in the quality of patient care (Birgand et al., 2015; Correa et al., 2020). This also applies to IPC guidelines, and as such, for IPC measures to be successful, barriers to effective implementation must be identified and overcome (Birgand et al., 2015; Houghton et al., 2020). Data analysis identified several barriers to implementation of IPC guidance categorised into organisational and individual challenges.

Organisational barriers mapped onto the COM-B component of physical and social opportunity, physical and psychological capability and the TDF domains of environmental context, resources and social influences. The organisational barriers that related to physical opportunity included resource constraints such as shortage of finances and HCWs, infrastructural challenges, delay in delivery of IPC supplies, and intermittent water supply while those that aligned to social opportunity were a lack of support supervision from either local or national levels, including absent or non-functional national IPC committee, and a lack of voice. Further, there was one organisational barrier related to capability and this included a lack of training and orientation.
Further, one individual barrier; poor attitudes from some staff mapped onto the COM/B component of psychological capability and motivation and the TDF intention domain.

### 9.3.1. Organisational challenges

Data from the current study suggested a number of organisational barriers impeding IPC guideline use within the context of this study. Organisational challenges were the most significant barriers as they directly impacted the physical and social opportunities available to the HCWs to practice the required IPC measures.

**Resource constraints**

Findings from the current study identified resources as one of the most critical elements for the successful implementation of IPC guidance as they provide physical opportunities to practice IPC measures. These opportunities are provided through the availability of vital resources, including finances, IPC supplies such as PPE, HH products, cleaning supplies, human resources, and structural resources such as isolation units and adequate bed space. A lack of these resources was regarded as a barrier. Participants indicated that they had a shortage of resources, so it was often impossible to comply with the recommended IPC measures. The limited funding in Uganda is evidenced through the health sector budget which dropped to 6.1% from 7.2% of the national budget in the previous year (2019/2020), far from the 15% target (Ministry of Health, 2022, 2015). The per capita allocation for health was approximately USD 17 in the financial year 2019/20 (Ministry of Health, 2022). This is way below the minimum recommended WHO per capita expenditure on health for low-income developing countries of US$34 (The Global Fund, 2019). The literature indicates that such barriers are not unique to this study and have been identified in other studies in other settings.

Limited finances have been cited within the literature as a key barrier to the implementation of guideline recommendations in different contexts, for example Kane
et al. (2016); Buxton et al. (2019); Shelley et al. (2020); Guhan et al. (2021); and Lowe et al. (2021). Within this literature, data was collected from different contexts using different methods with a focus on different guidelines; however, a key theme across the studies is the acknowledgement of limited funding/finances as a key barrier in implementing guidelines, particularly IPC guidelines as detailed below.

Kane et al. (2016) assessed perspectives on the feasibility and acceptability of the WHO guidelines for acute stress management in four clinics that provide mental health services in post-conflict northern Uganda, using in-depth interviews. The authors identified resource limitations as one of the key challenges that mental healthcare providers faced when trying to implement guidance. Although this study addressed mental health guidelines, the study was conducted in Uganda similar to the current study with similar findings. In another study, Shelley and colleagues, in a qualitative analysis of global survey responses, identified important barriers to implementing the WHO Framework Convention on Tobacco Control Article 14 guidelines, among which included a lack of funding, particularly in low-income countries (Shelley et al., 2020). Additionally, in a cross-sectional study conducted by Buxton et al., (2019) in Nigeria to identify the barriers and opportunities experienced by staff when implementing IPC guidelines in maternity wards across six health centres, staff responses indicated that IPC compliance is hindered by financial resource constraints which result in understaffing and senior staff or patients having to cover the costs for essential equipment. This echoes findings from the current study where, due to limited finances, staff were forced to ask patients to buy their own IPC supplies like gloves. Further, using semi-structured interviews, Lowe et al. (2021) explored barriers and facilitators to IPC across eight countries; Central African Republic, South Sudan, Democratic Republic of the Congo, Mali, Nigeria, Lebanon, Yemen and Afghanistan. Following thematic analysis of the data, inadequate funding was identified as one of the key barriers to IPC practice, as reported in the current study. This is also acknowledged in a qualitative study to explore barriers to implementing an IPC programme across three public hospitals in India. Nearly two-thirds of the participants cited a lack of financial resources as a barrier
to the implementation of the programme and its future progress and continuation (Guhan et al., 2021).

As pointed out earlier, financial resources are also required for implementing the appropriate human resources, with limitations often resulting in understaffing (Wemos Health Unlimited, 2019). The Global Strategy on Human Resources for Health: Workforce 2030 (WHO 2016b) emphasises that health systems can only function well when they have a health workforce with sufficient numbers, however, findings from the current study revealed the challenge of HCW shortage and identified it as a fundamental barrier to implementing IPC guidance. A shortage of HCWs led to an increased workload and, consequently, as staff bore a heavier workload, they experienced increased time pressure which led to forfeiting critical IPC measures to attend to more clinical patient needs. As reported by the Ministry of Health in Uganda (2015) in their annual report, staffing in public facilities was at about 76%, below the Health Sector Development Plan target of 80% by 2019.

Inadequate staffing levels have been reported to affect the implementation of evidence-based guidance elsewhere. A rapid review synthesising existing literature on HCWs’ compliance with infection control measures during infectious disease outbreak reports found evidence that a high workload may be a barrier to compliance with recommended personal protective behaviours (Brooks et al., 2021). Whilst this was a rapid synthesis of evidence focussing on outbreak reports without critical appraisal of included papers; nonetheless, it provides synthesised findings that are comparable to results within the current study, which found that a staff shortage led to heavy workloads, particularly in busy settings, such as the emergency department (ED). This is also echoed in a study by Chapman et al. (2017) that employed a grounded theory methodology to investigate the knowledge–action gap in the decision-making process by which HCWs understand their occupational risk and use preventive strategies to reduce nosocomial M. tuberculosis transmission in the Dominican Republic. Participants reported that if unrealistic workloads remained, they would not be able to maintain the IPC guidelines within their hospital.
However, Kritsotakis and colleagues argue that not all staffing levels have the same impact on IPC practice. The authors contend that nursing staff levels have the most significant impact on IPC implementation, particularly HH guidance when compared to other factors. In their cross-sectional benchmarking survey study in Greece, Kritsotakis et al. (2018) reported that the presence of one additional IPC nurse was associated with an increase of about 20% in the median total WHO Hand Hygiene Self-Assessment Framework (HHSAF) score ($P = .090$) and a significant increase of about 53% in the median training and education component score ($P = .035$). Other staffing levels, including IPC doctors, antibiotic stewardship consultants, and ward nurses, did not affect the level of implementation of hand hygiene practices and promotion strategies (Kritsotakis et al., 2018). Whilst this study was conducted in a high-income country with different contextual settings; it appears that understaffing remains a determinant of poor IPC compliance.

Furthermore, the current study identified infrastructural challenges such as the absence of isolation units at the facility, poorly maintained buildings and lack of space leading to overcrowding. Damaged surfaces that required maintenance, including walls and floors, were challenging to keep clean. At the same time, participants also reported that the facility did not have appropriate isolation units to separate probable or confirmed infectious disease patients from other patients of other diseases, which made it difficult to observe the recommended measures such as isolation and bed spacing. The Ugandan Ministry of Health openly acknowledges that infrastructure is inadequate. Maintenance of buildings and equipment is poor, with estimates from the 2018/19 health sector performance report suggesting that only 40% of available equipment was in good working condition (MoH, 2010). Two studies from sub-Saharan Africa found similar difficulties regarding infrastructure (Zinatsa et al., 2018; Matakanye et al., 2019). These studies were generally small-scale qualitative designs using convenience sampling, with Zinatsa and colleagues collecting data across three primary health centres in South Africa, while Matakanye et al. generated data from six participants at one regional hospital in South Africa. Zinatsa et al. (2018), investigating factors influencing TB infection control behaviour, reported a consensus among participants that
infrastructure was the biggest impediment to good infection control implementation. Participants mentioned that facilities were too small, leading to congestion and overcrowding of waiting rooms; a lack of separate waiting rooms for TB and general patients. Whilst Matakanye et al. (2019), exploring the personal experiences of six nurses caring for TB patients at a regional hospital in Limpopo province, revealed that the nurses’ biggest concern was wards that perpetuated the spread of infection. Participants also reported that building where TB wards were allocated were old and needed refurbishment and were not user-friendly for implementing principles of infection control. These findings resonate with the current study findings, which cited a lack of isolation facilities and buildings were found to be too old, often requiring maintenance.

As well as old physical structures requiring maintenance, the current study revealed that the hospital layout and space also presented challenges to IPC guideline implementation. The building space was no longer fit for purpose as the facility received a high number of patients. This often-created overcrowding, particularly felt in the ED, maternal and antenatal ward, which further made IPC practice difficult, as identified by some participants. These negative consequences of overcrowding, particularly in the ED, are a recurrent theme in the literature, including poorer patient outcomes and the inability of staff to adhere to guideline recommendations, as identified through a systematic review by Morley et al. (2018). Morley and colleagues synthesised evidence from 102 studies on the causes and consequences of ED overcrowding. They reported that this led to poorer patient outcomes and the inability of staff to adhere to the recommended guidelines. However, the impacts of overcrowding were identified in relation to adherence to general guideline recommendations and included studies from high-income countries; nonetheless, these findings may also apply to IPC guidance and those identified in the current study.

In addition to the above, the current study also cited a delay in the supply of essential IPC materials, such as PPEs, alcohol hand rub, and waste bins. Participants were unable to get these supplies in time, often leading to shortages. These shortages meant that
participants were unable to practice the right guideline recommendations, in turn leading to implementation gaps. These findings are consistent with findings from a qualitative study conducted in Mozambique using focus group discussions to investigate HCWs' perceptions of their occupational TB risk and measures to reduce this risk and challenges they encounter while using these IPC measures (Brouwer et al., 2014). The study found that irregular supply led to indifference and poor practice in IPC use.

In addition to insufficient funding, Vledder et al. (2019) attempt to offer another explanation for the regular delays in healthcare supplies in low-income countries. Using a randomized trial conducted in 439 health facilities and 24 districts in Zambia, Vledder and colleagues investigated the optimal supply chain structure for essential medicines distribution in the public sector in low-income countries. (Vledder et al., 2019). The findings revealed that a disconnected and lack of a well-functioning supply chain for essential healthcare supplies is often the cause of this poor availability as many of these countries rely on centralised agencies that distribute medicines down to healthcare facilities, as is the case in Uganda. This poor availability of healthcare supplies often creates difficulties in clinical practice and leaves HCWs with an uphill task in implementing IPC practices, as experienced by participants in the current study.

Although the WHO (2019) recommend a consistent supply of a safe and sufficient quantity of water to be available for all required IPC measures inside the facility, there was a lack of a steady supply of running water as cited within the current study. Participants mentioned that they often experienced situations with no mains water within the hospital; consequently, critical IPC practices such as hand washing and environmental cleaning were more difficult to perform. Water supply challenges have been reported as a significant barrier to IPC implementation elsewhere (Akshaya et al., 2017; Tantum et al., 2021). Akshaya et al. (2017), in a mixed methods study to assess the compliance of drug-resistant TB centres to national airborne infection control guidelines in Karnataka, India, reported a lack of running water as one of the reasons for non-compliance. Participants mentioned that when it came to hand washing, although sinks were available, no water was available, which made compliance with HH difficult. Even though this study was conducted in India, the challenge of a steady water supply
is not unique to these settings, as revealed by findings from a cross-sectional study conducted in Liberia to explore the barriers and opportunities for sustainable HH interventions in rural hospitals (Tantum et al., 2021). In the study, Tantum and colleagues reported water and power availability as inconsistent with piped running water reported available on only 23% of wards which ultimately undermined both implementation and sustainability of practicing HH recommendations. It is also interesting that similar findings were demonstrated despite the variation in context. Regardless of the differences in context and study design, both studies produced comparable findings to the current study; a lack of consistent supply of piped running water impacted how HCWs practised some recommendations, for example, HH and cleaning measures. Although the lack of piped water could be overcome using ABHR or water tanks and water trolleys, a delay in the supply of these materials and a shortage of finances meant that this challenge was more pronounced, as was the case in the current study.

9.3.2 Other organisational challenges

Apart from resource constraints, data from the current stay also revealed the existence of other organisational barriers that aligned to the COM/B component of social opportunity. These included a lack of support supervision from either local or national levels, including absent or non-functional national IPC committees and a lack of voice. The lack of these social influences acted as a barrier to the implementation of IPC guidance. Further, a lack of training and orientation was another barrier identified, however, this aligned to the COM/B component of capability. These are further explored in the following sections within broader literature.

Lack of support supervision from local IPC committee

The issue of support supervision has been well noted in literature, with Sunkwa-Mills et al. (2020) using a grounded theory methodology to examine the perspectives of healthcare providers in the neonatal intensive care unit on HAIs and to determine major
barriers and facilitators to promoting standard IPC practices across two university hospitals in Ghana. Participants mentioned that there was a need for supervision to improve adherence to IPC guidelines in the wards. Managers also noted that senior nurses should enforce policies by being on the frontlines to work with the lower cadre HCWs and provide guidance to them through applying effective management practices such as good communication, leading by example and effective delegation. Additionally, Ayub Khan et al. (2018), using a mixed-method study, explored factors hindering the implementation of surgical site infection (SSI) control guidelines in the operating rooms of low-income countries (in Pakistan). Participants perceived the supervision and support they received as insufficient to develop the required human resource capacity to implement SSI guidelines in operating rooms. Ayub Khan reveals that supervision provided an opportunity to advocate for the recruitment of more staff, to continually build capacity and to increase the confidence and morale of the health workforce at health facilities. However, data from this study was collected via self-administered questionnaires, which are prone to self-report bias and the majority of the participants from this study were mainly from private healthcare facilities, although the lack of support was also noted among participants from the few public healthcare facilities that were included in the study. Additionally, whilst the study findings could be generalised to other low-income countries, Pakistan's political and cultural context is different from the current study context; therefore, findings should be generalised with caution. Nonetheless, the findings generated in the study regarding supervision resonate with the current study, where supervision, although highly valued, was found to be insufficient at different health cadre levels.

Similarly, the concept of support supervision was also noted from a different context. Williams et al. (2016) employed a realist methodology to evaluate the role of intermediaries in promoting infection prevention across two hospitals within the United Kingdom. Intermediaries were defined as individuals within the practice environment who can influence nurses towards specific goals and could include clinical nurse educators, clinical nurse specialists, practice developers and champions. Data revealed that intermediaries with high levels of physical presence in clinical areas were important
for raising awareness and were keen to help clinical staff find immediate solutions to problems. Consequently, for clinical staff, this resulted in the belief that there was the availability of personal support for infection prevention which motivated them to reflect and practice IPC measures correctly. Although realist approaches are cognizant of real-world constraints, it is incompatible to try and draw generalisations from realist studies (Robson, 2002). However, the findings provided by the study give insight into the important role of supervision in IPC practice. Even though this study was conducted in the United Kingdom, a country with a different context from the current study, the findings point toward a greater need for better supervision if IPC practice is to be enhanced. As noted from the current study, there was a need for more and better supervision through clinical visits by the responsible government body, IPC committee members and senior staff, which further underscores the need for improved oversight and supervision across different levels of IPC structures.

Lack of support from the national IPC committee
According to the Uganda National IPC guidelines (2019), in addition to the development and updating of IPC policies, the national IPC committee is also responsible for providing supervision to cadres at health facilities through periodical visits, however, current study findings revealed an absent or non-functional national IPC committee. Similar results were noted in a mixed method study aimed at assessing the implementation of the TB IPC healthcare measures in health settings in Bangladesh across 11 health settings (Nazneen et al., 2021). Using data from key informants, Nazneen and colleagues reported that there was no infection control coordinating body. As a result, guidelines were partially implemented due to a lack of instructions from the authorized ministry.

Similarly, while evaluating the effectiveness of IPC committees in Lesotho using data from 16 participants, Mugomeri (2018) reported that the MoH lacked the capacity to coordinate IPC activities across the country. Consequently, IPC committee members at the health facility were unable to implement IPC guidelines as they lacked guidance from the supervising body at the ministry. Although a relatively small number of hospitals
were included in this study, which may have left out the views of other IPC committee members, nonetheless, the study attempts to provide an explanation or reason for the absence of the national supervisory IPC body, a significant challenge that was identified from the current study. Similar findings were cited in a qualitative study involving 4 focus group discussions and 55 individual interviews conducted in Mongolia that aimed to identify the main perceived challenges and barriers that hinder the effective implementation of infection control programmes (Ider et al., 2012). According to the participants, the infection control committees at both national and local levels were not functioning well, and one of the reasons for this was that the MoH had no staff in charge of HAI control policy; therefore, infection control issues were solved independently in different ministry divisions. Secondly, the national and hospital-level infection control committees lacked committed professionals, and as a result, these committees did not function well. Unlike the study by Idler et al. (2012), the current study did not interview participants from the national IPC committee. However, the available policy documents indicated the presence of a national IPC committee, participants mentioned that these had never been seen at the hospital, but no explanation or reason was given for this situation. Nonetheless, as pointed out by Ider et al. (2012) and in line with findings from the current study, close supervision of IPC activities by MoH officials is critical in the implementation of IPC guidelines and the success of IPC programmes.

A Lack of voice
A lack of space to make suggestions was also cited as a barrier. The patriarchal style of communicating with other staff without allowing them an opportunity to express themselves negatively impacted the implementation of IPC guidance. Perveen et al. (2018) conducted a qualitative study to identify hospital infection control management constraints using the Mcinsey 7s framework in Pakistan. Findings from this study revealed a lack of a proper system of communication at the hospital. No communication channels existed between heads of departments, upper management and ward staff regarding infection control activities at the hospital, similar to what was raised by some participants in the current study.
Relatable findings were noted in a study by Berman et al. (2021) that employed the Systems Engineering Initiative for Patient Safety (SEIPS) model to better characterize SSI prevention practices and factors affecting adherence to prevention guidelines at Jimma University Medical Center in Ethiopia. The authors noted that although there was a functional IPC team at the facility, participants reported limited interaction between the IPC team and surgical staff, which curtailed their efforts in the implementation of SSI prevention practices. Given the single-centre design of this study, these results may not be representative of other hospitals in Ethiopia or other LMICs. Despite these limitations, the study demonstrated further evidence supporting the findings identified in the current study in which lower cadre HCWs were not allowed space to make suggestions, which affected how they implemented the IPC guidance.

**Lack of training and orientation**

The WHO (2019) through their technical guidance on the minimum requirements for infection prevention and control programmes recommend the education and training of relevant HCWs on the guideline recommendations and the monitoring of adherence with guideline recommendations to be undertaken to achieve successful implementation. However, the current study also cited a lack of training and orientation as a barrier to implementation as it created a gap in the knowledge and skills of HCWs. An action research thesis on antibiotic stewardship among midwives in the Kabarole district of Uganda reported that midwives acknowledged getting taught about the use of antibiotics during their midwifery training, but alluded to the fact that this education was lacking and that there was no additional training at the hospital which contributed to their lack of knowledge (Welsh, 2019) This is also supported by a study to understand the barriers and facilitators to the implementation of maternal health guidelines in Uganda. In this study, Timmings et al. (2015) employed mixed methods to collect data from different stakeholders. Participants from the focus group discussions (FGDs) identified a lack of opportunities for training and professional development for HCWs as prominent barriers. Additionally, this lack of training was identified as a barrier that
contributes to new HCWs not feeling confident or adequately prepared to use a given intervention, resulting in a lack of compliance with guideline recommendations. Whilst this study identified barriers and facilitators to maternal health guidelines, the context of the study was similar to the current study, with data collected from multiple stakeholders. In addition, the lack of training as identified is not unique only to maternal health guidelines but to other guidelines, including IPC guidelines that were a focus of the current study.

Further evidence is provided in a secondary analysis of data from meeting reports and articles describing projects undertaken in 5 LMICs (Kosovo, Uganda, Malawi, Myanmar and Tanzania) to explore similarities and differences in challenges to maternal health and evidence implementation in general across these countries (Puchalski Ritchie et al., 2016). Inadequate service training and continuing education resulting in a lack of knowledge and skills was cited as a significant barrier to evidence implementation in all countries. Participants commented on inadequate or outdated curricula and a lack of hands-on or skills-based training (Puchalski Ritchie et al., 2016). However, the use of project meeting reports and articles as the units of analysis may have failed to capture some barriers and facilitators, particularly those identified as outliers in the primary studies. Additionally, although the countries were defined as low-income, the contexts were likely different. However, it is interesting that despite the variation in context, the findings were similar across the different countries and are comparable to findings from the current study; that training was inadequate.

Additionally, as identified from the current study, although some training was available, it was not inclusive as only senior staff members were able to access it. This problem is not unique to the current study, as Chapman et al. (2017) and Agreli et al. (2019) identified the same issue across different contexts. Chapman et al. (2017), while investigating the role of powerlessness among HCWs in TB infection control in the Dominican Republic at two tertiary-level healthcare institutions, identified a lack of inclusive training. Most participants shared that they were unaware of and had not attended regular continuing training programs related to TB or other general health guidelines while employed at their health institution. Some HCWs also stated that some
general trainings were provided randomly to a select group of nurses, most of whom were managers but not frontline care providers. Likewise, in an ethnographic study exploring how IPC guidelines are used and understood by healthcare professionals, patients and families in Ireland, Agreli and colleagues (2019) reported that although training was valued as it created a shared understanding between professionals and promoted engagement, it was not available in all settings. These findings, although generated from different contexts, produced comparable findings that are relatable to findings from the current study where non-inclusive training was cited as a barrier to the implementation of the IPC guidelines.

9.3.2 Individual Challenges

Individual challenges conceptualized the poor attitude of some staff which affected the intentions of implementing IPC measures.

There is well-established research from different contexts on the potential role of attitude in influencing IPC implementation (Woith et al., 2012; Li et al., 2019; Kisaka, 2021). For example, Woith et al. (2012), in a qualitative study with a convenience sample of 96 HCWs aimed at identifying barriers and motivators to the use of infection control measures among Russian TB HCWs, found that a culture of complacency among HCWs was likely to affect how HCWs adhered to IPC guidelines. One participant described moving from caution to carelessness in the work setting, evidencing how attitude impacts IPC practice. Although there is a limitation with using a convenience sample, the findings from this study highlight the significance of attitude, particularly complacency in IPC practice. Further, Li et al. (2019) presented an interesting perspective in their descriptive study conducted in Taiwan to understand how infection preventionists perceived their challenges and how they negatively affected their infection prevention work in psychiatric clinical settings. Although some HCWs fully understood effective infection control, the authors noted that many undervalued its importance and ultimately decided against implementing the required measures.
Further, Kisaka (2021), in a mixed method study to establish the factors affecting compliance to IPC measures among frontline health workers at a referral hospital in Kenya, reported HCW poor attitudes and perceptions as a barrier to adherence to IPC standards. Participants mentioned that it did not matter how often people were trained; they still did not follow IPC standards and failed to take advice. An interesting aspect of this study was that it was conducted in a context similar to the current study and noted a comparable finding of poor attitudes among some staff towards IPC standards.

Stein and Welch (1997) attempt to explain such behaviours through the use of cognitive psychology. They identify that cognitive psychology provides tools for analysing simple rules people use when reacting to dilemmas. However, they affirm that neither a single cognitive theory of choice nor a dominant decision rule prevails. They note the existence of filters and simplifying mechanisms through which people process information and interpret their surrounding environments. The influence of these filters and simplifying mechanisms on the decision-making process always presents contextual and individual variances. As such, cognitive psychology explains to some extent why people may deviate from rational behaviours. For example, in this study, the rational behaviour would be practising IPC guidance; however, some participants reported that others did not bother to follow these. Additionally, a systematic review of 20 studies to identify barriers and facilitators to healthcare workers’ adherence to IPC guidelines for respiratory infectious diseases noted that such poor attitudes from HCWs were down to either disagreement with guidelines or specific recommendations, a lack of outcome expectancy, a lack of self-efficacy expectations, and a lack of motivation might lead to suboptimal guideline uptake (Houghton et al., 2020).

9.4 Enablers to the implementation of IPC guidance

The low resource environment formed the background upon which this thesis was situated. It was viewed and treated as a ‘context of limitations’, which gives the impression of potentially negative connotations. Although its uniqueness presents challenges in implementing IPC guidance, as highlighted in the emergent theory, such contexts also provide enabling factors within certain considerations. These enabling
factors mapped to the COM/B component of physical and social opportunity and capability. These were aligned to the TDF domain of social influences, behavioural regulation and environmental context and resources. These facilitative opportunity and capability factors included management support, having an IPC committee, having reminders, having support supervision, having CMEs, an organised environment, teamwork and cross-organisational. These are discussed in the following sections.

Management support
Management support was highly valued as participants felt it positively impacted the implementation process since management was responsible for providing adequate supplies and funds for IPC activities, and overall planning for hospital requirements which increased the physical opportunity for HCWs to practice the required measures (Uganda National Infection control guidelines, 2013). This finding confirms those of previous studies that have indicated management support as a significant influence of the implementation success of IPC guidance (Haile et al., 2017; McAlearney et al., 2021; Das et al., 2022).

In a mixed-method study to assess compliance with IPC measures and associated factors among HCWs in northwest Ethiopia, Haile et al. (2017) noted that 80.6% of the participants reported having followed at least one IPC measure. Management support was found to be a statistically significant predictor of compliance. The authors explained that this might be because management played a key role in availing all necessary safety equipment for those HCWs who need it and built a safe workplace safety climate for themselves, HCWs, and patients. This is further supported by findings from a qualitative study conducted in Ohio involving 420 key informants to identify actions, leaders can take to promote HAI prevention efforts (McAlearney et al., 2021). The authors reported that the visibility of hospital leadership was highly valued. Frontline staff emphasized the importance of executive leadership engagement in HAI prevention efforts because it demonstrated that infection prevention goals were a priority for the organization, and leadership visibility promoted open communication with frontline staff. Additionally, in
a theory-informed qualitative study to assess perceived barriers and facilitators to IPC among professionals working at residential care facilities in the Netherlands, participants perceived management support through awareness and a sense of urgency as an important facilitator of IPC as this implied that management was aware of their issues and priorities (Das et al., 2022). Interestingly, although the above studies were conducted across various contexts, they reported comparable findings on how management support acts as a facilitator to IPC implementation further confirming findings from the current study.

Having an IPC committee
The positive social influences generated through having an IPC committee fostered the implementation of IPC guidelines as it provided social opportunities to practice the required IPC measures. Several studies within the literature have reported similar findings regarding how IPC committees facilitate IPC implementation (Abdella et al., 2014; Hegarty et al., 2019; Kisaka, 2021). These studies were generally mixed-method studies utilizing self-administered questionnaires across different contexts.

For example, Kisaka (2021) established the factors affecting compliance with IPC measures among frontline HCWs at a referral hospital in Kenya. The author reported a significant relationship between the existence of an IPC committee and full compliance to hand hygiene ($\chi^2 = 4.851, P = 0.028$) and injection safety ($\chi^2 = 3.957, P = 0.047$). HCWs who were aware of the existence of an IPC committee were 2.8 and 21 times more likely to adhere to hand hygiene and safe injection practices, respectively, compared to those unaware. Similar results were noted in a study by Abdella et al. (2014) to assess HHH compliance and associated factors among health care providers. The findings revealed that the presence of IPC committees was positively associated with HH compliance among HCWs. Those HCWs who were aware of the presence of the IPC committee were about 2.6 times more likely to follow the guidelines than those who did not know the presence of the IPC committee. Further, Hegarty et al. (2019) explored the implementation of National Clinical Guidelines pertaining to methicillin-resistant
Staphylococcus aureus and Clostridium difficile from the leadership angle in Ireland. The findings revealed that leaders through the presence of IPC committees can facilitate implementation of HAI guidelines by promoting regular and targeted updates and multipronged educational activities for frontline staff.

Various explanations were offered; for example, Kisaka et al. (2021) suggested that enhanced supervision from the IPC committee led to improved adherence to IPC guidelines. Additionally, HCWs with knowledge of the existence of an IPC committee would request and be provided with the needed resources such as IPC supplies, training, and updated guidelines. This would also mean that the grievances of HCWs would be addressed promptly, motivating them to implement and comply with IPC guidelines and practices. Abdella et al. (2014) indicated that IPC committees provide supervision and audit and may give feedback to HCWs at the point of care, which further improve IPC practice. While Hegarty et al. (2019) indicated that IPC leaders can facilitate the implementation of IPC guidelines by reminding front-line staff about where and how they can find evidence-based guidelines, by facilitating the adaptation of guidelines in summative versions, promoting regular and targeted updates, and educational activities for frontline HCWs. Although generated from different contexts, all these findings and explanations resonate with findings from the current study.

Generally, IPC committees continue to have a huge role to play in the implementation of IPC guidance. The emergence of COVID-19 has placed more focus on IPC committees' importance as it has increased their visibility and recognised their roles within healthcare facilities. A qualitative study conducted in Kenya exploring Infection prevention and control during the COVID-19 pandemic in Kenyan public hospitals revealed that IPC committees are now being asked to offer technical advice to managers, which was rare or non-existent before (Maina et al., 2020). This study was conducted among health facilities that had previously been part of the author's WASH assessment (before the pandemic). However, the limitation was getting a realistic assessment of changes attributable to the COVID-19 response. Regardless, IPC has come to the fore, particularly during this era, albeit with many challenges to overcome.
Despite all the challenges noted in the current study, the IPC committee was reported as an important cog in the success of IPC guideline implementation.

**Having reminders**

The presence of reminders that act as behavioural prompts was an enabling factor in implementation. These reminders are a relatively frequently used strategy for promoting IPC practice, particularly hand hygiene adherence, as demonstrated in various studies (Unverzagt et al., 2014; Blomgren et al., 2021; Pereira et al., 2022). Using a qualitative design, Blomgren et al. (2021) investigated HCWs’ perceptions of infection prevention and acceptance of an electronic reminder system at a university teaching hospital in Sweden. Data was collected through FGD interviews with assistant nurses, nurses and physicians. Participants reported that an electronic reminder system positively affected IPC practice routines like HH as it worked as social pressure in a positive way. However, the caveat was that these reminders should not be set up in areas for relaxation, such as staff rooms. Thus, the electronic reminder system seemed to facilitate the development of behavioural change towards better hand hygiene and IPC, as participants perceived reminders as a way to remind those who had complied poorly.

Further, a systematic review and meta-analysis of guideline implementation strategies within healthcare settings analysed 15 trials that investigated the benefit of reminder systems, and the overall odds ratio (OR 1.30; 95% CI 1.17 to 1.45; P= 0.01) in favour of reminder systems was statistically significant with moderate heterogeneity among the studies (Unverzagt et al., 2014). Although the majority of these trials were from high-income countries with some heterogeneity, the positive impact of reminders on guideline implementation was established. An umbrella review that identified 36 systematic reviews regarding 30 strategies targeting healthcare organizations, healthcare providers and patients to promote guideline implementation reported that when used alone, reminders proved to be effective in promoting physicians’ adherence to the guidelines (Pereira et al., 2022). Although these studies used different methods
and were conducted in different contexts, the common finding demonstrates how HCWs perceive reminders as an enabler to IPC practice, similar to what was reported by participants from the current study.

In contrast, some studies have found that reminders do not always trigger IPC practice as they are often ignored, which was also noted within the current study (Nevo et al., 2010; Updegraff et al., 2011; Birnbach et al., 2017). These studies showed a mixture of results regarding the effectiveness and efficacy of these reminders in healthcare settings. For example, Nevo et al. (2010) found that visual cues improve hand hygiene practice in a quasi-experimental controlled study to establish the efficacy of visual cues that act as reminders in improving hand hygiene compliance, but their efficacy varied. Although this was a small study involving 150 participants, it demonstrated that certain visual cues (reminders) may be important factors in improving IPC practices like hand hygiene practice. This is in line with another earlier study that reported that cue signs resulted in significantly greater usage than no sign but were not equally effective. For example, dispensers with gain-framed signs (those focused on attaining the desired outcome) had the greatest usage (66%). In comparison, loss-framed signs (those focused on negative outcomes) were associated with a 58.4% increase in use over no sign (Updegraff et al., 2011).

Additionally, Birnbacet al. (2017) called the effectiveness of reminder signs into question in an observational study that assessed the efficacy of a hand hygiene sign disseminated by the CDC in an intensive care unit. This study revealed that even when the content and design of a hand hygiene reminder sign incorporated evidence-based constructs, HCWs complied only a fraction of the time. However, it should be noted that this was an observational study and hence prone to confounding (Hess and Abd-Elsayed, 2019). Nonetheless, according to the Communication Human Information Processing model, the ability to be noticed and attended to is the essential first requirement of effective reminder signs (Wogalter et al., 2002). Therefore, it is crucial to design cues with features that enable them to be detected within the noise of the information overload that characterises the clinical environment (Stella et al., 2019). As such, considering the
positive effects of reminder signs in IPC practice, particularly hand hygiene, observed in some prior studies coupled with findings from the current study, the potential for such signs to influence IPC uptake has to be leveraged.

Having support supervision

Another facilitative social influence factor identified in this study was receiving supervision. This finding has also been noted in a quasi-experimental study that evaluated the impact of supportive supervision in improving IPC compliance and standards in healthcare facilities in Liberia during the Ebola outbreak (Ephraim et al., 2018). Ephraim and colleagues (2018) reported that following the introduction of supportive supervision of IPC practices, all the facilities recorded fair to good performance in all the fields during the fourth round of assessment that included IPC administration, supply and equipment, personnel and staffing, triage and waste management, except for isolation facilities. However, the checklist used for the assessment focused mainly on structural and administrative aspects of IPC, with less emphasis on practical IPC skills and knowledge of the HCWs. Nonetheless, the findings of this study generated from a low-income country demonstrate that effective supervision is critical to improving and sustaining IPC guidelines, standards and practices.

Further, Abubakar et al. (2021), in a qualitative assessment to determine the barriers and facilitators to compliance with IPC measures among HCWs in Gombe State, Nigeria, revealed that supportive supervision was one of the facilitators to adherence to good IPC practices. For example, participants mentioned that supervision encouraged the use of PPEs, HH and proper waste management. These findings, although generated from rural Nigeria with contextual differences from the current study, further give support to the findings from the current study that having support supervision is crucial in IPC guideline implementation.
Although the benefits of supervision were clear and highly valued, data from the current study revealed that supervision should be the right kind and delivered in the right way to be a catalyst to implementation. For example, if supervision were advisory, understanding and collaborative rather than a blame game, it would enhance knowledge of IPC and increase the willingness of HCWs to implement the required guidelines, however, if it was not, it acted as a barrier. Bailey et al. (2016) explored the importance of quality supervision in a systematic review of supportive supervision as a strategy to improve primary healthcare services in Sub-Saharan Africa. The review noted that the success of supportive supervision lies in the formation of relationships between supervisor and supervisee, whereby a feeling of trust and team spirit is fostered through open two-way communication. This, in turn, increases HCWs’ morale and motivation; as confidence improves, skills and knowledge are increased. This is also supported by a study by Manzi et al. (2014), who used a qualitative approach to explore the perceptions of providing mentoring and enhanced supervision at health centres from the perspectives of clinical mentors, mentees and district clinical leadership in rural Rwanda. The authors reported that supporting not policing through a non-judgmental approach, active listening, and humility were fundamental elements for trusting and productive supervisor−supervisee relationships and consequently, these encouraged change and improvement. Some participants reported that some supervisors were scaring and always trying to capture what was not done correctly, which often discouraged them. These findings are comparable to the findings from the current study where some participants, particularly the students and interns, felt like giving up because of how they were supervised. This further underscores the importance of the right kind of supervision if successful implementation of IPC guidance at health facility level is to be achieved.

Having training through CMEs

Effective implementation of evidence-based guidelines requires foundational competencies, for example, specific knowledge and skills. Training is crucial to ensure that HCWs are capable of practising IPC guidance. The Uganda National Infection
Prevention and Control Guidelines (2013), encourages pre-service training in infection control and induction at recruitment and on job training through mentoring, coaching and support supervision to ensure consistent IPC practices. As Larson (2007) points out, the successful implementation of such evidence-based recommendations requires additional strategies, including training interventions, to ensure this guidance is translated into daily practice.

The finding of training as an enabler to IPC implementation and practice is not unique to the current study, with multiple studies from different contexts identifying training as a crucial part of an IPC implementation strategy (Keïta et al., 2018; Mattingly et al., 2019). Keïta et al. (2018) evaluated the impact of IPC training on health facilities during the Ebola virus disease outbreak in Guinea. The study’s data analysis confirmed that the number of trained staffs in a healthcare facility was positively associated with the IPC score, even after adjusting for the type of health facility. Furthermore, compared to healthcare facilities with no IPC-trained staff, those with one IPC-trained worker were almost four times as likely to have an IPC score above median (aOR 3.85, 95% CI 1.50–9.90). Cascade training was also associated with IPC performance (p < 0.001), with health centers that organised a cascade training being approximately six times as likely to have an IPC score above median compared to those that did not. Although conducted during a pandemic and in Guinea, these findings provide further support to the findings from the current study where participants saw trainings and educational programmes as the trigger for changing practice and crucial for effective IPC implementation.

Further evidence is noted in a qualitative study conducted in Ethiopia exploring implementation lessons from reducing surgical infections using the ‘clean-cut initiative’, which reported that the most effective driver of change was increasing the level of knowledge surrounding surgical site infection, which frequently required correcting previously held unfounded beliefs through continuous training (Mattingly et al., 2019). Although the responses may have been inherently influenced by the fact that all participants had been engaged in the clean-cut for several months by the time of the interview, the findings underscore the significance of improving IPC knowledge, mainly
through education and training. This is also identified in the current study, with participants highlighting that having CME trainings helped them understand different topics or concepts of IPC, and consequently, their knowledge of IPC improved, which allowed them to practice IPC better.

Although highlighted as an enabler in the current study, the effectiveness of training on IPC practice has been called into question. Drews et al. (2019), in a literature review integrating and synthesising research on human factors engineering contributions to IPC, noted that reinforced training achieved higher adherence to the use of PPEs. However, the authors noted that performance was never optimal even with training, as non-adherence to best practices was still observed. Similarly, Ousman et al. (2019), using a before and after study design approach, assessed the impact of refresher training of HCWs in IPC in the Democratic Republic during the Ebola Virus Disease outbreak and found that there was no relationship between the number of HCWs trained and level of IPC score (correlation factor; 0.29; p-value=0.093). However, because of the nature of the study design, there were likely many confounding factors. Nonetheless, the authors concluded that training should focus on quality rather than the number of HCWs trained. It must be combined with other implementation strategies and have good IPC structures in place if effective IPC is to be achieved.

Organised environment
An organised environment, one where every material or item was in a specified place, had a positive influence on the implementation of IPC guidance. The role of an organized environment in healthcare has been explored in different studies (Anderson et al., 2010; Kanamori et al., 2015; McCauley et al., 2021).

Ediau et al. (2022), in a before and after study assessing the impact of the Kaizen approach on improving adherence to HH guidelines at Kabale Hospital, Uganda, found that the installation of ABHR dispensers in places where they were visible, as well as hand washing facility, improved compliance by 24.4%. However, the study design
implies that the study was prone to confounders as other HH campaigns were implemented. Further, a qualitative study by Kanamori et al. (2015) exploring the implementation of the 5S management method for lean healthcare at a health centre in Senegal reported that improvements in the quality of services were caused by changes in the work environment, including fewer unwanted items, improved orderliness of items, and improved labelling and directional indicators of service units. Participants mentioned that they could easily find drugs to be offered to patients as all the unnecessary items were thrown away, and the environment was more organized. Pertaining to this were represented key themes that included fewer unwanted items, improved hygiene and cleanliness, improved orderliness of items, improved labelling and directional indicators of service units. All this improved productivity and better adherence to clinical health guidelines. As this study utilised a qualitative approach, these findings are only applicable to these settings. Nonetheless, the findings from both these studies support findings from the current study that an organised environment served as an enabler to the implementation of IPC guidance by ensuring consistency and productivity.

Further, a scoping review of factors contributing to missed care and non-compliance to IPC practices of nurses reported that the location of equipment storage and disposal facilities was also found to be an important factor, as one study noted that inconvenient placement of these facilities made nurse compliance with standard precautions difficult (McCauley et al., 2021). Similarly, an earlier review by Anderson et al. (2010) summarising human factors engineering to improve the effectiveness of IPC noted that the organization and proper placement of equipment, devices, and material in combination with providing the information needed for a task increase the likelihood that the task will be completed correctly and efficiently and in turn helps adherence to guidelines. The limitations of scoping reviews are that studies are not critically appraised; thus, there is no assessment of the risk of bias. Nonetheless, as summarized in these reviews, these findings add further evidence to the role of an organised environment in improving IPC practice within healthcare.
Teamwork and cross-organisational collaboration

Based on the current study, teamwork and cross-organisational collaboration were identified as catalysts for IPC implementation as they provided physical and social opportunities. Studies utilizing different study designs in different settings have shown that teamwork and collaboration can decrease infection rates, improve facility outcomes, reduce redundancies in processes, and improve IPC practice.

A cross-sectional study was conducted in the neonatal intensive care unit (NICU) to assess the teamwork climate across NICUs. It tested scale-level and item-level associations with HAI rates among infants (Profit et al., 2017). The findings revealed that a teamwork climate was inversely associated with HAI rates among infants, with odds of an infant contracting a HAI decreasing by 18%, with each 10% rise in NICU respondents reporting good teamwork. The results of this study must be viewed in the context of the study design as the authors reported limited participation from participants, which likely introduced bias. Further, the significance of teamwork was also highlighted in a qualitative study in Canada by Dubé et al. (2019) that described the barriers and facilitators to the adoption of recommended IPC practices among HCWs. Collaboration was one of the identified key determinants of developing an IPC culture in the care unit. The authors explained that collaboration helped improve IPC practice by fostering proactivity and ownership of IPC measures. Many HCWs (including the housekeeping team) noted that ownership of IPC measures and proactivity were also due to the collaborative relationships and trust with IPC teams in working together toward common objectives. Although a limited number of HCWs were interviewed, the study provided an in-depth understanding of collaboration as a determinant of the adoption of IPC measures.

In a qualitative study, Nessim et al. (2012) evaluated staff perceptions of the utility and impact of individualized audit and feedback data on SSI-related process metrics for their practice, as well as on overall communication and teamwork as they relate to SSI prevention. Notably, the view that effective SSI prevention requires a team effort was preponderant among participants. IPC was widely seen as a shared responsibility with interprofessional collaboration between clinicians, especially between surgeons and
anesthesiologists. This was viewed as an integral part of the consistent application of best practices as it led to greater cohesiveness of teams and sustained compliance with SSI prevention best practices. Even though the study sample included uneven distributions of participants from different interprofessional groups, however, this is consistent with standards of purposive sampling in qualitative research, which aims to evaluate the theoretical representativeness of participants rather than quantitative or demographic representativeness and the findings support the concept of collaboration for improved IPC practice.

The above findings across the different studies, although generated from different contexts utilizing different study designs, further emphasize how vital collaboration is in IPC practice and implementation and, ultimately, in reducing HAIs in clinical settings. They echo findings from the current study that successful prevention of IPC guidelines cannot be fully realized without support among all team members.

Furthermore, findings from the current study also highlighted the importance of cross-organisational working in the implementation of IPC guidelines for example, organisations like RHITES-E and IDI often provided IPC materials and trainings, which helped fill the gaps of supply shortages and lack of trainings. The significance of such networks has been highlighted within the literature. A multicenter study on the implementation of a surgical unit-based safety programme in African hospitals (Clack et al., 2019) reported that establishing quality improvement networks with strong horizontal links across hospitals supported implementation by exerting normative pressure on members, shared learnings and solutions. However, these findings should be interpreted in light of some limitations, such as the fact that the study included a limited number of participants; however, data were generated across five African hospitals.

The NGO Major Group Official (2017) Position Paper for the High-Level Political Forum, emphasises that a multi-sectoral, multi-stakeholder approach involving different actors will accelerate progress for Sustainable Development Goal 3 (SDG3), including ensuring access to safe water, sanitation and hygiene at all levels. This is further evidenced in a
case study exploring levels and types of linkages between the public health sector and Non-government Organisations (NGOs) in Uttar Pradesh, India, reported that NGOs maintained workforce linkages with the public health facilities through capacity building, technical assistance, mentoring or field coordination (Srivastava et al., 2016). The strong linkages between these organisations and public health facilities helped improve service delivery and outcomes through collaborative functioning. However, these findings should be viewed within this context. Nonetheless, these findings support findings from the current study that highlighted the importance of working with other organisations in improving patient safety through improved IPC practice.

Further, a report by Management Sciences for Health (2022) an international NGO working in Uganda shows that their program, The Medicines, Technologies, and Pharmaceutical Services (MTaPS) in Uganda improved training on IPC by delivering CMEs reaching over 335 health workers and as a result, health workers’ knowledge on IPC and hand hygiene improved by 58%. This further adds to the evidence base of the positive impact of cross-organisational work in improving IPC practice, particularly in Uganda.

Evidence presented in this section shows that enablers such as management support, having an IPC committee, having reminders, having support supervision, having CMEs, an organised environment, teamwork, and cross-organisational collaboration are important in increasing IPC guidance uptake and strengthening IPC implementation. Establishing and strengthening these factors that may underpin implementation is vital. Together with findings from the current study, this evidence can help guide and support IPC implementation if well leveraged.

### 9.5 Overcoming challenges faced in the implementation of IPC guidance

Recognising challenges was essential to how HCWs implemented IPC guidance. The respondents described numerous and frequent occurrences of challenges throughout their daily work as they tried to implement this guidance. This overwhelming encounter with challenges, particularly resource constraints, negatively impacted the
implementation process. Ultimately, these challenges created multiple hurdles to the implementation process. Therefore, this necessitated coming up with solutions to overcoming these challenges, which participants did through a process of improvisation which showed that they were highly motivated to follow the required IPC guidance. This was represented analytically within these two overarching categories, on-demand improvisation and planning for the future. Employing these two strategies provided HCWs with the means to overcome some of challenges, as evidenced in the findings chapter. These categories and strategies are detailed in the following sections.

9.5.1 Improvisation

Uncertainty is inherent in healthcare, as evidenced in the current study, for example, resource constraints, the intermittent water supply and the delay in delivery of IPC supplies. One strategy for acting in the face of uncertainty is to improvise. As noted in the current study, participants’ ability to navigate these challenges through improvisation positively impacted the implementation of the IPC guidelines. Through improvisation, HCWs demonstrated high motivation and commitment to adhere to IPC practices.

Within the literature, improvisation has long been considered a function of music, dance, and the theatre arts and is generally defined as the flexible treatment of preplanned material (Weick, 1998). More specifically, in jazz, improvising has been described as “reworking pre-composed material and designs in relation to unanticipated ideas conceived, shaped, and transformed under the special conditions of performance, thereby adding unique features to every creation” (Berliner, 1994, p.241). An exploration of these definitions and characteristics of this concept in relation to the art and practice of nursing provides an opportunity to illuminate related qualities within healthcare. While exploring improvisation in nursing, Hanley and Fenton (2013) noted that healthcare, particularly nursing, has always demonstrated improvisation because it is often required to meet the needs of patients in a rapidly changing environment usually littered with challenges. This is supported by findings from a qualitative descriptive
study that analysed the subjectivity of nursing workers in the practice of adapting and improvising materials in Brazil, where participants revealed that the improvisations always occurred because, in addition to the typical way of dealing with problems, they were numerous that it was impossible to enumerate them (Lima et al., 2016). The authors noted that where there was an observation of numerous scenarios in which, through the scarcity or inadequacy of material resources, nursing professionals performed various improvisations and adaptations.

Against this background, as applied in this study, improvisation was a means of resolving situations where resources were not available, or other challenges were encountered. By improvising, participants were able to vary their actions based on context or situation. Rather than being a mandated course of action within the study, it was an iterative process that allowed HCWs to creatively solve the problems at hand. One theory that may put the role of improvising into the context of what is often considered a medical decision-making process is the dual process theory of clinical reasoning, as identified by Pelaccia et al. (2011). In this theory, Paleccia et al. (2011) suggest that doctors rely on two processes to determine a course of action for a patient. The first is an intuitive process that is based on experience and pattern recognition. We see this in this study's findings through on-demand improvisation, further explored in section 9.5.1.1. The second is an analytical and rational process that comes from a rational and deliberate judgment based on additional information collected actively by the individual in their environment and the conscious application of rules that have been acquired through learning. This was observed in this study through planning for the future improvisation further explored in section 9.5.1.2. Therefore, in improvising, information about a situation is collected and integrated in a social process, through interactions with other practitioners, the patient, and other staff members. McKenna et al. (2013) point out that this social nature of improvisation enables HCWs to extend their knowledge base beyond their individual funds of knowledge, capitalizing on the knowledge of the other colleagues on their team or within their network, and thereby act more effectively in situations with high levels of uncertainty and challenges. This
combination and reorganization of knowledge and information allow HCWs to arrive at unique and creative solutions, as noted in this study.

9.5.1.1 On-demand improvisation

This type of improvisation happened when individuals were faced with the need to identify just-in-time resources and other strategies to overcome challenges as they were encountered. This strategy has concepts routed in sensemaking, pragmatism and logical incrementalism (Weick, 1988; Quinn, 1980; Edupedia, 2018). Weick (1998) suggests that sensemaking is vital to understanding crisis because crisis brings about ambiguity and uncertainty. Weick et al. (2005) further elaborate that sensemaking is rooted in the idea that when catastrophes suddenly occur, for example, within the current study, a shortage of ABHR, intermittent supply of water and a lack of isolation facilities, there is no time to think them through in the moment and instead to apply a pragmatic approach based on experience and pattern recognition for example this is seen when HCWs were able to get large makeshift boxes as sharp wastes as those provided by the hospital were too small.

Furthermore, sensemaking helps shed light on organizational resilience during devastating events, especially as individuals and collectives endeavour to craft and improvise new ways of understanding a problem and finding solutions (Webb, 2004). For example, within the current study, IPC members were able to adopt the use of mobile-based tools such as WhatsApp platforms as a meeting space in case members were too busy to convene the necessary in-person meetings. Relating to improvisation, the sensemaking framework is especially useful as it pays attention to identity construction, the ongoing process of identifying problems and their solutions, extracting cues from past familiar situations to understand the current one, and the plausibility associated with workable solutions as noted in the current study (Stephens et al., 2020).
Additionally, on-demand improvisation followed a pragmatic approach. According to William James (1841–1910) and John Dewey (1859–1952), cited in Edupedia (2018), pragmatism involves ideas stemming from a human need to choose a possible action for a circumstance. The conclusions that we draw from the result of those actions guide our future decisions. The beliefs that we gather as outcomes of the decisions help us determine our personal set of rules regarding right and wrong. Foster (2001) adds that through this evolutionary problem-solving approach and the learning that is afforded through processes of exploration, practitioners actively engage with the issues and dilemmas at hand (Foster, 2001). At the heart of this is the timely adaptation to the contingencies met within the environment and the demands of the individual's ability to respond to these with imagination (Luntley, 2016). This is well noted in the current study, for example, while attending clinical work without the availability of hand washing facilities, HCWs often stocked up on their ABHR sanitisers, while others adapted guidelines, for example, instead of using the recommended small sharp boxes, which often filled up so quickly, participants often improvised through make-shift boxes. Therefore, in applying a pragmatic approach, the line of thought from HCWs was to be able to produce practical solutions with practical results.

Furthermore, this strategy also had concepts from logical incrementalism. The logical incrementalism approach, first described by Quinn (1980), involves loosely linked incremental actions open to adjustment in the process. This sees feasible actions or decisions made individually to solve existing problems (Quinn, 1980). Proponents of logical incrementalism point out that individuals rarely make decisions in the formal, rational manner outlined by strategic planning advocates (Camillus, 2016; Mintzberg, 1994; Quinn, 1980). Instead, as Mintzberg points out, strategies often cannot be developed on schedule and immaculately conceived but must be free to appear at any time and place. Here we see individuals solving problems as they arise. For example, in the current study, participants were forced to come up with stop-gap solutions to problems as they appeared, such as telling patients to buy PPEs materials in scenarios where there was a shortage. However, Bryson (2001) and Walker et. (2010) caution that this approach does not guarantee that the various loosely linked decisions will add up
to fulfilment of overall purposes as it does not necessarily focus on desired outcomes in a disciplined manner. However, its ability to handle complexity and change and its emphasis on minor and major decisions create impactful incremental actions that add up over time to effectively reach the overall goal (Poister et al., 2013). For example, the small actions taken by HCWs to navigate IPC challenges over time bring them closer to ideal IPC practice.

In summary, the literature cited highlights on-demand improvisation as a sensemaking pragmatic approach that may involve loosely linked incremental actions which are open to adjustment in the process. This is supported in this study, where HCWs develop practical solutions based on different situations to implement IPC guidance. These small actions ensure that barriers are navigated to improve IPC practice.

9.5.1.2 Planning for the future improvisation

Through planning for the future improvisation, participants developed enhanced awareness of their context and the challenges they presented and were able to go through thought, planning and action. This happened when participants anticipated a challenge way ahead of time and drew up a plan to avoid these challenges. This was an analytical and rational process that came from a rational and deliberate judgment based on additional information collected actively by HCWs in their environment and the conscious application of solutions to overcome the challenges. This strategy utilised within this study lends itself to a number of theories and models within the literature (Pridham et al., 1979; Chaffe, 1985; Taylor, 1998).

Firstly, this strategy borrows from the linear strategy model explicated by Chaffe (1985). According to Chaffe, this strategy focuses on planning with the term linear, hinting at the systematic, directed, and sequential action involved in planning. Chaffe further adds that managers go through a classical rational decision-making process. They identify goals, generate alternative methods of achieving them, weigh the likelihood that alternative methods will succeed, and then decide which ones to implement. Although
this model was developed primarily for profit-seeking businesses, with two of its measures of results being profit and productivity, the emphasis here is on planning and forecasting (Rahim et al., 2011). We see this in this study, where some participants anticipated and forecasted challenges and planned accordingly. For example, a nurse in-charge anticipated a shortage of IPC supplies and stored excess IPC materials to be used during times of scarcity. However, critics of this model, for example, Sanabaria and Pulido (2009), in a critical review of problem-solving processes, argued that the strategic problem to be solved is always much more complex and cannot just be overcome with linear sequential actions but rather through a combination of solutions. Nonetheless, as experienced among participants in this study, the linear strategy can be useful in solving healthcare challenges.

Furthermore, planning for the future had the underpinnings of the rational planning model. The rational planning model or theory includes a comprehensive, systemic and long-range view as well as an analytical approach to the planning process (Taylor, 1998). Taylor adds that the rational planning theory or model is a process of realising and identifying problems, establishing, determining and evaluating possible alternatives, choosing the best alternative, implementing and finally monitoring and evaluating the outcome based on the chosen alternative. Although it is commonly used in economics, urban planning, transport and political sciences, education and research field share the usage of similar theories in their planning process due to its simplicity and apparent logic. With reference to healthcare, in rational planning theory, future context identification is vital before establishing a comprehensive approach to generating all possible alternative solutions (Manaf et al., 2018). This is exhibited by participants in this study, for example, with a forecast of HCW shortages, especially during particular months, the facility established a broader collaboration with schools that provided nursing and nursing assistant students, who helped fill this gap. Additionally, some IPC committee members and nurse in-charges often delegated to other staff when they anticipated their own unavailability. This demonstrates how participants understood the various problems within their setting and formulated alternatives to overcome these challenges.
This also lends itself to the anticipatory care model of problem-solving. This model relates to the preparation of the patient to deal with problems or accomplish goals at some time in the future (Pridham et al., 1979). This model of clinical problem solving characterizes seven separable phases of the process: scanning, formulating, appraising, planning, readiness to problem-solve, implementing and evaluating, in which the behaviours of both clinician and patient are of interest (Pridham et al., 1979). Each operation addresses characteristic process issues. Within each phase or operation, the actions of the clinician or client result in specific data, recognisable decisions, and feedback to the other participant. Although developed to guide problem-solving in clinical care, some concepts apply to IPC practice and findings in this study. For example, in solving challenges using the planning for the future strategy, HCWs anticipated future problems (scanned and planned) such as absence from work was anticipated and solved through delegation of duties (implemented).

In summary, as identified in the literature, the planning for the future strategy has parallels with the linear strategy model (Chaffe, 1985) which involves planning and forecasting and further lends itself to the anticipatory care model (Pridham et al., 1979) and rational planning model (Taylor, 1998) to problem-solving with concepts such as scanning, planning, implementation, identifying the problem and plans of action supported by findings in this study. Further, the current findings suggest that uncertain situations are frequent when implementing IPC guidelines within these contexts and that improvising is an important and commonly used approach to acting in these uncertain contexts.

9.6 Comparing TDF results with other studies

As noted from the behavioural analysis in chapter 8, the identified barriers and enablers to the implementation of IPC guidance were related to 13 TDF domains, with social influences and environmental context and resources being the most prominent. The importance of other domains such as knowledge, skills, professional role and identity, behavioural regulation, memory, attention and decision processes, goals, beliefs about
capabilities, beliefs about consequences, intentions, emotion and reinforcement was also noted. These domains have also been noted as key influences in IPC practice across different literature that employed the TDF (Squires et al., 2014; Newlands et al., 2016; Smith et al., 2019; Greene and Wilson, 2022).

Squires et al. (2014) interviewed 42 physicians, both staff and residents from surgical and medical wards, using a question schedule informed by the TDF. Nine of the 14 domains from the TDF were identified as relevant to hand hygiene practice, which included knowledge, skills, beliefs about capabilities, beliefs about consequences, goals, memory, attention, and decision processes, environmental context and resources, professional role and identity and social influences. Physicians reported that knowledge, skills, social influences, environmental context and resources as the most relevant to participants’ compliance to HH. Likewise, Newlands et al. (2016) conducted an interview study to understand the barriers of using local measures instead of prescribing antibiotics to manage bacterial infection in general dental practices across Scotland. Five domains; behavioural regulation, social influences, reinforcement, environmental context and resources, and beliefs about consequences were identified as the main determinants of prescribing.

Similarly, Smith et al. (2019) used a staff survey to identify key attitudes, barriers and facilitators to hand hygiene in the care home setting. The barriers and enablers to hand hygiene were related to three domains; environmental context and resources, beliefs about consequences, and professional role and identity. The main barriers were related to the domain of environmental context and resources, while beliefs about consequences acted as a facilitator for performance of hand hygiene, for example, awareness of the consequences of an infection occurring or its potential spread to other patients or the HCW themselves was a facilitator for performance of hand hygiene. Additionally, hand hygiene was facilitated by the domains of professional role and identity. Further, a scoping review to synthesise the evidence on the application of behaviour change theories to interventions to improve IPC practice in healthcare settings identified the domains; beliefs about consequences, environmental context and
resources, and professional role and identity across all three IPC behaviours (Greene and Wilson, 2022). Although these studies employed different study designs across different IPC guideline implementation, as well as differing in settings and contexts, it is interesting to note that they produced comparable findings, with beliefs about consequences and environmental context and resources identified across all the studies as a key influence of IPC different practices similar to the outputs generated from the TDF mapping conducted within the current study. Additionally, Smith et al. (2019) identified beliefs about consequences as an enabler to hand hygiene performance, comparable to the current study where beliefs about consequences of following guidelines were regarded as a facilitator to the implementation of the IPC guidance.

Other domains featured in some studies but not in others, for example, reinforcement was only reported by Smith and colleagues (2014), knowledge and skills were reported by only Squires et al. (2014), while social influences were reported as key influences in two studies (Squires et al., 2014; Newlands et al., 2016). Professional role and identity was reported by only three studies (Squires et al., 2014; Smith et al., 2019; Greene and Wilson, 2022). Additionally, studies identified different numbers of domains as being relevant, for example, Squires et al. (2014) identified nine domains, Newlands et al. (2016) reported five, while Smith et al. (2019) reported three barriers as being relevant. Despite the similarities and differences among the studies, the key influencing domains seen from this published literature are similar to what was noted from the current study. An important finding from this research was that barriers and enablers to the implementation of IPC guidance aligned to the different TDF domains and do exist across the continuum of evidence. However, some of the highlighted differences between the findings of the cited studies also demonstrate the importance of exploring determinants of IPC behaviour within individual settings and contexts to be able to develop tailored intervention strategies. Further, the use of behavioural analysis to supplement the grounded theory findings provided a unique way of conducting qualitative research in the field of IPC practice.
9.7 Implications of the findings for IPC practice

The emergent grounded theory explains the phenomenon of 'striving' for improved IPC practice. It provides a set of enabling conditions, identifies the challenges and sets out the strategies for overcoming them. Overall, findings from this study suggest that striving for improved IPC in low-income settings is important in ensuring that IPC is maximised in health care facilities and that the safest possible health care is delivered to patients. The behavioural analysis conducted in chapter 8 revealed that capability, opportunity, and motivation play an important role in the uptake of IPC guidance and that these components are not independent. Therefore, enablers identified in this study can be used to target these components and inform policymakers on how best to leverage these factors to ensure relevant interventions are developed in the implementation of IPC guidance and subsequently improve IPC practice across health care facilities. The strategies conceptualised as ‘improvisation’ in this study could be helpful to HCWs in understanding the impact of barriers in their work and overcoming these barriers. In summary, understanding the phases in this process might help individual HCWs, hospital administrators, and health policymakers to design implementation interventions targeting enablement, environmental restructuring, training and education, persuasion and incentivisation to improve the implementation of IPC guidance within these settings. These findings also benefit the wider healthcare sector in these settings by illuminating the constant challenges HCWs face while delivering safe healthcare.

9.8 Summary

This chapter has explored the substantive grounded theory by situating it within a wider literature and theoretical landscape. It compared the findings presented within this thesis with the extant literature and showed how they fit existing understandings.
As shown, the theory of striving for the implementation of IPC practice resonates with concepts of altruism and extracts from Alfred Alder's theory of striving for perfection or superiority and has been further supported by wider literature. Furthermore, the chapter has also discussed barriers and enablers to IPC implementation identified in this study. Evidence from the wider body of literature highlighted the role of management support, IPC committee, reminders, support supervision, training, an organised environment and teamwork in the implementation of IPC guidance. Additionally, improvisation as a problem-solving strategy in IPC practice has been discussed with concepts from sensemaking, pragmatism, logical incrementalism, linear strategy model, anticipatory care model, and rational planning model used to support the findings from this study. Finally, findings from the TDF analysis have been compared to the extant literature, demonstrating their significance in the implementation of the IPC guidelines.

The next chapter synthesises the research, presents the contributions of this study, suggests areas for future research, presents the researcher's reflections throughout this PhD journey and makes recommendations to improve practice, education and policy.
CHAPTER TEN: CONCLUSION, RECOMMENDATIONS AND REFLECTION

10.1 Introduction

The preceding nine chapters in this thesis have presented the background and significance of IPC guidance and its implementation, justified the research design and methodology, detailed the findings and discussed how such results can be positioned within the literature. This chapter provides a conclusion to the thesis. It begins with an overview of the grounded theory findings and then details the study's contributions by evaluating the substantive theory according to Charmaz's (2014) criteria. Recommendations for wider practice are made according to the results of the behavioural analysis, while the study's strengths and limitations are acknowledged, with suggestions for future research. The chapter concludes with personal reflections of the researcher throughout this PhD research journey.

10.2 Overview of findings

A systematised literature review conducted between February 2018 – March 2018 to inform this study revealed very little qualitative research conducted on the implementation of IPC guidance at the health facility level in low-income countries in this area. Therefore, the current study set out to fill these gaps and contribute to the qualitative evidence within this area. It was conducted within the context of low resource settings with the overall aim of exploring the implementation of IPC guidance at the health facility level in Uganda and to generate a theoretical explanation for the processes involved in the implementation of IPC guidance within these settings.

As such, this qualitative study employed the constructivist grounded theory methodology to address this evidence deficit through exploring and understanding the implementation process of IPC guidance in these settings. Thus, it offers research evidence that could inform future policies, guidelines and interventions. As a result, the
study developed a theoretical explanation of how HCWs strive to improve IPC practice in the face of challenges, explained by the theoretical code ‘asymptote’. This theoretical explanation of getting close but not close enough offers a four-phase process conceptualised as striving for improved IPC practice; Recognising the importance of IPC, Playing a role, Encountering challenges and Overcoming challenges. The study also applied behavioural theory to conduct an analysis of identified factors which presented as barriers and enablers to the desired behaviour (implementation of IPC guidelines) and made preliminary recommendations in relation to the broad categories of intervention functions that might be helpful. Using the TDF; social influences, environmental context and resources, knowledge, skill, professional role and identity, behavioural regulation, memory, attention and decision processes, goals, beliefs about capabilities, beliefs about consequences, intentions, emotion and reinforcement were identified as important theoretical domains in understanding the implementation of this IPC guidance. Moving on to apply the COM-B framework to the analysis, capability, opportunity, and motivation were identified as important behaviour influences in the implementation of IPC guidance. As such, interventions that involve enablement, environmental restructuring, modelling, training, persuasion, incentivisation, education, and coercion were identified as those that would improve and enhance the implementation of IPC guidance in this context.

10.3 Original contribution

This thesis has offered some new knowledge claims and confirmed some extant ones. Ultimately, the main contribution to the knowledge base of this thesis centres on the implementation of IPC guidance within low resource settings, specifically Uganda.

Firstly, findings within this thesis highlight the role of HCWs as central in the implementation of IPC guidance at healthcare facility level, how challenges are significant in this process, and how important it is to leverage the potential of enabling factors if IPC guidance is to be practised within health care settings. Further, this study
contributes to the grounded theory empirical literature by providing another example of the use of this methodology in healthcare research, particularly infection control research. Additionally, this thesis adds to knowledge by offering an experiential reflection on conducting constructivist grounded theory. For example, by describing the conceptual development process in detail, the thesis provides an educational resource for novice grounded theory researchers learning the practicalities of the methodology.

Finally, the substantive theory developed illustrates unique strategies for overcoming challenges within current and similar contexts conceptualised as on-demand and planning for the future improvisation, for example, the use of mobile-based platforms, working with other organisations and manufacturing of local ABHR. The theory further provides an insightful explanation of the experiences of HCWs in IPC implementation in a low resource context. Additionally, the substantive theory in this study offers a good explanation and comprehensive understanding of the process of IPC implementation at the health care facility level in a low-income country. Moreover, the resultant four-phase process underpinned by challenges and enabling factors was identified, which further enabled theorising and constructing from data an explanatory scheme that integrated various concepts through statements of relationships with each other. For example, recognizing the importance of IPC resulted in HCWs playing different roles in the implementation of IPC guidance. As a result of encountering challenges, HCWs were forced to improvise to overcome these challenges. These relationships were also noted among barriers, for example, a shortage of HCWs caused a work overload by health personnel. Additionally, a lack of finances caused a scarcity of IPC materials or items, which ultimately affected how HCWs practised IPC measures. A lack of a steady supply of water also meant that there was a need for ABHR, further stretching the already limited funds. These relationships between categories and within sub-categories helped the researcher generate explanations while demonstrating links between phases.

Furthermore, this thesis has highlighted some of the challenges of using the full complement of grounded theory procedures, particularly concerning concurrent data collection and analysis, especially the interface between the inductive nature of
grounded theory, the practical realities of healthcare research and the academic requirements of PhD studies. The perception that data collection and analysis should occur concurrently is, in some situations, unrealistic within certain contexts, for example, the practical realities such as a limited time at the research site meant sometimes the researcher was not able to conduct concurrent data collection and analysis. Further, the amount and flexibility of theoretical sampling is not simply within the control of the individual researcher but is influenced significantly by external factors, for example, HCWs’ busy schedules meant that the researcher had to schedule interviews opportunistically. This thesis demonstrates that revising methodological ideals to fit research realities is sometimes necessary. The experience of conducting this study and the theoretical output thus contribute to the knowledge of doing grounded theory by highlighting the realities and practicalities of its real-world application.

A further contribution of this study is explicated through the evaluation of the developed grounded theory. This is presented in the following sections.

10.3.1 Evaluation of the substantive theory

The methods chapter five explained the approach to enhancing the rigour of the research process, integrating the three techniques of peer debriefing, audit trials, and reflexivity (Baillie, 2015). Evaluation of the substantive theory as a robust research product is now presented in the following sections using Charmaz's (2014) criteria; credibility, originality, resonance and usefulness, in keeping with the constructivist grounded theory approach.

10.3.1.1 Credibility

Charmaz (2014) defines credibility as having sufficient relevant data for asking incisive questions about the data, making systematic comparisons throughout the research process, and developing a thorough analysis. In line with this, the methodology and
methods used in this study were rigorous and consistent with constructivist grounded theory methods. Evidence for this is now provided in the following sections.

First, constant comparison analysis occurred by systematically comparing data between categories, focusing on the coding process, category and theoretical development. Additionally, there is evidence of solid and logical connections between data generated, analysis and argument defending the theory, as shown in the methods chapter five, findings chapter seven and discussion chapter nine. The presentation of data and analysis included detail which enables the thesis reader to assess the credibility of the concepts that emerged to create the theory, as shown in the methods and findings chapters, as well as within illustrative appendices, with a clear emergence of the overarching phenomenon and other categories. However, although the amount of relevant data was adequate, it is acknowledged that the researcher cannot be certain whether theoretical sufficiency was achieved as data was not gathered as initially planned due to the COVID-19 pandemic (this is discussed as a limitation in the section 10.4.1). However, transparency is shown in how the theory emerged from the data and was not forced, as evidenced in chapters five and six.

10.3.1.2 Originality

Originality can take varied forms, such as offering new insights, providing a fresh conceptualisation of a recognised problem, and establishing the significance of the analysis (Charmaz, 2014). Firstly, the categories recognising the need for IPC, playing a role, encountering challenges and overcoming challenges were fresh and unique, offering new insight into the implementation of IPC guidance within these contexts. Secondly, the grounded theory was positioned amongst extant literature to show how it expanded, refined, related, and differed from established concepts and other theories, as evidenced in the discussion chapter. Originality is further highlighted throughout the exploration of the research topic. Firstly, this is current research in addressing gaps in the knowledge base for implementation of IPC guidance at health facility level in low
income countries, as identified in the systematised literature review (Chapter two). Secondly, by using the TDF and BCW/COM-B after generating a theory, the study introduced an interesting way of combining grounded theory methodology and behavioural theoretical frameworks in IPC research.

10.3.1.3 Resonance
Resonance means that the researcher must have demonstrated that the constructed concepts represent their research participants' experience and provide insight to others (Charmaz, 2014). According to Charmaz and Thornberg (2020), to gain resonance, researchers must fit their data-gathering strategies to illuminate their participants' experiences.

The topic guide did not remain static but was shaped by the participants' main concerns, with new questions added as the process progressed. For example, questions like 'How does your experience affect how you follow IPC guidelines?', 'Where do the guidelines come from?', 'How does support from hospital management influence your decisions?' and 'How does support from external organisations influence how you implement IPC guidance?' were added. This demonstrates how the researcher gained resonance by being sensitive to participant experiences and concerns. Additionally, the analysis of participant data leading to the theory offered deeper insights into HCWs' concerns about the implementation of IPC guidance. Links were made between categories of recognising the importance of IPC, playing a role, encountering challenges and overcoming challenges and the social processes when the data analysis indicated potential connections, thereby resonating with participants' experience.

10.3.1.4 Usefulness
According to Charmaz (2014), usefulness includes clarifying research participants' understanding of their everyday lives, forming a foundation for policy and practice
applications, contributing to creating new lines of research, and revealing pervasive processes and practices.

The central organising phenomenon of 'striving' and major categories of recognising the importance of IPC, playing a role, encountering challenges and overcoming challenges have functional applications in IPC across healthcare practice in low resource settings. The theory offers practical interpretations of the data that people can use within their work on IPC practice in healthcare facilities. As highlighted, the theory provides insight into challenges, solutions, and enabling factors that can be leveraged to improve and better implement IPC guidance in healthcare facilities. Additionally, memoing (examples provided throughout chapter 5) showed the potential for the theory to have workable and pragmatic utility in healthcare practice in similar contexts. Reflections on implications for the theory highlighted potential areas for the theory to be used and developed further in section 10.7.

In summary, the application of Charmaz's evaluation criteria demonstrates that the study was original, and the findings were credible, with concepts developed reflecting participant experiences with practical applications in IPC guidance implementation, specifically within low-resource settings.

10.4 Study strengths and limitations

The study explored the implementation of IPC guidance in a low-income country using a constructivist grounded theory and subsequent behavioural analysis. Like any research, it needs to be acknowledged that there were a number of strengths and limitations in undertaking qualitative research of this type. The following sections will present these strengths and limitations.
10.4.1 Strengths

The study utilised a robust systematised literature review to identify the evidence gap within the literature which provided a justification for the study.

Additionally, the constructivist grounded theory facilitated the exploration of an area of high complexity and generated theory from the data. The exploratory and constructivist nature of the study allowed the identification of aspects of practice through the expression of the voices and experiences of HCWs as guideline users in the co-construction of the data. The codes and categories developed in this grounded theory offered a unique insight into the implementation of IPC guidance in a low-income country. Adopting this approach promoted the development of a theoretical explanation which conforms closely to the study settings and topic being explored, in this case, the implementation of IPC guidance. This means that the theory is likely to be understood and usable by those in similar settings.

The study's exploratory nature and the flexibility of grounded theory gave the participants the freedom to share experiences they considered important in implementing IPC guidance. This was appropriate for this study, which was intended to maintain a focus on the implementation process at the healthcare facility level. Additionally, in-depth interviewing allowed the pursuit of the topics that arose in the interview and potentially a deeper exploration of the participants' constructed experiences (Charmaz, 2014).

By incorporating behavioural analysis, the study primarily supplemented the limitations of the thesis caused by the COVID-19 pandemic, as it enabled focused and tailored recommendations to be generated, further highlighting the importance of theory in implementation studies. This combination offered an interesting and novel way of conducting qualitative research within healthcare.
10.4.2 Limitations

As identified in the previous section, strengths have been acknowledged; however, the study was also bound to the limitations and pressures of a doctoral thesis presented in this section. In light of this comment, research limitations do not devalue the study findings' usefulness, credibility, and implications in the field, instead, they help illuminate optimum ways to make sense of these findings (Ross and Bibler Zaidi, 2019).

Firstly, the limited time frame while collecting data and the busy schedules of HCWs meant that the researcher had to take advantage of the best available time for the participants. Therefore, the researcher could not comprehensively analyse data from one interview before going into another. Corbin and Holt (2011) advise that it might be necessary to proceed with fieldwork as the opportunity to gather data presents itself, regardless of whether this allows for ample time to engage in analysis. As such, the researcher did a brief partial analysis that involved listening to the audio-recorded interview and noting important initial findings after each interview. Further analysis was done later after collecting all the interview data. Because of this, the researcher may have missed the opportunity to explore or theoretically sample for additional data to support emerging categories not picked up by just listening to recordings and making quick notes.

The COVID-19 pandemic presented another limitation. Initially, the study was to undertake a second phase of in-depth investigation of IPC practices at the tertiary and lower healthcare facilities as dictated by theoretical sampling, following a period of analysis. However, this was not feasible, owing to the COVID-19 pandemic. In the face of the pandemic, it was impossible to collect more data to ensure theoretical saturation as anticipated. Thus, the researcher and the supervisory team decided to use the already collected data and although an explanatory grounded theory was developed, it is uncertain that full theoretical saturation was achieved.

Further, there were geographic limitations imposed upon the sample, consisting of HCWs from a rural-based healthcare facility. As such, it could be suggested that the...
rurality of the study site impacted the finding's relevance to urban healthcare facilities. However, such a limitation would have to be weighed against the value of this study's findings within such rural locations.

Additionally, there was a lack of variety in the sample as interviews only involved a narrow range of IPC practice at a tertiary health care centre and did not include lower health care facilities and actors at the national level. Identifying such a limitation may also serve as a genesis for further research that utilises a different and cross-comparative population sample from different healthcare settings.

In conclusion, although the study had limitations, this study's findings provide an enlightening insight to add to the currently limited literature related to the implementation of PC guidance in low-resource settings. These findings will add to the academic and practical debates on how best to implement IPC guidance within similar settings.

10.5 Recommendations

Several recommendations based on the integration of the grounded theory findings and subsequent behavioural analysis are now presented below in order to improve IPC practice in these and wider health contexts.

10.5.1 Recommendations for practice

Firstly, it was clear from the study's findings that HCWs participants were a motivated group with altruistic tendencies in striving for improved IPC practice. Therefore, health managers should pro-actively demonstrate through staff meetings, clinical supervision and supervisor support arrangements the value it places on the roles and responsibilities fulfilled by all its HCWs in delivering safe healthcare.
While conducting behavioural analysis through mapping the enablers and barriers to the TDF and BCW/COM-B models, it was found that behavioural theory has a role to play in IPC implementation, as findings show that some participants were hesitant in accepting and practicing IPC guidance while some participants did not practice IPC guidance because of other factors out of their control. Without the commitment and buy-in of everyone, it is unlikely that IPC implementation will be successful. Therefore, implementation strategies should be developed that take due cognizance of behaviour theory and incorporate these within interventions at the development stage to improve uptake, as evidenced in this study. This may be particularly important as factors to changing behaviour may not be static, and obstacles that arise may be explored using the domains of capability, opportunity and motivation, with the subsequent selection and suggestion of techniques based on those deemed most likely to address those deficits. Examples are given below.

To start with, the study identified environmental context and resources as the most significant barrier. These challenges appeared in different ways, for example, a shortage of finances, shortage of HCWs, intermittent supply of water, infrastructural challenges and delay in delivery of IPC supplies. To address these environmental contexts and resource barriers, interventions should consider environmental restructuring, enablement, education and incentivisation to encourage IPC practice. HCWs should be provided with the necessary tools and requirements to help them practice the recommended IPC measures. These could include lobbying the government and hospital management to allocate more funds to IPC activities and obtain formal commitment, incentivising HCWs through paying for overtime, and strengthening the use of information technologies, for example, online meeting platforms to increase capability and facilitate practice change among IPC committee members as well as other HCWs, having water storage tanks and promote network weaving to encourage stakeholder relationships and develop resource sharing agreements with such organisations. However, addressing health system reforms, including regular IPC supplies and infrastructure upgrades, is important to have on the government and management agenda for urgent consideration.
Besides the above challenges, integrated findings from the study revealed that supportive social influences had a positive impact on IPC practice, for example, the presence of an IPC committee and teamwork and cross-organisational collaboration. However, a lack of voice was identified as a barrier. Therefore, practitioners or policymakers should deliver interventions around enablement and modelling. Examples could be by providing regular supervision and strengthening communication with hospital management, for example, providing suggestion boxes to enlist suggestions and views from all staff to increase the participation of other HCWs in IPC decisions. Healthcare managers should ensure that the relevant supervisors provide appropriate mechanisms of supervision. However, constraints on the supervisor, such as other clinical and administrative work, may inhibit this vital component. To this end, effectively designed workshops, plans and supervision schedules should be in place. Additionally, IPC committees should continue holding meetings as regularly as possible and allow other staff members to attend these meetings.

This research also identified that knowledge and skills acted as both barriers and enablers. For example, the knowledge of guidelines gained specifically through meetings or training played an important role in raising awareness and the importance of IPC guidance. The challenge here was that these trainings were not inclusive, leaving out some members of staff which had a negative impact on the implementation process. Therefore, to strengthen knowledge and skills and tackle this challenge, interventions around education, training, modelling and enablement, for example educating HCWs about IPC guidance and any new updates to the guidance and its importance in delivering safe healthcare. Secondly, delivering tailored training developed through a training needs analysis for the different groups of staff as well as an increase in the frequency of CMEs delivered. Strengthening cross-organisational networking can further help fill the gap of a lack of training.

Memory, attention and decision processes, as well as behaviour regulation, had a positive influence on the implementation of the guidance, for example, having reminders served as a memory jogger that triggered HCWs into practising the recommended IPC measures. Therefore, these can be further leveraged through
modelling, training and persuasion. This could be through increasing the number of posters, charts and notices around the different wards and providing more regular CMEs alongside other options for CPDs.

Additionally, beliefs about capabilities acted as barriers and enablers, such as taking responsibility as dictated by HCWs’ professional roles and identity. This positively impacted their perceived ability and confidence in their ability to follow IPC guidance. However, professional role and identity also acted as a barrier in cases where some people did not play their respective roles. Therefore, interventions around enablement and modelling should be considered. This could be through inviting peer experts to discuss roles and responsibilities and their significance in the implementation of IPC guidance through facilitated workshops and by providing the required tools for HCWs to continue playing their roles, particularly by ensuring a steady supply of IPC supplies.

Similarly, beliefs about consequences acted as an enabler. HCWs’ perception of the benefits of following guidelines had a positive impact which influenced their decision to practice the required IPC measures. Therefore, to leverage this, interventions targeting persuasion should be considered, for example, information provision and constant communication about the benefits of IPC guidelines and harms of not following guidelines through facilitated workshops and posters around wards.

To address issues around intentions, goals and reinforcement which acted as a barrier, for example, poor attitudes from staff, training should be delivered to the relevant HCWs to educate and persuade those showing hesitancy towards IPC guidance. Lastly, the HCW shortage leading to heavy workloads could be addressed through enablement, and incentivisation could be considered, for example, recruiting more HCWs, bonus payments for overtime and working with schools to avail more students for cover, especially during busy periods.
10.5.2 Recommendations for education

As pointed out in the previous section, knowledge and skills were found to have a significant influence on the implementation of IPC guidance. Therefore, to increase this knowledge and enhance skills in IPC, it is recommended that training in IPC guidance and infection control principles should be incorporated into formal educational programmes as part of the curriculum. The training and education of healthcare professionals competent and cognisant of IPC principles is essential in routinising IPC practice in healthcare settings. Therefore, incorporating IPC guidance or practice into medical, nurse, and other allied health professions training education programmes will further raise awareness of IPC core principles, IPC practices, and IPC guidance, both national and international guidelines and the core competencies of IPC practice among HCWs. This would also mean fewer training needs will be required once HCWs are in practice.

Further, standalone IPC training programmes should be developed and linked to a qualification framework that enhances the skill and knowledge base of the workforce, which will lead to the production of dedicated qualified IPC staff. Effective consultation and liaison between the Ministry of Health and higher education providers would result in a combined approach to the validation and accreditation of such programmes. For example, a partnership between the government of a country and an academic institution may be formalized to provide HCW training or mentorship on IPC protocols.

10.5.3 Recommendations for policy

As revealed by the behavioural analysis, interventions targeting the policy categories of communication, regulation and service provision can be considered to improve the uptake of this guidance.

With regards to communication, clear communication about the guidelines is essential for improvement and enhancing the awareness of guidelines at different healthcare
levels. Therefore, publicizing the guidance through translated media broadcast, translated print, and electronic media would further enhance the understanding of this guidance within these contexts. Additionally, implementation manuals should be included alongside the policy documents, and these should be easily accessible to everyone.

Furthermore, the Ministry of Health should establish regulation by developing IPC standards of practice to streamline IPC practice across different healthcare facilities and among staff. These local institutional guidelines and standards can be adapted from the WHO IPC core components and tailored within the realms of the local contexts. However, all relevant stakeholders must be involved in the process of developing these standards. This will ensure that staff have a sense of ownership of the policy and increases the chance to follow the policy recommendations. Lastly, with regard to service provision, the government, through the Ministry of Health, should aim to improve the delivery of services through health system reforms such as regular IPC supplies, infrastructure upgrades and regular maintenance of facilities.

10.5.4 Recommendations for further research

The range of issues arising from the study limitations highlighted the potential for some fascinating future research, and these are presented below.

Firstly, future research could explore this topic on a wider scale involving actors at all levels of IPC implementation within a specific context, to identify the different experiences among all these participants. For example, involving hospital administrators and Ministry of Health officials who are not directly involved in delivering health care will add to the findings of the present study and complement this research.

Secondly, research with greater flexibility in timescales and resources could include a wide range of data-gathering activities, pursue theoretical sampling further, and develop additional categories that may offer a fuller picture of the topic within the same contexts as the current study. This could be done by using a variety of data sources such
as observations, document reviews, or focus groups to take a more holistic approach, enrich the gathered data, and add to the depth of the analysis (Birks and Mills, 2015).

Thirdly, further research may benefit by extending the sample to include all levels of healthcare facilities and private hospitals across the country with geographical and practice variations to capture a greater range of practice experiences in the data.

Additionally, having identified the most important factors influencing IPC guidance implementation as well as theory-informed recommendations, further research may focus on intervention design and testing using behavioural theory.

Whereas the purposes of this research were met through constructivist grounded theory, future research of pragmatist or post-positivist epistemologies could employ quantitative research and mixed-method designs to test the applicability of this theory in practice, for example, a mixed method study exploring the different levels of IPC implementation and exploring reasons for these differences.

Lastly, given that this study was designed and conducted before the COVID-19 pandemic, the context of which likely changed after the pandemic, further research could explore the current contemporary context in Uganda. This would allow for exploration of the situation following the Ebola and COVID-19 outbreaks. These findings could be compared to findings from the current study to ascertain the impact of the pandemic on IPC practice within the country.

**10.5.5 Summary of recommendations**

The recommendations above all reflect theoretically sound proposals. However, before a decision is made on which interventions to adopt, a choice then needs to be made about which intervention functions are most appropriate or have the best possible chance of success in bringing about change in a particular context, as the social and environmental context is as important as considering the intervention’s effectiveness. Therefore, as suggested by Michie et al. (2014), the APEASE (Affordability, Practicality,
Effectiveness, Acceptability, Side effects, Equity) criteria can be used to aid this process by encouraging intervention designers to ask questions of potential intervention components and making strategic judgements about the most appropriate content for the intervention. It is acknowledged that some of the recommendations above may not meet the APEASE criteria in specific low-income settings. However, this final stage of intervention development was beyond the scope of the current study but could be used by policy and intervention developers within contexts similar to the current study.

10.6 Personal Reflection and Reflexivity

Dodgson (2019) notes that the concept of reflection is often used synonymously with the concept of reflexivity. However, reflection is an in-depth consideration of events or situations outside of oneself, while reflexivity aids the researcher in exploring their positionality and understanding how it constructs knowledge. Reflexivity goes beyond reflection in that it explores relationships with others and recursivity, as described in chapter five, section 5.10.3. Therefore, this section describes reflexivity and personal reflections throughout the research process. However, although this thesis is written in the third person, this section will be an exception, as it provides a personal account of the researcher's PhD journey, it will be written in the first person. As Williams (2012) highlights, reflective writing requires the use of the first person when analysing personal experiences.

Firstly, this is a constructivist grounded theory study aimed at understanding the implementation process of IPC guidance through the experience of HCWs. My choice of this methodology was driven by a desire to uncover a theoretical explanation of what happens when implementing IPC guidance at healthcare facilities in low settings. I chose a constructivist paradigm that fit the research study appropriately, allowing me to discover contextual and individual factors related to IPC implementation. A constructivist approach was based on my belief that people generate meanings based on locally understood realities, where knowledge results from subjective and inter-
subjective interpretations of a dialogue with the researcher (Schwandt, 1994). As such, I was actively involved in all the stages of the research. The data gathering took place through one-on-one interviewing. While my questioning was open-ended, the interview schedule was used as guidance, and I intended to be neutral to enable participants to share their perspectives. Constructivist grounded theory allowed me to use prompting, questioning for clarification and non-verbal cues such as smiling and nodding to progress the interview and pursue areas of interest as they arose. It is therefore acknowledged that whilst I initiated questions, the participants chose what information they shared with me; the gathered data was the outcome of my interactions with the participants and was therefore co-constructed during the interviews. Although this process seemed difficult in the beginning, I learned from it, which enabled me to avoid leading interviews and allowing participants to be drivers of their interviews.

My double role as a researcher and a Ugandan was a threat to my reflexivity. Being a Ugandan and having worked in a community health setting in Uganda, my inside knowledge of the research context might have affected my interviewing and interpretation of the data. However, I took extra steps to minimise the impact of this insider knowledge on the research project. For example, I framed open-ended questions to prevent the participant from simply agreeing or disagreeing with me. Therefore, when analysing data, I took particular care to stop frequently and consider whether the interpretation was based on the actual data or potentially what I assumed would be the case. This process led me to revise interview questions throughout the process. This was further supported by research field notes (Appendix XV) with regular meetings and discussions with the supervisory team. During the data analysis, the use of in-vivo codes and the processes of memoing, line-by-line coding, constant comparative analysis and going one level of abstraction up at a time were supported by my reflexivity.

Because of my position as a PhD candidate, some participants viewed me as an expert in the research area. This may have contributed to a rather tense atmosphere initially with some participants, which may have led to restrained responses. For example, junior
staff, students and interns seemed to give short precise answers without much elaboration. However, to solve this problem, I used probing techniques to explore their areas of concern further. Additionally, to get them relaxed, I told them to choose their interview location and constantly assured them throughout the interview that they were the experts in their experience with valuable insights to share with me. This was one of the few experiences in my life where I had been viewed as an expert in a particular field, and it helped me build my confidence and enhanced my interpersonal skills.

As a novice researcher, the use of grounded theory presented challenges. Timonen et al. (2018) revealed that while undertaking grounded theory for the first time, they were filled with doubt and lack of confidence in their ability to undertake grounded theory analysis. I experienced similar feelings, particularly in relation to the development of the theory and how I would execute concurrent data analysis in a short period since my time in Uganda was limited. Confidence in my abilities grew as I began to recognise that such anxieties were natural when one is new to the grounded theory approach. This confidence led me to adapt to the practical realities of data collection, as pointed out in the COVID-19 impact statement.

Further, having one of my supervisors who had previously utilised this methodology and had the experience of supporting students undertaking grounded theory studies further relieved my fears, as well as reading widely about the methodology. Additionally, writing the thesis offered many challenges, particularly around presenting the findings and incorporating the wider literature. However, reading other theses that utilised the same methodology, as well as guidance from my supervisors, enabled me to figure out how to structure and present my findings.

Additionally, as pointed out in the study modification, an additional objective which involved applying behaviour change theory to make preliminary recommendations for intervention design was incorporated in light of the pandemic. The addition of this objective meant that I had to unexpectedly learn about and apply the behavioural theory. This was a daunting task as I was challenged through the process. However, with
guidance from the supervisors and reading through different behavioural theories, I was finally able to grasp and apply these principles in the study. However, the behavioural analysis went through several iterations before the final product was written out.

In summary, the process was overwhelming at times, with data analysis and memoing proving the most daunting that often sent me doubting my abilities and outputs. Although I experienced considerable anxiety at times, wondering if I would be able to develop a theory from my data, this was also a learning experience, so much so that towards the end of my doctorate research, I could feel the significance of the doctorate journey on my personal and professional development. As Charmaz (2006, p.105) alludes, "feeling confused and uncertain but learning to tolerate the ambiguity shows your growth as a researcher". This encapsulated for me the essence of my research journey using grounded theory methodology.

10.7 Concluding Statement

In conclusion, the research aims of exploring the implementation of IPC guidance at the health facility level in Uganda and generating a theoretical explanation for the processes involved posed at the beginning of this study were achieved. The processes involved in the implementation of IPC guidance in resource-limited settings have been explicated within this thesis. The theoretical code that explained this process was asymptote, which means coming close but not close enough. In trying to implement IPC guidance, HCWs came close to full implementation but never quite achieved it because of the different challenges such contexts presented. This process of trying to get close was conceptualised as 'Striving for improved IPC practice', which provides an insight into the implementation of IPC guidance in low resource contexts. The substantive theory was derived from inductive data analysis and therefore presents a unique perspective in terms of the theory generated and methodology used in this area. The theory also offers significant insight into the enabling factors of this process and how the different challenges encountered are overcome during implementation. This reflects a high
degree of improvisation among HCWs in ensuring the implementation and practice of IPC measures.

The study also provides a theoretical basis for intervention design and development by identifying the most important behaviour influences and key intervention functions through the use of the TDF, COM-B and BCW while identifying key recommendations. All these findings are valuable contributions to understanding IPC practice within a low-resource context and provide sound evidence on the factors influencing the implementation of IPC guidance in low-income countries.
APPENDICES

Appendix I: Extract from MEDLINE showing how the search strategy was operationalised

<table>
<thead>
<tr>
<th>Implementation</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH &quot;Health Plan Implementation&quot;</td>
<td>4,889</td>
</tr>
<tr>
<td>1 (implement*): ti,ab</td>
<td>372,806</td>
</tr>
<tr>
<td>2 (adoption):ti,ab</td>
<td>37,975</td>
</tr>
<tr>
<td>3 (execute* OR execution*):ti,ab</td>
<td>37,084</td>
</tr>
<tr>
<td>4 (uptake):ti,ab</td>
<td>315,253</td>
</tr>
<tr>
<td>5 (Acceptability):ti,ab</td>
<td>27,240</td>
</tr>
<tr>
<td>6 (&quot;put into effect&quot;):ti,ab</td>
<td>188</td>
</tr>
<tr>
<td>7 (&quot;Put into use&quot;):ti,ab</td>
<td>73</td>
</tr>
<tr>
<td>8 OR/1-7</td>
<td>773,835</td>
</tr>
</tbody>
</table>

| Global                                                                         |          |
| 9 (global*):ti,ab                                                             | 323,383  |
| 10 ("international*"):ti,ab                                                   | 264,458  |
| 11 (world* OR worldwide):ti,ab                                                 | 418,483  |
| 12 (universal*):ti,ab                                                         | 93,477   |
| 13 (transnational*):ti,ab                                                      | 1,510    |
| 14 (multinational*):ti,ab                                                      | 6,321    |
| 15 (intercontinental*):ti,ab                                                   | 948      |
| 16 (transcontinental*):ti,ab                                                   | 295      |
| 17 (general*):ti,ab                                                           | 1,315,073|
| 18 OR/9-18                                                                    | 2,236,472|

<p>| Infection prevention and control                                              |          |
| 19 (MH &quot;infection control&quot;)                                                   | 21,623   |
| 20 (&quot;infection prevention and control&quot; OR &quot;infection prevention &amp; control&quot; OR &quot;IPC&quot;):ti,ab | 4,037   |
| 21 (&quot;infection prevention&quot;):ti,ab                                            | 3,174    |
| 22 (&quot;infection control*&quot;):ti,ab                                              | 17,002   |
| 23 (&quot;communicable disease prevention and control&quot;):ti,ab                     | 20       |
| 24 (MH &quot;communicable disease control&quot;)                                       | 19,835   |
| 25 (&quot;nosocomial infection prevention and control&quot; OR &quot;nosocomial prevention &amp; control&quot;):ti,ab | 8      |
| 26 (&quot;nosocomial infection prevention&quot;):ti,ab                                 | 34       |
| 27 (&quot;nosocomial infection control&quot;)                                          | 309      |
| 28 MH &quot;Cross Infection+/PC&quot;                                                    | 21,258   |</p>
<table>
<thead>
<tr>
<th></th>
<th>Query</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>(&quot;cross-infection prevention and control&quot; OR &quot;cross-infection prevention &amp; control&quot;):ti,ab</td>
<td>3</td>
</tr>
<tr>
<td>30</td>
<td>(&quot;HAI prevention and control&quot;):ti,ab</td>
<td>6</td>
</tr>
<tr>
<td>31</td>
<td>(&quot;Universal precautions&quot;):ti,ab</td>
<td>1,091</td>
</tr>
<tr>
<td>32</td>
<td>MH &quot;Universal Precautions&quot;</td>
<td>1,573</td>
</tr>
<tr>
<td>33</td>
<td>(&quot;infectious disease prevention and control&quot;OR &quot;infectious disease prevention &amp; control&quot;):ti,ab</td>
<td>32</td>
</tr>
<tr>
<td>34</td>
<td>(&quot;infectious disease control&quot;):ti,ab</td>
<td>386</td>
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<tr>
<td>35</td>
<td>(&quot;infectious disease prevention&quot;):ti,ab</td>
<td>129</td>
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<tr>
<td>36</td>
<td>OR/19-36</td>
<td>71,830</td>
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<tr>
<td>37</td>
<td>MH &quot;Guideline&quot;</td>
<td>0</td>
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<td>38</td>
<td>(guide*):ti,ab</td>
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<td>(recommendation*):ti,ab</td>
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<td>44</td>
<td>(directive*):ti,ab</td>
<td>10,263</td>
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<td>45</td>
<td>(advice):ti,ab</td>
<td>40,574</td>
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<td>46</td>
<td>(strategy OR strategies):ti,ab</td>
<td>828,383</td>
</tr>
<tr>
<td>47</td>
<td>(standard*):ti,ab</td>
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<tr>
<td>48</td>
<td>(protocol*):ti,ab</td>
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<td>49</td>
<td>(guidance):ti,ab</td>
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<td>50</td>
<td>OR/37-50</td>
<td>2,670,884</td>
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<td><strong>Guideline</strong></td>
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<td>51</td>
<td>MH &quot;Qualitative Research&quot;</td>
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<td>52</td>
<td>(qualitative):ti,ab</td>
</tr>
<tr>
<td></td>
<td>53</td>
<td>(quantitative):ti,ab</td>
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<tr>
<td></td>
<td>54</td>
<td>(&quot;mixed methods&quot;):ti,ab</td>
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<td></td>
<td>55</td>
<td>(&quot;case report&quot;):ti,ab</td>
</tr>
<tr>
<td></td>
<td>56</td>
<td>(&quot;case series&quot;):ti,ab</td>
</tr>
<tr>
<td></td>
<td>57</td>
<td>MH &quot;Case Reports&quot;</td>
</tr>
<tr>
<td></td>
<td>58</td>
<td>MH &quot;Cohort Studies&quot;</td>
</tr>
<tr>
<td></td>
<td>59</td>
<td>(cohort):ti,ab</td>
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<tr>
<td></td>
<td>60</td>
<td>(&quot;prospective cohort&quot;):ti,ab</td>
</tr>
<tr>
<td></td>
<td>61</td>
<td>(&quot;retrospective cohort&quot;):ti,ab</td>
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<tr>
<td></td>
<td>62</td>
<td>(MH &quot;Retrospective Studies&quot;)</td>
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<tr>
<td></td>
<td>63</td>
<td>(MH &quot;Prospective Studies&quot;)</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Count</td>
</tr>
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<td>---</td>
<td>------------------------------------------------------------</td>
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</tr>
<tr>
<td>64</td>
<td>(&quot;time series analysis&quot;):ti,ab</td>
<td>4,064</td>
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<tr>
<td>65</td>
<td>(MH &quot;Interrupted Time Series Analysis&quot;)</td>
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<tr>
<td>66</td>
<td>(&quot;cross-sectional&quot;):ti,ab</td>
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<tr>
<td>67</td>
<td>MH &quot;Cross-Sectional Studies&quot;</td>
<td>257,427</td>
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<td>68</td>
<td>(&quot;longitudinal&quot;):ti,ab</td>
<td>199,238</td>
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<tr>
<td>69</td>
<td>MH &quot;Longitudinal Studies&quot;</td>
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<td>70</td>
<td>(&quot;case-study&quot;):ti,ab</td>
<td>58,629</td>
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<tr>
<td>71</td>
<td>MH &quot;Case-Control Studies&quot;</td>
<td>243,299</td>
</tr>
<tr>
<td>72</td>
<td>(&quot;case-control&quot;):ti,ab</td>
<td>105,567</td>
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<tr>
<td>73</td>
<td>(&quot;observational study&quot;):ti,ab</td>
<td>57,300</td>
</tr>
<tr>
<td>74</td>
<td>(&quot;ecological study&quot;):ti,ab</td>
<td>2,130</td>
</tr>
<tr>
<td>75</td>
<td>(&quot;population study&quot;):ti,ab</td>
<td>5,649</td>
</tr>
<tr>
<td>76</td>
<td>(&quot;randomized control trial&quot;):ti,ab</td>
<td>3,560</td>
</tr>
<tr>
<td>77</td>
<td>MH &quot;Randomized Controlled Trial&quot;</td>
<td>114,165</td>
</tr>
<tr>
<td>78</td>
<td>(&quot;non-randomised control trial&quot;):ti,ab</td>
<td>283</td>
</tr>
<tr>
<td>79</td>
<td>(&quot;interrupted time series&quot;):ti,ab</td>
<td>2,013</td>
</tr>
<tr>
<td>80</td>
<td>(&quot;systematic review&quot;):ti,ab</td>
<td>103,787</td>
</tr>
<tr>
<td>81</td>
<td>(&quot;before and after study&quot;):ti,ab</td>
<td>1,123</td>
</tr>
<tr>
<td>82</td>
<td>(MH &quot;Controlled Before-After Studies&quot;)</td>
<td>304</td>
</tr>
<tr>
<td>83</td>
<td>OR/51-83</td>
<td>3,226,985</td>
</tr>
<tr>
<td>84</td>
<td>AND/8,18,36,50,83</td>
<td>299</td>
</tr>
</tbody>
</table>
Appendix II: Mindmap of the implementation concept
### Appendix III: Data extraction forms for systematized literature review included studies

<table>
<thead>
<tr>
<th>Study details, aims and/or objectives</th>
<th>Study design</th>
<th>Setting</th>
<th>Guideline implemented</th>
<th>Major research findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reference:</strong> Arnthz et al. 2016. Effectiveness of a multimodal hand hygiene improvement strategy in the emergency department in the Netherlands</td>
<td><strong>Method:</strong> Quantitative - Quasi-experimental (uncontrolled before and after)</td>
<td><strong>Study setting:</strong> the Netherlands, Health care setting</td>
<td>WHO guidelines on Hand Hygiene in Health Care (WHO MMHIS)</td>
<td>Nurse compliance increased from a baseline of 12.4% to 47%, while physicians started at 27.4% and reached 43.6%. HH compliance was highest in the second week of intervention, however, this dropped slightly in the third week. No significant differences between patient-personnel ratios or time of the day.</td>
</tr>
<tr>
<td><strong>Aims:</strong> To assess the effect of a multimodal improvement strategy on HH compliance in an emergency department</td>
<td><strong>Ethical considerations:</strong> Hospitals ethical committee exempted from the study</td>
<td><strong>Sample recruitment:</strong> 39 nurses, 9 residents, and 5 physicians.</td>
<td><strong>Process of implementation:</strong> The interventions were planned 3 intervention weeks, 4 weeks apart. Each intervention week consisted of a multimodal approach to promote HH awareness. During intervention weeks, education on the 5 indications of HH according to the World Health Organisation guideline and the relevance of preventing HAI were provided in daily presentations for the nurse staff and available physicians</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Data Collection:</strong> Direct observations,</td>
<td><strong>Data Analysis:</strong> SPSS 20.0, $X^2$ tests, descriptive statistics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study details, aims and/or objectives</td>
<td>Study design</td>
<td>Setting</td>
<td>Guideline implemented</td>
<td>Major research findings</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------</td>
<td>---------</td>
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<td>-------------------------</td>
</tr>
</tbody>
</table>
| Reference: Allegranzi et al. 2014. Status of the implementation of the World Health Organisation multimodal hand hygiene strategy in the United States of America health care | **Method:** Quantitative study design; Cross-sectional Survey (WHO hand hygiene self-assessment form)  
**Ethical considerations:** Approval granted by WHO, CDC and Columbia University Medical Centre institutional review | **Study setting:** USA, July – Dec 2011.  
**Sample recruitment:** Health care facilities registered for the WHO “SAVE LIVES: Clean your hands” global initiative (N=2,238) | WHO guidelines on Hand Hygiene in health care – WHO Multimodal Hand Hygiene Strategy | Only 168 facilities participated in the survey. Facilities ranged in size from 5 to 671 patient beds. According to the HHSAF score level of hand hygiene, implementation progress was advanced or intermediate in most facilities. The mean total HHASF score was 373.2 +/- 70.8. *3 (48.9%) advanced, 58 (45%) intermediate and 8 (6.2%) basic. HHSAF was higher for hospitals with infection prevention staffing, and detailed quantitative assessments of adherence. |
| **Aim:** To evaluate the implementation of the strategy in the United States health care facilities and examine the differences in the degree of implementation by facility size, geographic region and infection prevention structure | **Data Collection:** Survey using the WHO HHSAF questionnaire  
**Data Analysis:** t-tests, Wilcoxon rank-sum/Kruskal-Wallis tests, SAS version 9.3 | **Process of implementation:** WHO MMHIS 5 steps and 5 components but not described in detail.  
**Adaptation:** N/A | | |
<table>
<thead>
<tr>
<th>Study details, aims and/or objectives</th>
<th>Study design</th>
<th>Setting</th>
<th>Guideline implemented</th>
<th>Major research findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference: Allegranzi et al. 2013. Global Implementation of WHO’s multimodal strategy for improvement of hand hygiene</td>
<td><strong>Method:</strong> Quantitative study design; Quasi-experimental (uncontrolled before and after study)</td>
<td><strong>Study setting:</strong> Costa Rica, Italy, Mali, Pakistan, Saudi Arabia, Mali – Health care settings</td>
<td>WHO guidelines on Hand Hygiene in Health care – WHO Multimodal Hand Hygiene Improvement Strategy</td>
<td>Generally, HH compliance improved significantly for all categories of health professionals. In high-income countries, compliance averaged 54.3% before and 68.5%. In low-middle income countries, compliance averaged 22.3% before and 46.1%. Compliance was independently associated with gross national income per income, and the intervention’s impact was greater in low and middle-income countries.</td>
</tr>
<tr>
<td><strong>Aims:</strong> To assess the effect of the implementation of the WHO MMHIS on a range of indicators and how feasible and adaptable to different settings</td>
<td><strong>Ethical considerations:</strong> Approved by the UPHG, Mali Ministry of Health and WHO Regional Office for Africa</td>
<td><strong>Sample recruitment:</strong> 55 departments, 43 hospitals</td>
<td><strong>Implementation:</strong> Step-wise implementation approach was divided into four 3–6 month phases: preparedness, baseline assessment, intervention, and follow-up assessment. Actions were taken to ensure the availability of alcohol-based hand rub at the point of care. At sites where no hand rub was available (Costa Rica and Mali), local production of the hand-rub formulation recommended by WHO was started. Two sites (Saudi Arabia’s King Saud Medical Complex and Pakistan) already used a commercially produced hand rub but switched to local production because it was less expensive or regarded as better accepted by healthcare workers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Data Collection:</strong> Status of implementation assessed using semi-structured telephone interviews using a pre-defined questionnaire Compliance-Direct observation,</td>
<td></td>
<td></td>
<td>The average knowledge score improved substantially from 18.7% to 24.7% at all sites. Neither gross national income nor sex significantly affected knowledge improvement</td>
</tr>
<tr>
<td></td>
<td><strong>Data Analysis:</strong> linear mixed effects model with logit link function, Stata 12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Study details, aims and/or objectives

**Reference:** Birnbaum et al 1990. Adoption of guidelines for universal precautions and body substances in Canadian acute-care hospitals

**Aims:** To determine the rates of receipt and adoption of published guidelines for UP or Body substance isolation (BSI). After CDC released the UP and BSI guidelines, it was important to establish how they were taken up by different health facilities.

### Study design

**Method:** Quantitative study design; Survey

**Ethical considerations:** Not mentioned

### Setting

**Study setting:** Canada

**Sample recruitment:** Mailed invitations were sent out to all Canadian hospitals. 943 hospitals.

### Guideline implemented

**CDC UP/BSI guidelines**

**Process of implementation:** Not described

### Major research findings

After exclusion, 557 questionnaires’ were deemed relevant. From this Adoption, 64.4% (359) claimed to adopt guidelines.

The number of beds was most significant determinant of guideline receipt. A third of hospitals under 200 beds hadn’t received the guidelines.
<table>
<thead>
<tr>
<th>Study details, aims and/or objectives</th>
<th>Study design</th>
<th>Setting</th>
<th>Guideline implemented</th>
<th>Major research findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reference:</strong> Celentano et al. 1987. Diffusion and adoption of CDC guidelines for the prevention and control of nosocomial infections in US hospitals</td>
<td><strong>Method:</strong> Quantitative study design; Cross-sectional Survey</td>
<td><strong>Study setting:</strong> USA</td>
<td>CDC guidelines on the prevention and control of nosocomial infections</td>
<td>Most hospitals sampled, ranging from 84% to 94%, reported that guidelines were received (defused). The adoption rates of each of the recommendations as an official policy were between 22.9% and 78.4%. This varied across individual recommendations. However, this also varied according to the size of the hospital, with smaller hospitals adopting fewer recommendations than bigger hospitals. From 42% in small-sized hospitals to 54% in mid-sized hospitals to finally 62% in large hospitals.</td>
</tr>
<tr>
<td><strong>Aim:</strong> To evaluate the extent to which practices recommended by the CDC have been successfully diffused and adopted in US hospitals and establish the degree of awareness of these guidelines among hospitals</td>
<td><strong>Ethical considerations:</strong> Not mentioned</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Method:</strong> Quantitative study design; Cross-sectional Survey</td>
<td><strong>Sample recruitment:</strong> Random sample of 445 hospitals selected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Collection:</strong> Retrospective self-reports of behaviour, discussion of awareness and the diffusion and adoption of guideline recommendations</td>
<td><strong>Data Analysis:</strong> Descriptive statistics, comparative analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Implementation:</strong> Aspects of diffusion: - whether or not guidelines were available at the hospital and if they had been reviewed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adoption: - whether the hospital had a policy conforming to some or all the guidelines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study details, aims and/or objectives</td>
<td>Study design</td>
<td>Setting</td>
<td>Guideline implemented</td>
<td>Major research findings</td>
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<tr>
<td>--------------------------------------</td>
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<td>---------</td>
<td>-----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Reference: Chen et al. 2016. Impact of the implementation of the World Health Organisation multimodal hand hygiene improvement strategy in a teaching hospital in Taiwan</td>
<td>Method; Quantitative study design; Quasi-Experimental Design (Uncontrolled before and after study)</td>
<td>Study setting: Taiwan, health care setting</td>
<td>WHO guidelines on Hand Hygiene in health care – WHO Multimodal Hand Hygiene Strategy</td>
<td>HH compliance – increased from 62.3% to 73.3%. HH compliance according to the 5 moments increased significantly after the intervention (59% to 68.2% for indication 1, 52% to 53% indication 2, 67.8% to 85.8% for indication 3, 72.4% to 81.9% indication 4, and 68.9% to 71.1% indication 5). Sustainability of HH compliance was at 83.4% after 4 years post-intervention</td>
</tr>
<tr>
<td>Aim: To assess the impact of the implementation of the WHO multimodal HH improvement strategy on compliance and rates of HAI</td>
<td>Ethical considerations: Not mentioned</td>
<td>Sample recruitment: 1,408-bed tertiary care - 542 physicians, 1,197 nurses, 514 technicians, 215 nursing assistants</td>
<td>Process of implementation: Disposable ABHR placed on every bed Training and education conducted Evaluation and feedback Reminders through posters Included a cost-saving component.</td>
<td>HAI rates reduced from pre 3.71 to post 3.07 per 1000 patient admission days. UTI reduced from 1.50 to 1.17, BSI from 1.18 to 1.00. Campaign saved $950,000 and a reduction of 3,799 admission days.</td>
</tr>
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<td></td>
<td>Data Collection: Survey using the WHO HHSAF questionnaire, Direct observation</td>
<td>Data Analysis: $X^2$ tests, paired t-test, SPSS 18.0.</td>
<td>Adaptation: Involved in educating the public on HH concepts, shared compliance and effect of HH with the public</td>
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<tr>
<td>Study details, aims and/or objectives</td>
<td>Study design</td>
<td>Setting</td>
<td>Guideline implemented</td>
<td>Major research findings</td>
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</table>
| Reference: Chun et al., 2016. Impact of a hand hygiene campaign in a tertiary hospital in South Korea on the rate of hospital-onset methicillin-resistant Staphylococcus aureus bacteremia and economic evaluation of the campaign | **Method:** Quantitative study design; Quasi-Experimental (uncontrolled before and after study)  
**Ethical considerations:** Approved by the Institutional Ethics Review Board of SNUBH | **Study setting:** South Korea, Health Care Setting  
**Sample recruitment:** 1,241-bed tertiary care.  
**Data Collection:** Survey using the WHO HHSAF questionnaire, Hospital records  
**Data Analysis:** R-package, Bayesian models | WHO guidelines on Hand Hygiene in health care – WHO Multimodal Hand Hygiene Strategy  
**Process of implementation:** Used the 5 steps and 5 components and implemented hospital-wide. ABHR placed at every bed and in front of every ward. Web-based learning programme on hand hygiene. New employees taught about IPC and HH practices at the beginning of every month. Patients were also educated via an educational video on HH. Patients also evaluated the HH performance of workers.  
**Adaptation:** Web-based learning programme on hand hygiene included and compulsory. | HH compliance increased from 33.2% pre-intervention to 92.2% post-intervention. Increased consumption of hand sanitisers (Increased by 134%). MRSA declined from 31.92 per 100,000 patient days to 14 cases, to an average of 9 cases during the intervention period. Hand hygiene campaigns led to a reduction of 65 cases. Cost savings outweighed the costs of the campaign, with a cost-benefit ratio of 5.08. |
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<tr>
<th>Study details, aims and/or objectives</th>
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<th>Setting</th>
<th>Guideline implemented</th>
<th>Major research findings</th>
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<tbody>
<tr>
<td>Reference: Elaine et al. 2007. Dissemination of the CDC’s hand hygiene guidelines and impact on infection rates.</td>
<td>Method: Quantitative study design; Cross-sectional</td>
<td>Study setting: USA</td>
<td>CDC hand hygiene guidelines</td>
<td>Implementation scores were between 7 -12. Information about the guidelines was well disseminated. 89.6% of 1158 staff members surveyed were familiar with the guidelines. Appropriate hand hygiene supplies were readily available. CL-BSI and VAP rates are significantly lower post-implementation (from 5.5 to 4.8 per 100 days and 6.2 to 4.8 per 1000 days, respectively). No significant differences in rates of CAUTI or SSI following guideline implementation. Overall, hospitals had lower rates of HAI post-implementation.</td>
</tr>
<tr>
<td>Aims: To evaluate implementation and compliance with clinical practices recommended in the new CDC hand hygiene guidelines, compare rates of HAIs before and after implementation of the guideline recommendations and examine the patterns and correlations of changes in rates of HAI</td>
<td>Ethical considerations: Reviewed and approved by the institutional review boards of each participating hospital.</td>
<td>Sample recruitment: Hospitals that were members of the National Nosocomial Infection Surveillance System (NNIS). 40 hospitals recruited through an email invitation</td>
<td>Process of implementation: Changes in hand hygiene policies and procedures, formalised plan to monitor compliance, presence of recommended products and product usage, multidisciplinary meetings regarding hand hygiene and rates of HAI within ICU, and special sessions to train and educate staff.</td>
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<tr>
<td></td>
<td>Data Collection: Implementation Assessment Survey, Direct observation during site visits</td>
<td>Data Analysis: frequency distribution, logistic regression, X² tests</td>
<td>Adaptation: N/A</td>
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</tbody>
</table>
### Study details, aims and/or objectives


**Aim:** To implement the WHO MMHIS Hospital in Iran and assess its feasibility and efficacy.

### Study design

**Method:** Quantitative study design; Quasi-Experimental design.

**Ethical considerations:** Not mentioned

### Setting

**Study setting:** Iran.

**Sample recruitment:** 1 hospital with 54 wards.

### Guideline implemented

WHO guidelines on Hand Hygiene in health care – WHO Multimodal Hand Hygiene Strategy

### Major research findings

**Implementation:** The entire project involved the strategy's 5 steps and 5 core components. ABHR placed outside the room, not point at the point of care

**Adaptation:** Local production of alcohol. Nursing staff enrolled in IPC courses twice a year. Billboards were used instead of posters.

After the intervention compliance rate improved from 29.8% to 70.98%, and improvement was highest among nurses.
<table>
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<tr>
<th>Study details, aims and/or objectives</th>
<th>Study design</th>
<th>Setting</th>
<th>Guideline implemented</th>
<th>Major research findings</th>
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</table>
| Reference: Kuwaiti 2017. Impact of a multicomponent hand hygiene intervention strategy in reducing infection rates at a university hospital in Saudi Arabia | **Method:** Quantitative study design; Quasi-Experimental (before and after studies)  
**Ethical considerations:** Approved obtained from the Ethical Committee of Imam Abdulrahman Bin Faisal University. | **Study setting:** Saudi Arabia  
**Sample recruitment:** 1 hospital – All staff with direct patient access in the inpatient wards.  
**Data Collection:** Hospital records and Observations  
**Data Analysis:** Correlation analysis, SPSS version 20. | WHO guidelines on Hand Hygiene in health care – WHO Multimodal Hand Hygiene Strategy  
**Implementation:** Increasing the availability and ease of access to alcohol-based hand rub and water supply; Holding educational events on HH and infection control; Offering training and support with monthly evaluation and feedback analysis; Presenting visual displays to promote HH practices; and Ensuring a climate of institutional safety.  
**Adaptation:** Additional components incorporated like strictly to visitors’ policy and educating visitors to keep hands clean. Training handouts translated into Arabic | There was a significant increase in mean HH compliance from 50.17% to 71.5%. The HAI rates observed in the inpatient wards showed a decreasing trend from 3.37 pre-intervention to 2.59 post-intervention. CAUTI rates reduced from 3.73% to 1.75%. The reduction in both was statistically significant.  
There was a weak negative correlation between HH and HAI, however, there was a moderate negative correlation between HH and CAUTI rates. |
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<tr>
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<tbody>
<tr>
<td>Reference: Malangu and Mngomezulu 2015. Evaluation of tuberculosis infection control measures implemented in KwaZulu-Natal province of South Africa</td>
<td>Method: Quantitative study design; Cross-sectional Survey</td>
<td>Study setting: South Africa, health care setting.</td>
<td>WHO TB control policy</td>
<td>52 questionnaires were returned. 51 facilities complied with keeping a register. The other 9 aspects had varying percentages (23.15 – 76.5%). More facilities in Uthungulu district had a written infection control policy than in Ugu district. Non-existence of infection control committees. With regard to clinical control measures – all facilities complied. No single facility reported separating suspected patients from other patients. Overall – 1 out of 10 administrative aspects was complied with by at least 80% of facilities.</td>
</tr>
<tr>
<td>Aims: To describe and compare tuberculosis infection control measures implemented across two health facilities.</td>
<td>Ethical considerations: Approved by the Medunsa Research Ethics Committee of the University of Limpopo.</td>
<td>Study setting: South Africa, health care setting.</td>
<td>Process of implementation: Administrative measures, the establishment of committees, keeping relevant registers, availability of cough symptom checks, education on cough etiquette, separation of suspected patients, environment control measures, adequate ventilation systems, use of protective equipment, presence of hospital control policy</td>
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<td>Sample recruitment: 95 health facilities across two districts.</td>
<td>Data Collection: self-administered questionnaire and site visit observations.</td>
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<td>Data Analysis: Simple scoring system based on whether systems, documents or committees were present or absent. Independent samples t-test.</td>
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<td>Adaptation: N/A</td>
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<tr>
<td>Reference: Mestre et al 2012. “The 3/3 Strategy”: A Successful Multifaceted Hospital Wide Hand Hygiene Intervention Based on WHO and Continuous Quality Improvement Methodology</td>
<td>Method; Quantitative study design; Quasi-experimental (uncontrolled before ad after study)</td>
<td>Study setting; Spain</td>
<td>WHO guidelines on Hand Hygiene in Health care – WHO Multimodal Hand Hygiene Improvement Strategy</td>
<td>Significant increase in HH compliance averaging 25% points across all HH moments. This was better in conventional wards than in ICU and ED. HH compliance varied across the intervention period, always fluctuating, starting at 85%, recording highs of 96% and closing at 80%. Observed low HAI MRSA over the period, with a small but significant decrease during the entire intervention period.</td>
</tr>
<tr>
<td>Aims: To evaluate the impact and sustainability of a multifaceted hospital-wide HH Intervention is based on the multimodal WHO approach on HH compliance over time.</td>
<td>Ethical considerations: Approved by the Ethics Committee of the Delfos Medical Centre</td>
<td>Sample recruitment; 1 hospital – 500-bed health centre</td>
<td>Process of implementation: Phase 1: WHO MMHIS five steps approach. Phase 2: More interventions were added to increase the frequency of audits, dispensers, and feedback. Implementation of a standardized process for proactive action</td>
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<td></td>
<td>Data Collection; Direct observation, Knowledge questionnaire</td>
<td>Data Analysis: SPSS 15, Time series analysis by SPC, X² test.</td>
<td>Adaptation: Included a quality improvement tool to sustain compliance. Divided the implementation into 2 phases.</td>
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</tbody>
</table>
### Study details, aims and/or objectives


**Aims:** To report the effect of the WHO multimodal hand hygiene campaign on hand hygiene compliance immediately after implementation and the sustainability of changed behaviour 7 years after implementation

### Study design

**Method:** Quantitative study design; Quasi-experimental design (Before and After)

**Sample recruitment:** 175 Hospitals

**Data Collection:** Hand Hygiene Self Assessment Framework, observation.

**Data Analysis:** Chi-square test, McNemar test, Cronbach’s alpha coefficient, intra-class correlation, K-sample test, STATA.

**Process of implementation:** Implementation was based on the WHO MMHIS strategy, which is 5 phases and 5 core components.

**Adaptation:** N/A

### Setting

**Study setting:** Italy, health care setting.

### Guideline implemented

WHO guidelines on Hand Hygiene (WHO multimodal hand hygiene promotion).

### Major research findings

Overall, HH compliance increased from 40% to 63%. ICUs and other medical wards had more compliance than surgical wards. The perception was associated with increased compliance. Results showed that perception, unlike knowledge/ward/facility, was associated with a change in HH compliance. After 7 years, 48 hospitals participated, 44 of which were classified as intermediate or advanced in hand hygiene implementation, and HH compliance was between 71-80%.
<table>
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<tr>
<th>Study details, aims and/or objectives</th>
<th>Study design</th>
<th>Setting</th>
<th>Guideline implemented</th>
<th>Major research findings</th>
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</table>
| Reference: Pfafflin et al 2017. Implementation of the World Health Organization Multimodal Hand Hygiene Improvement Strategy in a University Hospital in Ethiopia | **Method:** Quantitative study design; Quasi-Experimental (before and after studies)  
**Ethical considerations:** Approved by college of Health Arsi University Ethical Review Committee. | **Study setting:** Ethiopia.  
**Sample recruitment:** 1 hospital – All wards involved in perinatal and maternal care  
**Data Collection:** Perception survey, hand hygiene knowledge questionnaire, observations  
**Data Analysis:** $X^2$ tests, multivariate regression analysis, Wilcoxon rank-sum, SPS version 20. | **WHO guidelines on Hand Hygiene in health care – WHO Multimodal Hand Hygiene Strategy** | Compliance was 1.4% at baseline, which increased to 11.7% on the first follow-up and ended at 13.1% on the final follow-up. There was a significant increase in HH compliance across all professional categories and all indications. Increase in HH compliance. HH knowledge increased from 13 to 17. |
<p>| <strong>Aim:</strong> To implement the WHO MMHIS in Asella Teaching hospital and assess its effectiveness on hand hygiene compliance in different health cadres. | <strong>Process of implementation:</strong> WHO MMHIS used. However, observations were done an announced at random times. Lectures on cultural aspects included. Observations also included observing the use of gloves. 100ml Pocket bottle filled hand rub | | | |<br />
| | <strong>Adaptations:</strong> Emphasised use of gloves as well. Provided 100ml bottles to health workers. |</p>
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td><strong>Reference:</strong> Raviglione et al 1997. Assessment of worldwide tuberculosis control by</td>
<td><strong>Method:</strong> Quantitative study design; Cross-sectional</td>
<td><strong>Study setting:</strong> Worldwide.</td>
<td>WHO TB control Policy/strategy</td>
<td>180 countries responded. 47% hadn’t implemented the WHO TB control strategy, 42% had implemented the strategy, and 11% had implemented them partially. The treatment success rate in countries that had implemented the strategy was 76%. The treatment success rate was 42% in countries that didn’t implement the strategy.</td>
</tr>
<tr>
<td>Aims: To assess the performance of the WHO strategy of TB control and compare regions that had adopted this and those that had not.</td>
<td><strong>Ethical considerations:</strong> Not mentioned</td>
<td><strong>Sample recruitment:</strong> 216 countries</td>
<td><strong>Implementation:</strong> Doesn’t describe the process</td>
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<tr>
<td></td>
<td><strong>Data Collection:</strong> Survey questionnaire, WHO reports</td>
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<td><strong>Adaptation:</strong> N/A</td>
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<td><strong>Data Analysis:</strong> Microsoft Access</td>
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</table>
# Study Details, Aims and/or Objectives

Reference: Reid et al. 2012. Implementation of tuberculosis infection control measures at HIV care and treatment sites in sub-Saharan Africa.

**Aim:** To assess whether TB infection control measures were implemented at a sample of 663 HIV care and treatment sites in nine sub-Saharan Africa. The study also sought to determine whether program and facility characteristics were associated with the implementation of TB IC measures.

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<tr>
<th>Study Details, Aims and/or Objectives</th>
<th>Study Design</th>
<th>Setting</th>
<th>Guideline Implemented</th>
<th>Major Research Findings</th>
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</thead>
<tbody>
<tr>
<td>Reference: Reid et al. 2012.</td>
<td>Method: Quantitative study design, Cross-sectional survey</td>
<td>Study setting: Ivory Coast, Ethiopia, Kenya, Mozambique, Nigeria, Rwanda, South Africa, Swaziland and Tanzania</td>
<td>WHO TB control policy</td>
<td>Most clinics – 91% of the 663 reported having implemented at least one recommendation from the WHO TB control policy. However, few sites had implemented a full complement of these measures/recommendations. Small sites were found to be less likely to implement these measures than larger ones.</td>
</tr>
<tr>
<td><strong>Ethical considerations:</strong> Institutional review not required since routinely monitored data was used.</td>
<td><strong>Process of implementation:</strong> Not described</td>
<td><strong>Adaptation:</strong> N/A</td>
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<tr>
<td><strong>Sample recruitment:</strong> 663 HIV care and treatment sites that received support from the International Center for AIDS Care and Treatment Programs</td>
<td><strong>Data Collection:</strong> Routinely collected monitoring and evaluation data.</td>
<td><strong>Data Analysis:</strong> $X^2$ tests, multivariate logistic regression analysis, SAS Version 9.2</td>
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<tr>
<td><strong>Data Collection:</strong> Routinely collected monitoring and evaluation data.</td>
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<td>Study details, aims and/or objectives</td>
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</table>
| Reference: Schmitz et al 2014. Effectiveness of a multimodal hand hygiene campaign ad obstacles to success in Addis Ababa, Ethiopia. | **Method:** Quantitative study design, Quasi-Experimental (Before and After).  
**Ethical considerations:** Project was approved by the Institutional Review Board of Emory and St. Paul’s Millennium Medical College.  
**Sample recruitment:** 278-bed university-affiliated teaching hospital.  
**Data Collection:** Direct observations, self-completed perception survey, questionnaire  
**Data Analysis:** $X^2$ tests, univariate, multivariate logistic regression analysis, SAS Version 9.3 | **Study setting:** Ethiopia,  
**WHO guidelines on Hand Hygiene (WHO MMHIS)**  
**Implementation:** Followed the MMHIS. However only 3 phases: Baseline evaluation, Intervention and evaluation. Utilized a five-component approach. Post-intervention training. Soap and commercial sanitiser are available.  
**Adaptation:** 3 steps of the strategy were used instead of 5. Post-intervention training included. | HH adherence rates increased significantly from 2.1% at baseline to 12.7% following the implementation of the WHO MMHIS  
In the perception survey – 64% of HCW indicated a preference for commercially manufactured sanitiser. |
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<tr>
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<th>Guideline implemented</th>
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<tbody>
<tr>
<td>Reference: Shai et al. 2004. Use of infection control procedures in an out-patient clinic for leg ulcers and the rate of contamination with methicillin-resistant Staphylococcus aureus</td>
<td><strong>Method:</strong> Quantitative (Uncontrolled Before and after study).</td>
<td><strong>Study setting:</strong> Israel, health care setting.</td>
<td>CDC guidelines on infection control for health care personnel.</td>
<td>Group A – 5 of the 37 patients were contaminated with MRSA. Group B – 7 out of 83 were contaminated with MRSA. The ulcers healed in 4 of the 12 patients, and 7 did not heal. One patient died, and another one from the remaining 7 moved to another clinic. Comparing group A and group B revealed a non-significant reduction in isolation of MRSA. Increasing number with ulcers treated in the clinic from 37 to 96. No significant difference in reduction of time until MRSA was identified in both groups. No conclusive result to suggest that infection control reduced contamination in MRSA. However, only 8.4% of patients were contaminated with MRSA after the implementation compared to 14.7% before implementation.</td>
</tr>
<tr>
<td><strong>Aims:</strong> To evaluate the efficacy of accepted infection control procedures in a wound clinic in Israel</td>
<td><strong>Ethical considerations:</strong> Not mentioned</td>
<td><strong>Sample recruitment:</strong> 37 patients before the implementation period and 96 patients after the implementation period.</td>
<td><strong>Process of implementation:</strong> Promoting hand hygiene (using a cleaning agent and water), use of gloves, proper mgmt of waste (waste bag as close to the point of care as possible), treatment rooms cleaned and disinfected after every patient.</td>
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<td><strong>Data Collection:</strong> Medical charts.</td>
<td><strong>Data Analysis:</strong> t-test for comparison of continuous variables, fishers exact test.</td>
<td><strong>Adaptation:</strong> N/A</td>
<td></td>
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<tr>
<td>Reference: Sirijatuhat et al 2018. Implementation of the global antimicrobial resistance surveillance system (GLASS) in patients with bacteremia</td>
<td><strong>Method:</strong> Quantitative study design; Cross-sectional</td>
<td><strong>Study setting:</strong> Thailand</td>
<td>WHO Global Antimicrobial Resistance Surveillance System (GLASS) in patients with bacteremia</td>
<td>40.2% of blood cultures were positive. The most common isolated organism was coagulase-negative staphylococcus spp, E.coli, K. Pneumoniae, S. aureus, A.bauminnii and P.aerouginosa. GLASS was far superior to the laboratory-based surveillance for blood culture specimens in patients with bacteraemia. Difficult to implement this system in a hospital-wide basis because of the resources required</td>
</tr>
<tr>
<td>Aims: To determine the feasibility and benefit of implementing the GLASS at a 2,300-bed tertiary care university hospital in Thailand.</td>
<td><strong>Ethical considerations:</strong> Approved by the Siriraj Institutional Review Board, Mahidol University</td>
<td><strong>Sample recruitment:</strong> 865 patients</td>
<td><strong>Process of Implementation:</strong> Implemented using a locally developed web application to transfer blood culture specimen data and to enter clinical data of patients with positive blood culture by infection control nurses and physicians at the hospital wards via their smartphones</td>
<td><strong>Adaptation:</strong> locally developed web application</td>
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<td><strong>Data Collection:</strong> Hospital records</td>
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<td><strong>Data Analysis:</strong> SPSS, t-test, X²test/fisher exact test</td>
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<td>Study details, aims and/or objectives</td>
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<tr>
<td>Reference: Uneke et al. 2013. Promotion of hand hygiene strengthening initiative in a Nigerian teaching hospital: Implication for improved patient safety in low-income health facilities by &lt;br&gt;Aim: To promote the adoption of recommendations of WHO guidelines on hand hygiene in health care. To identify the factors associated with non-compliance with HH among doctors and nurses.</td>
<td>Method; Quantitative study design; Quasi-Experimental (Before and After study). &lt;br&gt;Ethical considerations: Approved by the Ethics Committees of WHO and Federal Teaching Hospital Abakaliki.</td>
<td>Study setting; Nigeria &lt;br&gt;Sample recruitment; 1 teaching hospital; all health workers in direct patient contact. &lt;br&gt;Data Collection; Observation and KAP questionnaires &lt;br&gt;Data Analysis; Epi Info.</td>
<td>WHO guidelines on Hand Hygiene in health care – WHO Multimodal Hand Hygiene Strategy</td>
<td>Post-Intervention HH compliance was 65.3%. This was highest in nurses at 72% and lowest in doctors at 59.7%. Lack of adequate facilities was cited as the biggest challenge</td>
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<tr>
<td>Study details, aims and/or objectives</td>
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<td>Reference: Mugomeri 2018. The efficacy of infection prevention and control committees in Lesotho: A qualitative study</td>
<td>Method: Qualitative</td>
<td>Study setting: Lesotho</td>
<td>WHO IPC core components</td>
<td>IPC committees were largely ineffective in preventing surgical site infections and other HAIs and complying with other infection prevention guidelines. Barriers such as time constraints, inadequate funding, poor IPC policy implementation support, role uncertainty and financial disincentives were identified. IPC governance underpins the efficacy of IPC programs.</td>
</tr>
<tr>
<td>Aims: To evaluate the effectiveness of IPC committees in Lesotho with an aim of identifying barriers.</td>
<td>Ethical considerations: Approved by the Institutional Review Board of National University of Lesotho and Ethics committee of the Ministry of Health of Lesotho. Permission sought from relevant hospital authority. KIs interviewed through written informed consent.</td>
<td>Sample recruitment: 16 participants who were members of the hospital IPC committees, hospital administrators or MoH officials were purposively selected</td>
<td>Implementation: Implemented through the quality assurance office in the MoH through terms of reference which focus on SSI and antimicrobial stewardship, HAIs and TB. IPC committees at all healthcare facility but differ according to level of the health facility</td>
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<td>Data Collection: Key Informant Interviews</td>
<td>Data Analysis: Grounded Theory</td>
<td>Adaptation: Not mentioned</td>
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## Appendix IV: AXIS tool: Quality assessment for cross-sectional studies

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<td><strong>Introduction</strong></td>
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<td>1. Were aims/objectives of the study clear?</td>
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<td><strong>Methods</strong></td>
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<td>2. Was the study design appropriate for the stated aim(s)?</td>
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<td>✔</td>
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<tr>
<td>3. Was the sample size justified?</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>N/A</td>
<td>✔</td>
<td>✔</td>
<td>N/A</td>
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<tr>
<td>4. Was the target/reference population clearly defined? (Is it clear who the research was about?)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>N/A</td>
</tr>
<tr>
<td>5. Was the sample frame taken from an appropriate population base so that it closely represented the target/reference population under investigation?</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>N/A</td>
<td>✔</td>
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<td>N/A</td>
</tr>
<tr>
<td>6. Was the selection process likely to select subjects/participants that were representative of the target/reference population under investigation?</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>N/A</td>
<td>✔</td>
<td>✔</td>
<td>N/A</td>
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<tr>
<td>7. Were measures undertaken to address and categorise non-responders?</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>N/A</td>
<td>✔</td>
<td>✔</td>
<td>N/A</td>
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<tr>
<td>8. Were the risk factor and/or outcome variables measured appropriate to the aims?</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>9. Were the risk factor and outcome variables measured correctly using instruments/measurements that had been trialled, piloted or published previously?</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>10. Is it clear what was used to determined statistical significance and/or precision estimates? (e.g. p-values, confidence intervals)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
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<tr>
<td>11. Were the methods (including statistical methods) sufficiently described to enable them to be repeated?</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td><strong>Results</strong></td>
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<td>12. Were the basic data adequately described?</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
<td>✔</td>
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<tr>
<td>13. Does the response rate raise concerns about non-response bias?</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>N/A</td>
<td>DK</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>14. If appropriate, was information about non-responders described?</td>
<td>N/A</td>
<td>N/A</td>
<td>✔</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>15. Were the results internally consistent?</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
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<tr>
<td>16. Were the results presented for all the analyses described in the methods?</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td><strong>Discussion</strong></td>
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<tr>
<td>17. Were the authors' discussions and conclusions justified by the results?</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
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<tr>
<td>18. Were the limitations of the study discussed?</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td><strong>Other</strong></td>
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<tr>
<td>19. Were there any funding resources or conflicts of interest that may affect the authors' interpretation of the results?</td>
<td>NO</td>
<td>DK</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>20. Was ethical approval or consent of participants attained?</td>
<td>✔</td>
<td>✗</td>
<td>✗</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
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Appendix V: Quantitative tool used for before and after studies: quality assessment

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</thead>
<tbody>
<tr>
<td>1. Was the study question or objective clearly stated?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>2. Were eligibility selection criteria for the study population</td>
<td>X</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>NR</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>pre-specified and clearly described?</td>
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<td>3. Were the participants in the study representative of those who</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>NR</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>✓</td>
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<td>would be eligible for the test/service/intervention in the general or</td>
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<td>clinical population of interest?</td>
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<tr>
<td>4. Were all eligible participants that met the pre-specified entry</td>
<td>CD</td>
<td>CD</td>
<td>✓</td>
<td>CD</td>
<td>✓</td>
<td>NR</td>
<td>✓</td>
<td>CD</td>
<td>CD</td>
<td>CD</td>
<td>CD</td>
<td>CD</td>
<td>✓</td>
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<td>criteria enrolled?</td>
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<tr>
<td>5. Was the sample size sufficiently large to provide confidence in the</td>
<td>CD</td>
<td>CD</td>
<td>✓</td>
<td>CD</td>
<td>✓</td>
<td>NR</td>
<td>✓</td>
<td>CD</td>
<td>CD</td>
<td>CD</td>
<td>CD</td>
<td>CD</td>
<td>✓</td>
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<td>findings?</td>
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<tr>
<td>6. Was the test/service/intervention clearly described and delivered</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>consistently across the study population?</td>
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<tr>
<td>7. Were the outcome measures pre-specified, clearly defined, valid,</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<td>reliable, and assessed consistently across all study participants?</td>
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<tr>
<td>8. Were the people assessing the outcomes blinded to the patients'</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>NR</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>✓</td>
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<tr>
<td>exposures/interventions?</td>
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<tr>
<td>9. Was the loss to follow-up after baseline 20% or less? Were those</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>CD</td>
<td>CD</td>
<td>✓</td>
<td>CD</td>
<td>CD</td>
<td>✓</td>
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<tr>
<td>lost to follow-up accounted for in the analysis?</td>
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<tr>
<td>10. Did the statistical methods examine changes in outcome measures</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>from before to after the intervention? Were statistical tests done that</td>
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<tr>
<td>provided p-values for the pre-to-post changes?</td>
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<tr>
<td>11. Were outcome measures of interest taken multiple times before</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
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<td>the intervention and multiple times after the intervention (i.e., did</td>
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<td>they use an interrupted time-series design?</td>
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<td>12. If the intervention was conducted at a group level (e.g., a whole</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
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<td>hospital, a community, etc.) did the statistical analysis take into</td>
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<td>account the use of individual-level data to determine effects at the</td>
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<td>group level?</td>
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<tr>
<td>TOTAL SCORE RATING</td>
<td>50%</td>
<td>58.30%</td>
<td>75%</td>
<td>50%</td>
<td>75%</td>
<td>66.70%</td>
<td>66.70%</td>
<td>50%</td>
<td>50%</td>
<td>58.30%</td>
<td>58.30%</td>
<td>41.70%</td>
<td>66.70%</td>
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<tr>
<td>RISK OF BIAS</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate</td>
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267
# Appendix VI: CASP tool qualitative research: Quality assessment for qualitative studies

<table>
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<tr>
<th>Reference</th>
<th>CASP Question</th>
<th>Mandyata et al. 2017</th>
<th>How valuable is the research?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Was there a clear statement of the aims of the research?</td>
<td>Yes</td>
<td>The research is relevant, especially in developing countries where disease surveillance is still way off the required standards because of a multitude of challenges. This research, therefore, tries to generate evidence that would be useful if surveillance is to be improved in developing countries</td>
</tr>
<tr>
<td></td>
<td>Is the qualitative methodology appropriate?</td>
<td>Yes</td>
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<td></td>
<td>Was the research design appropriate to address the aims of the research?</td>
<td>Yes</td>
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<td></td>
<td>Was the recruitment strategy appropriate to the aims of the research?</td>
<td>Yes</td>
<td></td>
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<td></td>
<td>Was the data collected in a way that addressed the research issue?</td>
<td>Yes</td>
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<td></td>
<td>Has the relationship between researcher and participants been adequately considered?</td>
<td>No</td>
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<td></td>
<td>Have ethical issues been taken into consideration?</td>
<td>Yes</td>
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<td></td>
<td>Was the data analysis sufficiently rigorous?</td>
<td>Yes</td>
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<td></td>
<td>Is there a clear statement of findings?</td>
<td>Yes</td>
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<tr>
<td>Mugomeri 2018</td>
<td></td>
<td>Yes</td>
<td>The research is relevant especially in developing countries. It address the dearth of research in infection prevention. It is one of the few studies that has been conducted on the WHO core components other than hand hygiene.</td>
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Appendix VII: University ethical approval

Dear Andrew,

**HLS/NCH/18/031 Understanding the implementation process of infection prevention and control (IPC) guidance at health facility level in Uganda**

The Nursing Department Research Ethics Committee has reviewed the application and reached the following decision.

**Ethical approval is granted**

The ethics committee wishes you every success with the project.

Regards

Signature redacted

**Ben Parkinson** MSc, PGCert (TLHE), BN, RNMH, TCH, FHEA
Lecturer in Nursing / Ethics Chair for Nursing and Community Health
School of Health and Life Sciences
Normal working hours 9am-5pm Monday to Friday

T: +44 (0)141 331 3114 | E: ben.parkinson@gcu.ac.uk
Room A515 Govan Mbeki Building

Glasgow Caledonian University, Cowcaddens Road, Glasgow, G4 0BA,
Scotland, United Kingdom
Appendix VIII: Local institutional ethical and administrative approval in Uganda

Appendix redacted
Appendix IX: National registration and clearance

Appendix redacted
Appendix X: Participant information sheet and consent form

Study title
Understanding the implementation process of infection prevention and control guidance at health facility level in Uganda

Invitation to take part
You are being invited to take part in a PhD research study to be conducted at your health facility. Before you decide whether or not you would like to participate, I would like to explain to you why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or if you would like more information.

What is the purpose of the study?
This is a study being carried out by Andrew Owen Kalule for his PhD studies supported by his supervisory team (Dr. Lesley Price, Dr. Caroline King and Prof. Kay Currie). This study seeks to understand how you implement infection prevention and control guidelines and which factors influence your decisions about using infection control guidelines in your line of work in order to improve healthcare infection control practices. The findings of this research will inform development of better implementation strategies tailored for similar healthcare settings. Better implementation of this will help reduce healthcare associated infections, improve antimicrobial usage and register health gains for the people of Uganda as well as save associated costs incurred by both the government and patients.

Why have I been invited?
You have been invited to take part in this study because your valuable work as a frontline healthcare worker at a hospital or health centre which constantly involves making personal decisions on the use of infection control guidance. Because of this, we believe you have a valuable perspective on the study topic.

Do I have to take part?
Participation in this study is voluntary and you are under no obligation to take part. You are being asked to read this information sheet and decide whether or not you are interested in taking part.

What will I have to do if I take part?
You will be asked to sign a consent form to indicate your agreement to participate. You will then be interviewed (face-to-face) by the student at an agreed time convenient to you and the interview will be audio-recorded. During the interview you are not expected to respond to any questions that you do not want to answer. You will be compensated with 20,000 ug sh for your time and 5,000 ug sh towards any airtime costs you may have incurred.

What are the possible benefits of taking part?
In taking part you will be able to share your experience in using infection prevention and control guidance in your line of work which will provide useful insights into factors influencing guideline implementation. The information you provide will also inform development of better
implementation strategies tailored for similar settings which will help reduce healthcare associated infections, improve antimicrobial usage and register health gains for the people of Uganda.

**What are the possible disadvantages and risks of taking part?**
The disadvantage of taking part in this study is the impact on your time. It will take approximately 1 hour to conduct the interview. There are no known risks to participation.

**What happens when the study stops?**
Written reports of the study findings will be available through publications. However, if you wish, a copy of the report can be requested from Andrew Owen Kalule, using the contact details provided below.

**What if there is a problem?**
If you have a concern about any aspect of the study or the way you have been dealt with, please contact Andrew Owen Kalule, who will do his best to answer your concerns. If you remain unhappy and wish to discuss this with the other members of the research team or an independent member of staff at Glasgow Caledonian University, please see below for contact details.

**What will happen to the information that you give?**
All data will be anonymised during transcription and will be held securely using a doubled password protected electronic file. Data will be destroyed in conjunction with the University policy. Information is being processed on the basis of Article 6(1)(e) of the General Data Protection Regulation performance of a task carried out in the public interest, which states that 'processing is necessary for the performance of a task carried out in the public interests or in the exercise of official authority vested in the controller'.

**Will my taking part be kept confidential?**
Yes. All information that is provided by you during the course of this study will be kept strictly confidential. The responses that you provide will be treated in confidence. All your personal information will be stored securely in accordance with the General Data Protection Regulation (2018), Data Protection Act 2018 and Data Protection and Privacy Act of Uganda (2019) and only accessed by members of the research team. Names and contact details will be stored securely in an encrypted electronic file on a double password protected computer provided by Glasgow Caledonian University to the lead investigator. Only the lead investigator and the supervisory team will be able to access this data and it will be destroyed after the study has been completed. Any identifiable information about you (i.e. name and email address) will be stored separately from the audio recording and transcript of your interview to preserve your anonymity. Identifiable information will be used for the sole purpose of making contact with you and will not appear in any documents or in the final report.

You have the right to ask us to stop using your data and can do this by contacting the lead investigator. Enquiries relating to Data Protection should be made to the University's Data Protection Officer (DPO) at dataprotection@gcu.ac.uk. If you complain about how your information has been handled and are dissatisfied with the response from the University, you have the right to lodge a complaint with the following offices and organisations.
1. Information Commissioner’s Office (ICO): Information Commissioner’s Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF; email: casework@ico.org.uk, Telephone: +44 (0) 303 123 1113.

2. Mbale Regional Referral Hospital, Research Ethics Committee. P.O Box 921, Mbale (U). Phone +256 (0) 414671 162 | +256 (0) 393 280 584. Email: mrrhrec@gmail.com

3. Prof. Peter Olupot-Olupot, Chairperson, Mbale Regional Referral Hospital, Research Ethics Committee. P.O Box 921, Mbale. Tel: +256 (0) 772 457 217. Email: polupotolupot@yahoo.com

4. Uganda National Council for Science and Technology. Plot 6, Kimera Road, Ntinda . P.O.Box 6884, Kampala Uganda, Telephone: +256 414 705500 / +256 414 234579. Email: info@uncst.go.ug

What will happen if I don’t want to carry on with the study?
You can change your mind about participating even after agreeing to take part. You can withdraw from the study at any time during the interview without giving a reason and with no adverse consequences.

Who is organising and funding the study?
The study is being funded through a combination of a project grant and Glasgow Caledonian University funding. Your data will be stored securely at Glasgow Caledonian University for 6 years (end of project + 5 years) in compliance with the Joint Information Systems Committee (JISC) Records Retention Schedule for Higher Education, adapted by Glasgow Caledonian University.

What will happen to the results of the study?
The audio-recording of your interview will be transcribed word for word and analysed by the researchers along with the transcripts of other participants’ interviews. At the end of the study, a thesis will be compiled. The results will also be published in academic journals and presented at academic conferences. You will not be identified in the reports, publications, or presentations.

Who has reviewed the study?
The study has been reviewed and approved by the Glasgow Caledonian University School of Health and Life Sciences Ethics Committee, Mbale Regional Referral Hospital Research & Ethics Committee and government authorisation from the Uganda National Council for Science and Technology.

Further information and contact details
You can get more study information or discuss the project with the research team.

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<th>Lead investigator (PhD Student)</th>
<th>Director of studies</th>
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<td>Mr. Andrew Owen Kalule</td>
<td>Dr Lesley Price</td>
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<tr>
<td>School of Health and Life Sciences</td>
<td>School of Health and Life Sciences</td>
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<td>Glasgow Caledonian University</td>
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<td>E-mail: <a href="mailto:l.price@gcu.ac.uk">l.price@gcu.ac.uk</a></td>
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<tr>
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Consent Form

Name of Researcher: Andrew Owen Kalule

Healthcare-worker Face to Face Individual Interview

Please put your initials in box

1. I confirm that I have read and understand the information sheet dated 01st April, 2019 (Version 1) for the above study. I have had the opportunity to consider the information and ask questions, and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time during the interview without giving any reason and without any adverse consequences.

3. I understand that that my participation will be digitally-recorded and transcribed, I give my permission for this. The information I provide will be kept confidential and my identity will be kept anonymous.

4. I understand that the information I provide will be analysed for research purposes and that the results will be published in reports and academic journals and presented at academic conferences; however, it will not be possible to identify any participant from this.

5. I agree to take part in the above study.

_____________________________________________________________________
Name of participant          Date    Signature
_____________________________________________________________________
Name of researcher taking consent          Date    Signature
Appendix XI: District Health Office clearance

Appendix redacted
Appendix XII: Deciding on whom to interview first

Memo: 29.09.2019: Deciding on whom to interview first
With the necessary approvals and access permissions in place, the next decision is to decide which people to interview first. Therefore this memo serves as the first memo in this study and aims to detail how a decision was made. As this is the first memo, I am not yet confident in my ability to write memos, but I believe this will improve with time.

The decision process hasn't been easy, and I believe this will continue evolving. This process involved going through the Uganda National Infection Prevention and Control Guidelines of 2013, firstly, to understand how infection prevention and control is structured in the context of the Uganda Health System (a lot of prior reading was done about the Uganda Healthcare system). These guidelines established that IPC is organised in such a way with committees at different levels. The National Infection Committee at the ministry of health is responsible for developing policies and implementing the entire IPC policies. Below are different committees: an IPC committee at regional referral hospitals and general hospitals at healthcare centre IV and healthcare centre III. However, the committee at health care centre IV provides an oversight role in the implementation of IPC policies at Health care centre III. Representatives of HCIII and II sit on committees of HCIV. Having looked through the composition of IPC committees at each level, potential participants were shortlisted as shown below;

**Mbale Regional Referral Hospital**
- Nursing officer - doubles as the Infection Control Nurse and secretary to the committee
- Hospital Administrator
- Nursing Assistants
- In charge of Nursing Sciences
- Ward representatives
- Theatre assistants

**Busiu Health Centre IV**
- In charge
- Nursing Officer
- Infection Control Nurse - doubles as the secretary to the committee
- Theatre assistant
- Clinical officer
- Nursing assistants
- Representative from HCIII

**Nakaloke Health Centre III**
- Representative to HCIV IPC committee
- HCIII in-charge
- Nursing assistants

At Mbale Regional Referral Hospital, the Nursing officer, who also doubles as the ICN, has been thought of as the first contact. The decision here was based on the fact that this person would be knowledgeable about the research area and would be a good source of information for the initial interview.

At HCIV, the infection control nurse (ICN) would be the first contact as they would be knowledgeable about the research area. However, since HCIII has a representative to the IPC committee at HCIV, a decision was made not to interview any of these for initial interviews, but it would be useful to interview in the proceeding interviews if the theory leads us in that direction.

The above decisions are not set in stone, as thinking around whether nursing assistants, who are the main applicators of this guidance, would be the better alternative is still ongoing. Additionally, the practical modalities, especially to do with the participants' time and convenience, would be considered once the data collection process kicks off.

**Memo: 01.10.2019: Further decisions on who to interview first**
This memo is the second memo on this research journey. It follows up on memo 001/29.09.2019 that discussed decisions on who to interview first.

Following a discussion with the supervisory team, it was decided first to focus on and interview participants from Mbale Regional Referral Hospital. The consensus was that this was the main hospital in the area with all departments and would provide insightful
data, to begin with. Regarding who to interview first, a decision was made to interview as many people on the hospital IPC committee as possible. However, care should be taken to avoid interviewing everyone on the committee as there will be limited time. Current thinking in this round of data collection is to interview 3 doctors or physician assistants, 3 registered nurses and 3 nursing assistants. However, this should be dictated by theoretical sampling.
Appendix XIII: Interview guide

I will introduce myself, remind the participants about the study and answer any questions they may have about the study before beginning the individual interview. The questions provided in here are broad questions meant to act as a guide with changes anticipated following theoretical sampling procedures as the methodology dictates (Charmaz, 2014)

[Objective 1: To understand how healthcare workers make meaning of IPC guidelines]
1. Can you tell me about yourself and your role at this facility?
2. Could you tell me about infection prevention and control and what this means to you?

[Objective 2: To understand how healthcare workers make decisions regarding the use of IPC guidelines].
3. In your role how do you go about infection prevention and control?
4. Are you aware of any infection and prevention and control guidelines?
   a. Could tell me about any that you are aware of?
5. How do you make decisions about which IPC guidelines to follow or use?

[Objective 3: To identify factors that influence healthcare workers’ decisions regarding the use of IPC guidelines].
6. What factors influence your decisions about the use of IPC guidelines – what helps or hinders you in using IPC guidelines?

Finishing the interview: Thanks for your time. Have you any questions, further points to highlight
Appendix XIV: Revised interview guide following initial analysis

Individual Interview Guide

I will introduce myself, remind the participants about the study and answer any questions they may have about the study before beginning the individual interview. The questions provided in here are broad questions meant to act as a guide with changes anticipated following theoretical sampling procedures as the methodology dictates (Charmaz, 2014).

**Objective 1: To understand how healthcare workers make meaning of IPC guidelines**
1. Can you tell me about yourself and your role at this facility?

2. Could you tell me about infection prevention and control and what this means to you?

**Objective 2: To understand how healthcare workers make decisions regarding the use of IPC guidelines.**
3. In your role how do you go about infection prevention and control?
   - Tell me more how do you go about it what you do?

4. Are you aware of any infection and prevention and control guidelines?
   - Could tell me about any that you are aware of?

5. How do you make decisions about which IPC guidelines to follow or use?
   - Who do you discuss with?
   - How are you involved?

**Objective 3: To identify factors that influence healthcare workers’ decisions regarding the use of IPC guidelines.**
6. What factors influence your decisions about the use of IPC guidelines – what helps or hinders you in using IPC guidelines?

Finishing the Interview: Thanks for your time. Have you any questions, further points to highlight

- How do you discuss guidelines
- How does your experience affect how you follow these guidelines
- Anything else that occurred to you during this cut
Individual Interview Guide

I will introduce myself, remind the participants about the study and answer any questions they may have about the study before beginning the individual interview. The questions provided in here are broad questions meant to act as a guide with changes anticipated following theoretical sampling procedures as the methodology dictates (Charmaz, 2014)

[Objective 1: To understand how healthcare workers make meaning of IPC guidelines]
1. Can you tell me about yourself and your role at this facility?

2. Could you tell me about infection prevention and control and what this means to you? 
   - How do questioners get down from committee level to ward level?

[Objective 2: To understand how healthcare workers make decisions regarding the use of IPC guidelines]
3. In your role, how do you go about infection prevention and control?

4. Are you aware of any infection and prevention and control guidelines?
   a. Could tell me about any that you are aware of?

5. How do you make decisions about which IPC guidelines to follow or use?

[Objective 3: To identify factors that influence healthcare workers’ decisions regarding the use of IPC guidelines]
6. What factors influence your decisions about the use of IPC guidelines – what helps or hinders you in using IPC guidelines?

Finishing the interview: Thanks for your time. Have you any questions, further points to highlight?
Individual Interview Guide

I will introduce myself, remind the participants about the study and answer any questions they may have about the study before beginning the individual interview. The questions provided in here are broad questions meant to act as a guide with changes anticipated following theoretical sampling procedures as the methodology dictates (Charmaz, 2014)

[Objective 1: To understand how healthcare workers make meaning of IPC guidelines]
1. Can you tell me about yourself and your role at this facility?
2. Could you tell me about infection prevention and control and what this means to you?

[Objective 2: To understand how healthcare workers make decisions regarding the use of IPC guidelines]
3. In your role how do you go about infection prevention and control?
4. Are you aware of any infection and prevention and control guidelines?
   a. Could tell me about any that you are aware of?
5. How do you make decisions about which IPC guidelines to follow or use?

[Objective 3: To identify factors that influence healthcare workers’ decisions regarding the use of IPC guidelines]
6. What factors influence your decisions about the use of IPC guidelines – what helps or hinders you in using IPC guidelines?

Finishing the interview: Thanks for your time. Have you any questions, further points to highlight

- How does support from other organisations influence your implementation of IPC guidelines?
- Can you give me examples of how organisations and how they helped?
- How does support from hospital management influence your decision?
- How does working together influence how you implement guidelines?
Appendix XV: Reflective field notes

FIELD NOTES ON INTERVIEW 2

This interview was with a more senior staff of the facility. Because of this, she was very busy and came late for our scheduled interview. The interview kicked off about 2 hours late as she advised me to first go see another nursing officer.

The interview went well as the participant was quite knowledgeable. I felt I was more confident this time. However, it felt rushed. The participant seemed to want it done quick as she had another appointment.

Because of this, I was able to ask enough follow-up questions and the interaction wasn’t as thorough as the first one.

I must say I didn’t do thorough analysis from my first interview although was able to follow-up some questions I had wanted to explore some questions that arose from my previous analysis.
The interview was great. The research participant was willing to give a lot of information. The participant did most of the talking in the interview. However, it's important to note that the participant of reticent at first before the interview. However, during the interview, she was very receptive and very cooperative. This far, this has been the best interview.
INTERVIEW 1

This interview was also done with a doctor. This is the second interview I have conducted with a doctor. But the similarity in the interviews is glaring. In both cases they participants didn't seem to have enough time and were rushing through the interview.

This particular interview/doctor had patients to see and allocated a specific amount of time. Most of their answers were brief as they were keen to get the interview done and back on with their work.

Lesson learnt - How should I get more information from doctors given the limited time. How can I adjust my interview techniques for similar participants?
Appendix XVI: NVivo program used for data storage, organisation and analysis
Appendix XVII: Examples of mind-maps and diagram sketches used

**PROCESS OF IMPLEMENTATION AT HEALTH FACILITY LEVEL**

- **IDI (Other Organisations) Government**
  - Provide training
  - Provide materials
  - Provide Supervision

- **Hospital Management**
  - Requisition for materials and resources
  - Administrative decisions

- **IPC Committee**
  - Day to day activities
  - Audits
  - Organise assessments
  - Meetings
  - IPC decisions

- **Ward In-Charge**
  - Implementation at ward level
  - Trainings to staff at ward level
  - Feedback from IPC committee to ward staff
  - Ensure daily IPC practices

- **Everyone else**
  - Expected to put in practice whatever has been agreed on
Appendix XVIII: Examples of initial memos after each interview

Memo: 12.11.2021: Pool of resources involved in implementation

Memo: 13.11.2019: Understanding the role of doctors in implementation
From this interview, the process of implementation comes to life. The findings from the previous and this interview show that implementation goes through a system collection of actors, at the top are the Gout and organizations like IDI that provide guidance, training, and mentor supervision. The next actors are the Hospital management who provide administrative role and order for materials required. The IPC Committee is responsible to the day-to-day activities like conducting audits, organizing...
### Appendix XIX: Initial codes

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<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Ability to call on another department</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Absent National IPC committee</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Adaptation of guidelines</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Administration has dilemmas</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Adaptation influenced by prior training</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>And of course they come here around to also see how best they can help or what precautions</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Availability of expertise</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Becoming a tradition</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Being able to understand the guidelines</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Being accountable</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Being advocates</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Being an advocate</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Being aware of guidelines</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Being exemplary</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Being in charge</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Being let down by other colleagues especially those under ones supervision</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Being sure</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Being the mother</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Being too busy</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Big hospital huge population density</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bringing the public into the picture of infection prevention</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Appendix XXI: Initial codes grouped into focussed codes of meaning

<table>
<thead>
<tr>
<th>Category</th>
<th>Code(s)</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Initial Codes</strong></td>
<td>- failing, change, being ready, being active, identifying</td>
<td>- being involved, being valued, being respected, being chosen, being heard, being informed, being included,</td>
</tr>
</tbody>
</table>
Back to code

Playing a role → Playing a role

Making decisions

Enabling/Implementing
Fostering implementation
Working together
Organising the environment

Focusing on guidelines
Understanding IPE
Being aware of guidelines
Making decisions
Acquiring information

Navigating hurdles
Encountering hurdles (caution, avoidance)

Manoeuvring

Back to my open codes, and after re-arranging them, these four categories are developed, i.e. playing a role, enabling/advancing, making decisions and manoeuvring.

Manoeuvring happens when you encounter a challenge or plan for a challenge way before encountering it.
Appendix XXII: Theoretical memos

Some theoretical codes to ponder on:
1. Binary
   a. Binary Retreat
      - Binary reconstruction
2. Asymptote
   - Getting as close as possible but never getting there
3. Balancing - Theoretical Code in line to understand complexities
   - What are the decision points and how do you approach them? What is the easiest way to get there?
   - What is the reason for decision-making processes? But when these decisions are made, what is the ultimate goal?
   - How can we move towards the theoretical concept?
   - Balancing is making do or accommodating to the best of our guidance.

What are the causes of making do?
- Constant challenge
- Maneuver
- Advancing

Memes - coherence
- More-than-making do

Making do is an emerging theoretical abstraction through which healthcare workers ensure that they provide prevention, protection, and control.

One of ways of making do is through maneuvering. Maneuvering may happen in two ways:
1. By xaving around the challenge for example, through dishonesty or compromising.
2. Collision avoidance, which involves coming up with solutions before encountering challenges such as delegation of duties, etc.
UNDERSTANDING THE IMPLEMENTATION PROCESS OF IEC GUIDANCE AT HEALTH FACILITY LEVEL IN UGANDA
**Manoeuvring**

- When does manoeuvring occur?
  - 1. During lack of materials
  - 2. During delay in delivery of materials
  - 3. During work overload

- How does manoeuvring occur?
  - 1. Testing patients to injury
  - 2. Keeping some materials for testing day
  - 3. Testing students to help out
  - 4. Delegation of chores

**What are the Consequences of Manoeuvring?**
- Better implementation
- Adaptation of guidelines

**Kinds of Manoeuvring:**
- Material adherence + materials + adapting
- Steady turning around on obstacles
- Circling

**Consequence of Manoeuvring:**
- Frustration among patients

**Confrontation:**
- Making more mistakes
- Working together

**Phenomenon of Manoeuvring:**
- Testing students to injury

**Action Strategies:**
- Navigating hurdles

** Potentially:**
- There is a challenge and you go around it. For example, difficulty in some guidelines than you adapt
- Communication avoidance: For example, avoid running out of materials
- Circles
Making Do: The process of making do

- ADVANCING
  - Individual level
  - Organisational level

- PLAYING A ROLE
  - Identifying self
  - Taking Responsibility

- MANOEUVERING
  - Collision Avoidance
  - Turning

Model 4: Integrating making sense

- Making Do
- Making Sense
  - Appraisal of situation
  - Action
    - Maneuvering
    - Advancing

Objective sense intended
Personal relevance/significance
Appendix XXIII: Memos demonstrating different conceptualisation models during different stages of analysis

BALANCING COMPLEXITIES IN THE IMPLEMENTATION OF IPC GUIDANCE

In executing their duties, health care workers recognise the need for delivering safe health care. However, in implementing the required infection prevention and control guidance, they are faced with a series of challenges that range from lack of resources, busy schedules, lack of support, among others. As such, they are forced to juggle through these complex situations through playing their necessary roles. These roles involve first by identifying themselves for example as a nurse or a doctor or a member of IPC committee. After identifying themselves, they take responsibility.
Striving
  /\        /
 / Maneuvering \\
/  \        \
+--------------+
| Collision Avoidance | Turning |
|                  |        |
+--------------+    |
             | Organsational level |
             |    |    |
             | Advancing |
             |    |    |
             | Individual level|
             |    |    |
             | Making Do |
             |    |    |
             | Making sense |
             |    |    |
             | Advancing |
             |    |    |
             | Manouevering|
             |    |    |
             | Playing a role|
             |    |    |
             | Making Do |
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