

**GUIDELINES FOR FOSTERING HAND HYGIENE COMPLIANCE AND
INFECTION CONTROL AMONG HEALTHCARE WORKERS AT MUTOKO
AND MUDZI DISTRICTS IN ZIMBABWE**

by

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submitted in accordance with the requirements
for the degree of

DOCTOR OF LITERATURE AND PHILOSOPHY

in the subject

HEALTH STUDIES

at the

UNIVERSITY OF SOUTH AFRICA

PROMOTER: PROFESSOR S.P. HUMAN

JANUARY 2019

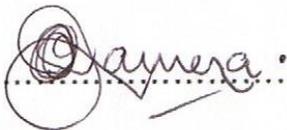
DEDICATION

To my parents, family, friends and colleagues

Student number: 606-766-2

DECLARATION

I declare that **GUIDELINES FOR FOSTERING HAND HYGIENE COMPLIANCE AND INFECTION CONTROL AMONG HEALTHCARE WORKERS AT MUTOKO AND MUDZI DISTRICTS IN ZIMBABWE** is my own original work and that all the sources that I have used or quoted have been indicated by means of complete references and that the work has not been submitted before for any other degree at any other institution.

.....


Signature

ISRAEL KUBATSIRWA JAMERA

8th January 2019

ACKNOWLEDGEMENTS

May I thank and glorify the Almighty who gave me power to study, courage to continue, strength to keep moving on and ongoing hope to complete this study through the most difficult times I have ever experienced in my life. The written Word remains forever.

The researcher is very grateful to the following individuals and institutions:

- The Executive Dean of Students, University of South Africa, for the encouragement in academic success, never to give up when one is too close to the finishing line. Thank you, Professor S.P. Human, for all your support.
- The University of South Africa community for all their support. Professor Moleki M.M. (Chairperson of the Department during the time) and Professor Havenga M. (Dean) for giving me staunch support, encouragement and readiness in guiding and sharing wisdom towards completion of this study.
- Ms Talana Erasmus: College of Health Sciences, University of South Africa, and all the librarians who worked extremely hard and tirelessly as a strong team to facilitate access to the relevant scholarly literature databases.
- Moira Mitchell and the whole librarian team in the United Kingdom, thank you for the full library services rendered throughout the study period.
- The Heads: Government and all the Health Care Institutions in Zimbabwe, I salute and honour every one of you for granting permission to conduct the study. Above all I thank the Medical Research Council of Zimbabwe with its expert Institutional Review Board (IRB) that reviewed and approved the above titled study for the two remote rural districts close to the Mozambiquean border with a tarred road that runs into Malawi and Tanzania.

- Finally, thank you everyone who contributed to the study. Mr Elliot Chikaka and Doctor Yuhua Su and Doctor Washington Karumazondo the statisticians, for assisting with data analyses and expert statistical consultancy, Doctors: - Malcolm and John Sutherland for editing the thesis as well as Professor. S. Tichapondwa Modesto for the best final editing. Thank you, John, –Eirik Docherty for printing and ring binding the thesis for examination.

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ABSTRACT

BACKGROUND

Healthcare workers' hand hygiene remains a key pillar because it prevents and controls healthcare associated infections. Healthcare Workers' hand hygiene compliance is suboptimal.

AIM

The study developed contextualised guidelines for Healthcare Workers' hand hygiene and infection control in patient care.

METHODS

The Precede-Proceed model with Theory of Planned Behaviour guided the study. The study was conducted following the mixed methodology approach, observational survey, exploratory, descriptive and contextual in nature study with mixed thematic analyses in a research wheel process.

Data were collected through direct participant observation of hand hygiene opportunities through observing (n=95 Healthcare Workers; n=570 practices). Self-administered questionnaires were used to collect data from Healthcare workers (n=189) regarding challenges they faced in achieving hand hygiene. Structured interviews were conducted with patients (n=574). Retrospective reviews of healthcare associated infections and their associated mortalities were carried out from mortality records. Data were analysed retrospectively. Partly the data were statistically and mixed thematically analysed.

Guidelines were developed using intervention alignment throughout, mapping, matching, pooling, patching and validation corroborated with Precede-Proceed models' best practices. The study was ethically reviewed and approved by University of South Africa and the Medical Research Council of Zimbabwe project numbers, 6067662 and MRCZ/B/208.

RESULTS

Hand hygiene non-compliances were mostly found in the following contexts, after touching patients' surroundings, and before doing an aseptic procedure. A non-hand hygiene compliance of Healthcare workers 167(29.3%) and compliance 403(70.7%) in context was suboptimal with sad patients and challenges faced by Healthcare workers.

CONCLUSION

Healthcare Workers had gaps in hand hygiene compliance and availability of required resources. Gaps were also noted in ongoing hand hygiene promotion educational strategies and guidelines to comply and prevent. Guidelines to enhance hand hygiene included, attend to hand hygiene strictly after touching patient surroundings, bed linen, lockers and curtains to prevent gastroenteritis; follow standard precautions against HCAs from spreading to patients'

environments; and comply with hand hygiene guidelines, policies and regulations for best practice with patients. The study contributes generalisable knowledge.

KEY CONCEPTS

Hand hygiene compliance, Healthcare associated infections, Healthcare workers, Guidelines, Precede-Proceed model, Theory of Planned Behaviour.

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List of Abbreviations

AHR	Alcohol Hand Rubs
AIDS	Acquired Immune Deficiency Syndrome
ANOVA	Analysis of Variance
APIE	Assessment, Planning, Implementation, Evaluation
ARI	Acute Respiratory Infections
ART	Antiretroviral therapy
C. diff	Clostridium difficile
CDAD	Clostridium difficile Associated Disease
CDC	Centers for Disease Control and Prevention
CDI	Clostridium difficile Infection
CDT	Clostridium difficile toxin
CI	Confidence interval
DMO	District Medical Officer
DNO	District Nursing Officer
EHT	Environment Health Technician
ESBLs	Extended-Spectrum Beta-Lactamases
GLM	Generalised Linear Models
GMC	General Medical Council
GROS	General Register office for Scotland
HCAIs	Healthcare Associated Infections
HIV	Human immunodeficiency virus- A blood borne virus that can lead to AIDS
HIV/AIDS	System of immunoassays level named new serology due to social stigma
H1N1	Pandemic Influenza A; Virus for Swine Flu
HCW	Health Care Worker
HCWs	Healthcare Workers

xxx

HCWHHCQ	Healthcare Workers' Hand Hygiene Compliance Questionnaire
HHO	Hand Hygiene Opportunity
HHOT	Hand Hygiene Observation Tool
HPS	Health Protection Scotland
HSREC	Health Studies Research & Ethics Committee
ICHE	Institute of Continuing Health Education campus University of Zimbabwe
ICD	International Classification of Diseases as International Statistical Classification of Diseases and Related Health Problems
ICU	Intensive care unit
INICC	International Nosocomial Infection Control Consortium
IRB	Institutional Review Board
MAPP	Mobilising for Action through Planning and Partnership
MATCH	Multilevel Approach to Community Health
MHHOT	Modified Hand Hygiene Observation Tool
MDR	Multi Drug Resistant
MIT	Massachusetts Institute of Technology
MOH & CW	Ministry of Health and Child Welfare Zimbabwe
MRCZ	Medical Research Council of Zimbabwe
MRSA(BSI)	Methicillin Resistant Staphylococcus aureus Blood Stream Infection
NGOs	Non-governmental organisations
NHS	National Health Service (United Kingdom)
NICD	National Institute of Communicable Diseases
NICE	National Institute for health and Care Excellence
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
ORS	Oral Rehydration Solution
OSHA	Occupational Safety and Health Administration
PATCH	Planned Approach to Community Health

PCR	Polymerase-Chain Reaction
PPHHAPQ	Perceived Promotion Hand Hygiene Among Patients Questionnaire
PMD	Provincial Medical Director in Zimbabwe
PRECEDE	Predisposing, reinforcing enabling constructs in educational, ecological diagnosis and evaluation (Acronym)
PROCEED	Policy, regulatory and organisational constructs in educational and environmental development (Acronym)
POST	Parliamentary Office of Science and Technology is an office of both Houses of Parliament (United Kingdom) charged with providing independent and balanced analyses of public policy issues.
QUAN	Quantitative- dominant
QUAL	Qualitative- dominant
Quan	Quantitative-not dominant
Qual	Qualitative-not dominant
SAS/STAT	Statistical Analysis Software version
SARS	Severe Acute Respiratory Syndrome
SPSS	Statistical Package for Social Sciences
SSIs	Surgical Site Infections
SSS	Salt Sugar Solution
T5	Tally sheet number 5
UK	United Kingdom
UN	United Nations
UNISA	University of South Africa
USA	United States of America
USD	United States of America dollar
WHO	World Health Organization
WHOCC	World Health Organization Collaborating Centre

ZINWA Zimbabwe National Water Authority

CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

The study presents an examination of hand hygiene compliance and infection control among Healthcare workers (HCWs) in the Mutoko and Mudzi districts, remote rural areas in Zimbabwe. The phenomena are investigated in the context of set goals and purpose related contextual attributes guided by Precede-Proceed model and Theory of Planned Behaviour. This chapter provides an introduction as well as giving an overview of the entire study that concerns factors contributing to guidelines for fostering hand hygiene compliance and infection prevention and control among HCWs in the Mutoko and Mudzi districts in Zimbabwe.

1.2 BACKGROUND INFORMATION ABOUT THE RESEARCH PROBLEM

The background is in the context of the Mutoko and Mudzi districts in Zimbabwe. This study is guided by the Precede-Proceed model that means Predisposing, reinforcing, enabling constructs in educational, ecological diagnosis and evaluation as one acronym and Policy, regulatory and organisational constructs in educational and environmental development as the other acronym coupled with the Theory of Planned Behaviour. This theory considers intentions as plans of actions, intentions to do or not to do in view of the attitudes of the HCWs to patients. These intentions are the result of an attitude leading to behaviour (Ajzen, 2005 in Polit & Beck, 2014:138). These are applied to address the research questions and objectives.

Hand hygiene is the simplest and yet the most efficacious means of preventing and controlling health care-associated infections (HCAIs) in healthcare settings

(Damani, 2012:140; Gould & Drey, 2013b:88). The position taken by Starling (2005:4) is that hygiene particularly hand hygiene, initiatives have been effective in preventing and managing HCAs but that a culture of cleanliness needs to become more embedded amongst HCWs. Experts suggest that 15–30% of HCAs could be prevented by effective application of best practice. However, according to Seville, Chevret and Valleron (1997:84) using a mathematical model, they approximated that if the prevalence of *Methicillin Resistant Staphylococcus aureus* (MRSA) colonisation was 30% where no hand hygiene is practised this would be lowered to 22% if HCWs' hand hygiene compliance reached 40% and the infection level could be lowered to 20% if hand hygiene compliance was 60%. The development of new antibiotics cannot keep pace with the continuing mutations among infectious microorganisms and viruses and their growing resistance. Furthermore, HCWs face difficulties in complying with hand hygiene practices, which are needed in order to lower HCAs rates and the spread of antimicrobial resistance (WHO, 2009b:5). According to al Kadi and Salati (2012:1) hand hygiene is the single most cost-effective method for preventing infection transmission.

According to Haralambos, Holborn, Chapman and Moore (2013:885), people's consciousness enables them to effectively construct real meanings from off their surroundings by their experiences through their own human senses' inherent realisation abilities. Human beings, in inhabiting their own contexts are able to express this in dialogues, in textual and spoken words as well as through other lexicological languages or signs, such as music and poems. They do so to express their experiences, feelings, perspectives and expectations of own lives, including naming and classifying HCAs that hand hygiene compliance prevent and controls. However, according to Serrant-Green (2007:3) researchers examine and understand people's experiences and expectations by exploring the different socio-cultural contexts experienced by the individuals, communities and organisations in real health care settings rather than in laboratories.

Making sense of the real world is performed not only by presenting findings from the natural perspectives of individual participants, but also by embedding the social contexts of experience and expectations within the research process. There is a role for a researcher, on the one hand, to protect the participants' human rights and also to understand HCWs' hand hygiene compliances *vis-a-vis* infection control and prevention by considering a variety of opinions and viewpoints (Serrant-Green, 2007:3). The role of the researcher is to maximise the positives that could be achieved through a risk benefits ratio; that is, to do no harm to the participants who are the sources of the information to be collected as data and to uphold all ethical considerations, in this context using Precede-Proceed model and in the real health care settings as operationalised. Furthermore, people do not react automatically to external stimuli as positivists claim; instead they interpret the meaning of a stimulus before responding to it in their own way as they see fitting with respect to their own values. (Haralambos *et al.*, 2013:885). Kilpatrick, Hosie and Storr (2013:16), and Storr and Kilpatrick (2013:12) concur that hand hygiene practices should be performed as a daily working routine valued habit of HCWs, and at the right times.

However, incorporating these into the normal life activity of the human beings' behaviour is far more complex in practice. This requires the integration of various robust interventions involving a multidisciplinary approach combined multiple variables. It requires the use of the Precede-Proceed Model, integrated with the Theory of Planned Behaviour concepts in complex organisations.

According to Green and Kreuter (2005:10); Ajzen, 2005 in Polit and Beck (2014:138) the following elements are relevant to this study as they form an integral part of the Precede-Proceed model: health educational and promotional strategies; organisational policies and regulations for HCWs behaviours for ensuring practices of hand hygiene with regards to compliance among HCWs. In addition there is predefining and reinforcing strategies to compel enablement of HCWs into complying with hand hygiene procedures; and, effecting the correct

behavioural changes towards upholding hand hygiene compliance at all times *vis-a- vis* HCAs prevention and control. According to Haralambos *et al.* (2013:885), Berger (1979:33), whatever HCWs may do in specific realities of hand hygiene and infection control, there is need to understand the interpretation of meanings and its relation to human behaviour, in addition to understanding the needs of the HCWs themselves. This is integrated within the concepts of Precede-Proceed model coupled with Theory of Planned Behaviour throughout this doctoral study. Handy (1999:14) illustrates why the study of organisational effectiveness is complex; there are numerous variables, some factors of which affect the organisational effectiveness. This is also true for HCWs' hand hygiene compliance in the healthcare settings.

The central purpose of this study is to foster Hand Hygiene compliance among HCWs in health care settings in order to improve infection control and prevention in the aforementioned two remote rural districts of Zimbabwe, using the mixed methodology approach. Fostering hand hygiene compliance among HCWs is linked to the issues of HCWs hand hygiene compliance; attitudes, skilful knowledge and actions, and also the complex nature of the organisations where they work.

Hand hygiene is considered to be the primary means necessary for reducing HCAs (WHO, 2009b:5). According to Damani (2012:140), even though the practice of hand hygiene is simple, poor compliance with such practice continues to be a persistent challenge among HCWs. This can be attributed partly to: HCWs' own lack of self - awareness, lack of motivation to practise effectively; and, lack of knowledge about the importance of complying with hand hygiene. Other reasons for poor compliance include inadequate material resources within the organisations, understaffing, inappropriately located hand-washing resources and lack of adequate hand washing facilities. On the other hand, Al -Tawfiq and Pittet (2013:374) explain that there are many factors that do contribute to low compliance in HCWs hand hygiene across and within different contexts.

Damani (2012:11) states that some health care institutions around the world are taking a “zero tolerance” approach in order to redress the problem. This is based on the premise that there are no preventable HCAs that should be tolerated at any level and that “no benchmark is good enough”.

1.2.1 The study population

The study population was derived from health care institutions in the remote rural Mutoko and Mudzi districts in Zimbabwe. Zimbabwe is situated in Southern Africa, South of the Equator in the Southern Hemisphere tropical region.

1.2.2 Target population

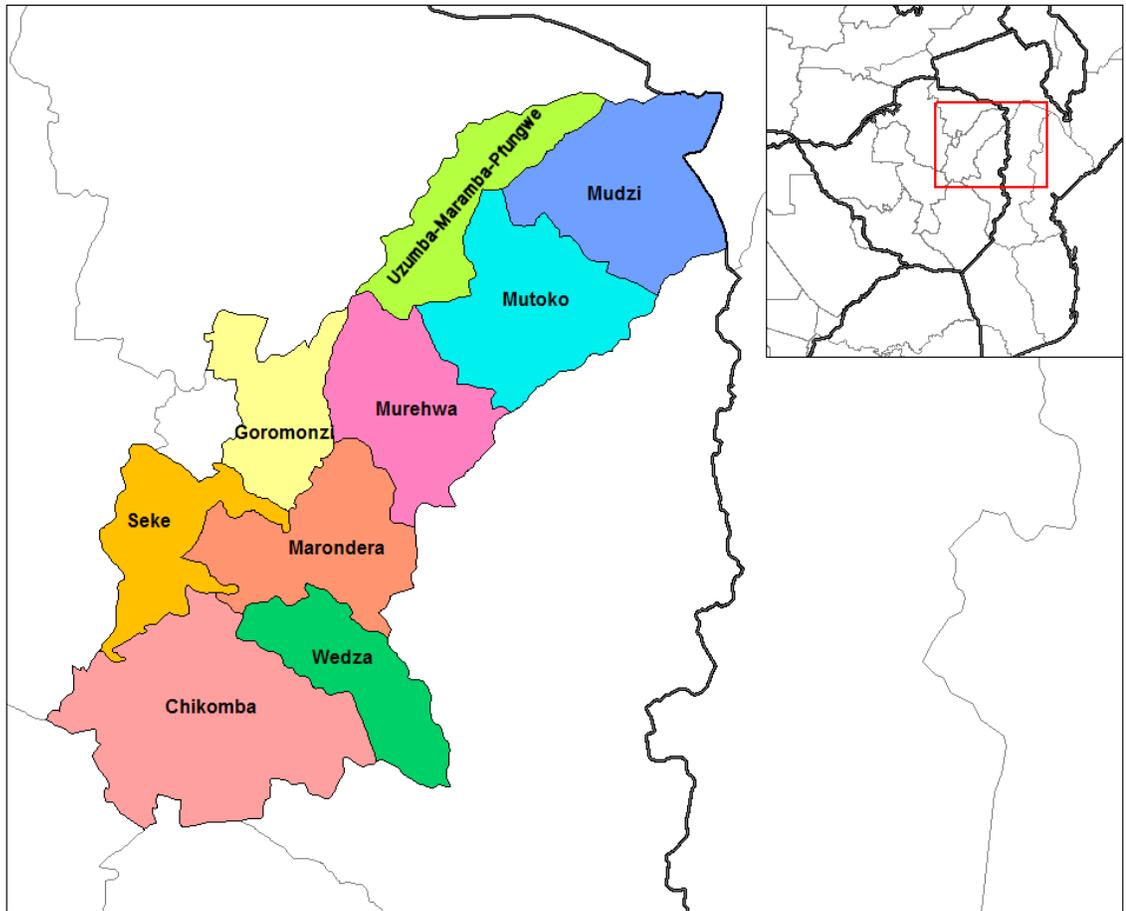
Every element, which a researcher intends to explore during the research, is known as the target population (Mulekar, Jezek and Fruh, in Hall & Roussel, 2014:65). The details of the study population will be discussed in more detail in Chapter 4 of this study. Grove, Gray and Burns, (2015:509) explain that a population contains all the elements of individuals, objects, events, or substances and may be termed the same as target population. LoBiondo-Wood and Haber (2010:222) note that a population is not restricted only to human subjects; it may consist of hospital records, blood, urine, or other specimens. In this study, health care settings, HCWs, hand hygiene opportunities, patients, and HCAs related mortalities from records, moments for hand hygiene compliance were investigated at the Mutoko and Mudzi districts health care institutions and the registrars' offices of births and deaths in Zimbabwe. The study sample is representative of the study population, representing all elements under study (Mulekar, Jezek & Fruh in Hall & Roussel, 2014:67).

1.2.3 Study sites

Entry into the settings of this study was gained by permissions, and ethical considerations within the environmental settings were upheld at all times. According to Holtzblatt, Wendell and Wood (2005:22), a contextual inquiry involves conducting field interviews with users in their workplaces while they work, in order to observe and enquire into the structure of a user's own work practices. The researcher captures the real business practice and daily activities of the people in the system, and not just self-reported practice or official policies.

The particular health care settings in the study were purposefully chosen by the researcher because of the long history of serving the population's health needs in Mutoko and Mudzi districts in Zimbabwe. The researcher has also lived and worked in the two districts for 17 years and has experiences of serving people's health needs, and is familiar with the contexts, processes and procedures.

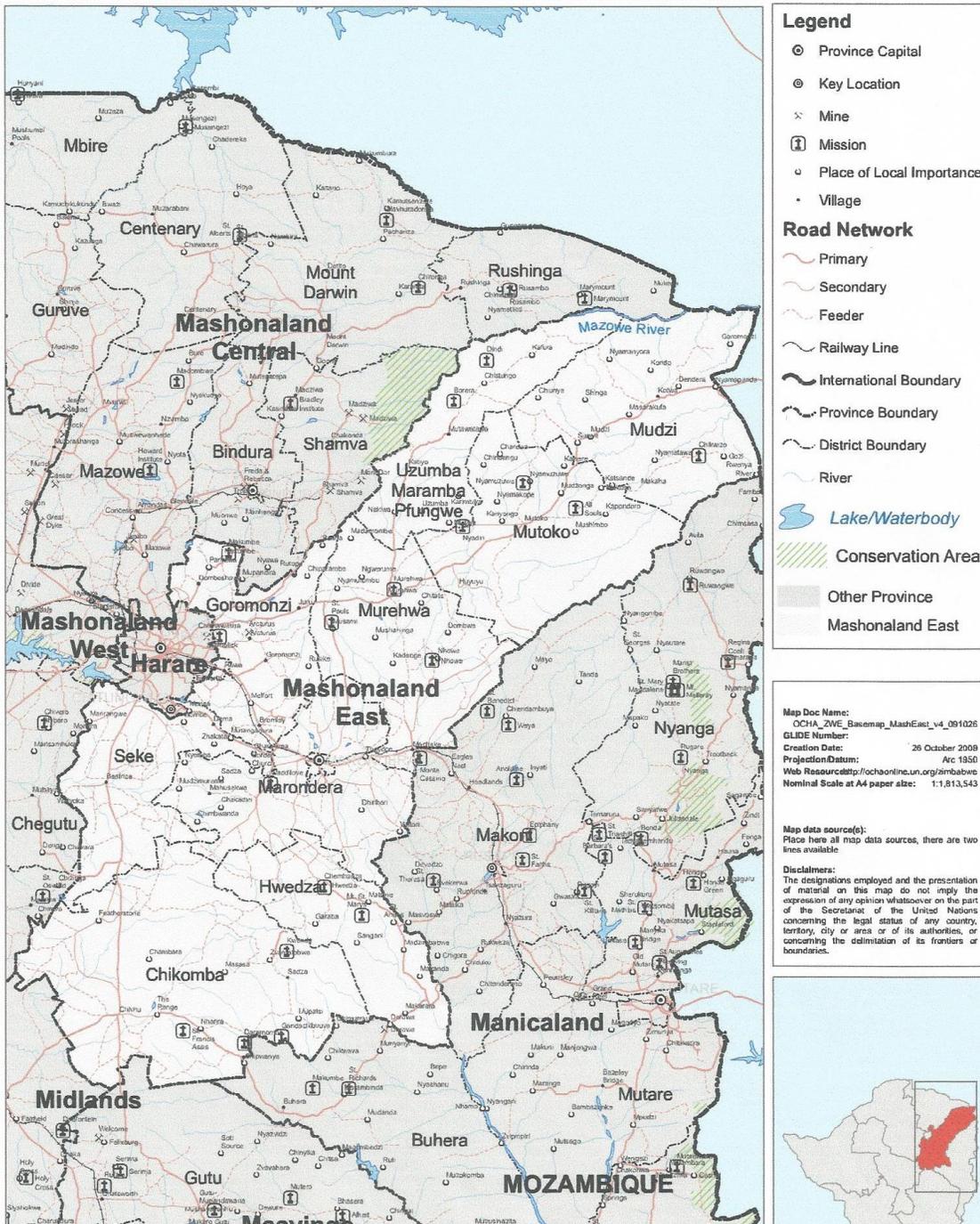
Zimbabwe is a landlocked country located in the Southern Africa Region. The country shares borders with South Africa, Mozambique, Zambia, and Botswana. Zimbabwe has ten administrative provinces including Harare and Bulawayo, the former as a capital city for the country, and the latter as a large city located 440 kilometres from Victoria Falls the town and the actual "Falls" one of the seven wonders of the world in Matabeleland North Province in Zimbabwe. The Mudzi district directly borders with Mozambique and has a border post at Nyamapanda where there is congested heavy traffic passing through to and fro. There is a main, tarred road network from Mozambique and Malawi and Tanzania that passes through the two districts to Harare, the capital city of Zimbabwe, in transit to South Africa, Namibia, Zambia, and Botswana. Figures 1.1 to 1.3 show the Mutoko and Mudzi districts in the Mashonaland East province in Zimbabwe.



https://pl.wikipedia.org/wiki/Maszona_Wschodnia#/media/File:Mashonaland_East_districts.png

Figure 1.1 Rarelibra Online. Mutoko and Mudzi districts in Mashonaland East: Zimbabwe area map

MASHONALAND EAST PROVINCE - Overview Map
26 October 2009



Legend

- ⊙ Province Capital
- ⊙ Key Location
- ✕ Mine
- ⓘ Mission
- Place of Local Importance
- Village

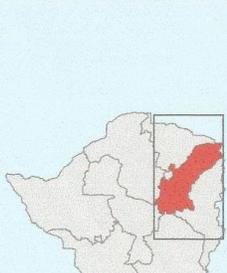
Road Network

- Primary
- Secondary
- Feeder
- Railway Line
- International Boundary
- Province Boundary
- District Boundary
- River
- Lake/Waterbody
- ▨ Conservation Area
- Other Province
- Mashonaland East

Map Doc Name: OCHA_ZWE_Basemap_Mash_East_v4_091026
 GLIDE Number:
 Creation Date: 26 October 2008
 Projection/Datum: Arc 1950
 Web Resource: <http://ochaonline.un.org/zimbabwe>
 Nominal Scale at A4 paper size: 1:1,813,543

Map data source(s):
 Place here all map data sources, there are two lines available.

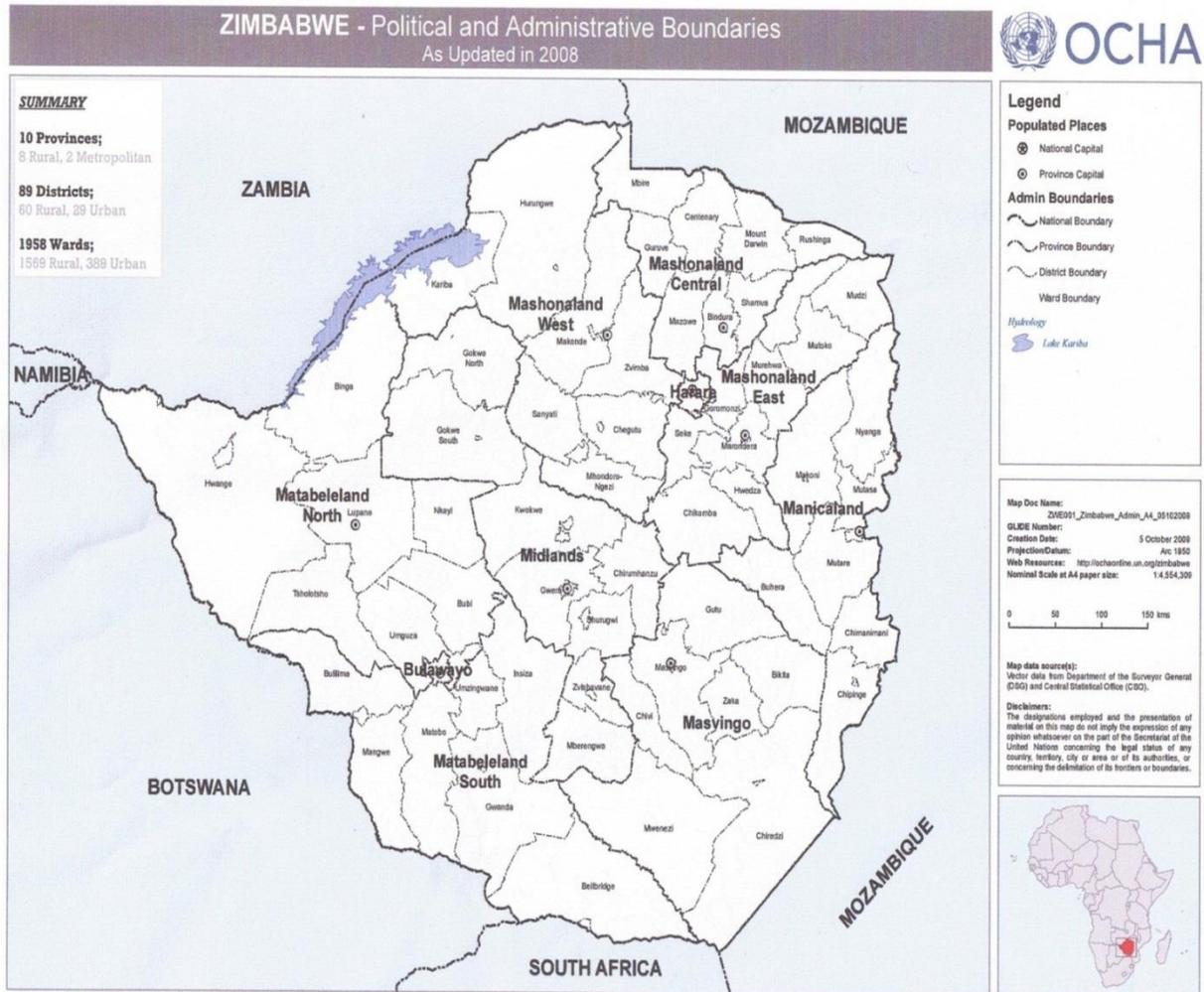
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 The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.



<https://reliefweb.int/sites/reliefweb.int/files/resources/0DACCB96D027F14785257>

[664007EDE01-map.pdf](#)

Figure 1.2 OCHA Online. Mashonaland East – Map: Overview. 2009a



<http://reliefweb.int/map/zimbabwe/zimbabwe-political-and-administrative-boundaries-05-oct-2009>

Figure 1.3 OCHA online. Zimbabwe: Political and Administrative Boundaries Map: Overview. 2009b

1.2.4 Prevalence of Healthcare Associated Infections, mortalities and costs consequences

The prevalence of HCAs is increasing worldwide, especially in developing countries, as does the rate of HCWs' hand hygiene non-compliance (Allegranzi & Pittet, 2009:305). Consequently, there are high morbidity and mortality rates associated with HCAs (Gould, Drey, Moralejo, Grimshaw & Chudleigh, 2008:194). Damani (2012:26) describes findings from a study conducted in the United States of America (USA) revealing an increase in hospital days due to some notable HCAs such as urinary tract infections (UTIs), lower respiratory tract infections (LRTIs), surgical site infection (SSIs) and septicaemia associated with intravascular devices as common HCAs. The increased hospital days are estimated as four days extra for UTIs, a week for SSIs, a week to three weeks for blood stream infections and period ranging from a week to a month for hospital acquired pneumonia.

According to the WHO (2009a:6), HCAs affect hundreds of millions of people around the world, and HCAs are a major concern for patient health and safety globally. HCAs account for an approximated 99,000 deaths every year in the USA alone (WHO, 2009a:6). In England, it has been estimated that around 5,000 people die from *Methicillin-resistant Staphylococcus aureus*' blood infections each year causing significant morbidity and mortality and have major cost implications for health care, of £1 billion annually (National Patient Safety Agency, 2008/2009:5; Agha, 2012:39). However HCAs are universal and cut across every health-care facility and system worldwide. The global burden of HCAs is unknown because of the unreliable diagnostic data especially in developing countries which justifies this study as HCAs are informative, evidence-based indicators of HCWs hand hygiene compliance in health care settings.

According to the WHO (2009b: 5), poor hand hygiene compliance rates have been reported from both developed and developing countries. Adherence to recommended hand hygiene procedures by HCWs varies substantially, with mean baseline rates ranging from 5% to 89%, and an overall average rate of 38.7%. Haas and Larson (2008: 41) reported that despite nurses and other HCWs being frequently reminded of the importance of hand hygiene in preventing infections, that poor adherence remain. CDC (2002:22) found that among all HCWs, compliance with “recommended hand-hygiene procedures” was “poor,” with baseline rates 5% to 81% and an average of 40% which leaves a gap for spreading HCAs among patients and even among HCWs themselves. This seriously compromises the health and safety of both patients and HCWs because they have high exposure risks to HCAs in contextual Zimbabwe (Haas & Larson, 2008:40; Al-Tawfiq & Pittet, 2013: 374).

1.2.5 Possible measures to improve hand hygiene

The authors Haas and Larson argue that health care settings may best improve compliance by assessing the barriers, measuring the rates of HCWs hand hygiene compliance, educating HCWs on the importance of hand hygiene, making sanitising products more available and holding staff accountable. The authors are of the view that to have sustainable improvement in hand hygiene is a joint effort that needs support of healthcare settings’ managers (Haas & Larson, 2008: 40; Haas & Larson, 2007: 6).

1.2.6 Contexts and relationships of hand hygiene and quality of care

HCAIs are acquired during direct patient contact as well as due to unhygienic environments. The infection can be transmitted from patient to healthcare provider, or vice versa. Around a third of HCAs can be controlled by reducing the spread of infection in healthcare settings (Agha, 2012:39).

1.2.7 Activities where hand hygiene is of specific importance

HCWs' hands should be properly cleaned at regular intervals including: before patient contact to stop virulent microbes spreading from unclean hands, after patient contact for HCWs self- protection from harmful microbes, after contact with patients' surroundings to stop microbes spreading in the health care environment, before aseptic tasks on patients to keep patient's health safe from infective microbes, and after exposure to body fluids to keep the environment clean from contamination by infective microbes (Fuller, McAteer, Slade, Cookson, Michie, Savage & Stone, 2009:5). Additionally, HCWs need to ensure that their hands are dried thoroughly to prevent wet hands from spreading microorganisms from one patient to another in health care environments of the institutions (WHO, 2009a:152; WHO, 2010:1).

1.2.8 Intervention strategies and measures to manage hand hygiene policies, surveillance

Prevention and intervention strategies for healthcare associated infections are based in clear policies and procedure, maintenance of equipment, regular measurement and audits of infection rates and quality control measures. Continuous education is essential in the management and control of healthcare associated infections. The surveillance of hand hygiene compliance, and performance feedback to HCWs, are critically important aspects of hand hygiene promotion (Sax, Allegranzi, Chraiti, Boyce, Larson & Pittet, 2009:827).

1.3 STATEMENT OF THE RESEARCH PROBLEM

The WHO states that “the global burden of HCAs is unknown because surveillance systems are virtually non-existent in most countries” (WHO, 2009b:2). This burden profoundly affects Sub-Saharan Africa including Zimbabwe as there are no robust surveillance systems of both hand hygiene

compliance among HCWs and surveillance for control and prevention of HCAs. Most developed countries generally have monitoring and intervention systems in place against HCAs and clearly categorise deaths caused directly or indirectly (comorbidity) by HCAs on death certificates. However, according to WHO (2009b:2) in developing countries the HCAs are a hidden danger as they are not clearly categorised and monitored for surveillance, therefore mortality rates are considered by the WHO (2009a:7) to be significantly higher than in developed countries. HCAs link closely with hand hygiene compliance of HCWs universally.

There are limited surveillance systems for HCAs and hand hygiene compliance in developing countries (WHO, 2009b:2), and that does not exclude Zimbabwe. This was found after a thorough search using various current databases to find studies or articles with respect to the surveillance of HCAs and hand hygiene compliances in Mutoko and Mudzi districts in Zimbabwe. In short the problem under investigation is HCWs hand hygiene compliance and HCAs prevention and control.

1.4 THE PURPOSE OF THIS STUDY

1.4.1 Aim of the research

The aim of this study is to establish the current state of hygiene practices, and develop guidelines to promote compliance to hand hygiene practices among HCWs, in Mutoko and Mudzi districts in Zimbabwe thereby preventing the high rates of morbidity and mortality due to healthcare associated infections.

1.4.2 Research questions

The following research questions lead to meeting the aim of the study:-

1.4.2. 1 What is the extent and nature of hand hygiene compliance

among HCWs during patient care in health care settings?

1.4.2.2 *What are the effective ways to foster HCWs hand hygiene compliance and infection control regarding patient care activities?*

1.4.2.3 *What are the key determinants of hand hygiene promotion by different categories of HCWs as perceived by patients?*

1.4.2.4 *What are the HCAs related mortalities in Mutoko and Mudzi districts?*

1.4.3 Research objectives

The following objectives are set up in order to: -

1.4.3.1 *Explore compliance of hand hygiene standards by HCWs in rural health care facilities in Zimbabwe.*

1.4.3.2 *Determine the key determinants of hand hygiene promotion by different categories of HCWs as perceived by patients.*

1.4.3.3 *Investigate HCAs associated mortalities in Mutoko and Mudzi districts.*

1.4.3.4 *Develop guidelines for hand hygiene in Zimbabwe.*

1.4.4 Hypothesis

If HCWs hand hygiene and HCAs prevention and control programme services are delivered through Precede-Proceed model concepts, compliance with hand hygiene prevention strategies will increase and healthcare associated infections and related morbidity and mortality will decrease. The associated null and alternative hypotheses are as follows:

H₀: variable X and variable Y are independent;

H_a: variable X and variable Y are not independent.

1.5. SIGNIFICANCE OF THE STUDY

This study adds to the body of knowledge in HCWs' hand hygiene compliance in the Mutoko and Mudzi contexts. The findings of the study contribute towards improving hand hygiene compliance and infection prevention and control in the two districts, in particular, and in Zimbabwe in general.

The findings will improve the databases for regulators in policy making, researchers and research bodies including the Medical Research Council of Zimbabwe (MRCZ), the Zimbabwe Ministry of Health and Child Welfare (MOH & CW), Local and Global Health Studies Departments such as the Institute of Continuing Health Education (ICHE) at the University of Zimbabwe (UZ) campus based at Parirenyatwa Hospital in the capital city of Harare. The databases will influence on further improvements in assessments, plans, and implementations as well as evaluations of Healthcare workers hand hygiene practices in the control and management of healthcare associated infections.

1.6 DEFINITIONS OF KEY CONCEPTS: CONCEPTUAL AND OPERATIONAL WORK

1.6.1 Hand hygiene compliance

1.6.1.1 Hand hygiene

Hand hygiene includes techniques of cleaning and sanitising hands from micro-organisms that can lead to healthcare associated infections (WHO, 2009a:2; 2009b:13). In this study direct observational protocol monitoring of HCWs means that hand hygiene acts were monitored by watching through eyes directly while HCWs were doing their day to day caring for the patients in context and documented using pencil and paper.

1.6.1.2 Compliance

Compliance is when a procedure or activity is undertaken and followed through to meet accepted standards, policies or procedures. In this study, the compliance is with reference to hand hygiene practices during different moments before, during and after patient contact (Black, Groves, Hucker, and McKeown, 2011:200). It was the expectation for the HCWs in Mutoko and Mudzi districts in Zimbabwe to do hand hygiene as expected standard of them by others regionally and internationally in order to prevent and control HCAs in healthcare settings.

1.6.1.3 Hand hygiene compliance

Hand hygiene compliance is a technique of thorough washing of hands for 40 to 60 seconds at the point of care: wetting hands under a running tap, applying soap, and, washing, rinsing and drying properly; or applying alcohol gel on hands and rubbing hands thoroughly for 20 to 30 seconds until they are dry. This is based on the “five moments for hand hygiene” (WHO, 2009a:100).

1.6.2 Fostering hand hygiene compliance

Fostering refers to the promotion or development of a particular factor. Promoting hand hygiene is fostering hand hygiene compliance pertaining to HCWs' hand hygiene compliance with a focus on controlling and preventing HCAs in patients and HCWs themselves (Black, Groves, Hucker & McKeown, 2011:200). In the current study, it refers to all contributing factors, which promote hand hygiene compliance among HCWs in the Mutoko and Mudzi districts' public health care settings. Factors found in the study that promote compliance to HCWs hand hygiene are used to develop guidelines for fostering hand hygiene compliance to prevent and control HCAs.

1.6.3 Health care-associated infections control

1.6.3.1 Health care-associated infections

HCAI is defined as an infection occurring in a patient during the process of health care delivery in health care settings which was not there or was incubating at the time of service delivery (WHO, 2015b:1). HCAs can affect patients in any health care setting and can also appear after the patient is discharged, and include occupational infections affecting hospital personnel. So far there is no institution or country that can claim to have solved this problem yet (WHO, 2015b:1).

1.6.3.2 Health care-associated infections control and prevention

This is a programme of HCWs. It is defined as the use of standard precautions against HCAs spreading from hands, direct contact, airborne infections, droplets infections and unsafe injection practices.

1.6.4 Healthcare Workers

This pertains to any member of staff working in a health care setting who deals with patients. These include nurses, midwives, doctors, clinical officers, health care assistants, environmental health technicians, occupational therapists, physiotherapists, domestic workers, medical and additionally students in training (WHO, 2009a:242).

1.6.5 Patient

According to Black, Groves, Hucker and McKeown (2011:744) a patient is any person a consumer of treatments or receiving health care services. Patients are people attending or using health care services in the healthcare institutions and

can be affected by HCWs' hands in transmission of HCAs. HCWs touch patients and patients' immediate surroundings including lives directly such as nurses, midwives, doctors, clinical officers, health care assistants, environmental health technicians, occupational therapists, physiotherapists, domestic workers, medical and others like healthcare students in training (WHO, 2009a:242) .

1.7 OPERATIONALISING THE PRECEDE-PROCEED MODEL CONCEPTS

The two components of the Precede-Proceed work together in conjunction to provide a continuum series of phases in assessing, planning, implementation and evaluation of the programme. The evaluation of factors for fostering HCWs hand hygiene compliance and HCAs prevention and control identified guided by the Precede component leads to mixed methodology, combining quantitative and qualitative research questions and objectives, which then become goals and targets used for the implementation phase of the Proceed component. Those goals and targets become the standards of acceptability when evaluating the success of the programme (Green & Kreuter, 2005:9). Green and Kreuter (2005:9) elaborate that working through Precede-Proceed contextualised concepts is like solving a jigsaw puzzle. However, the use of the model is an ideal re-situation of the health care settings that requires a combination of inductive and deductive logical reasoning. The researcher uses the Precede-Proceed Model to achieve the set questions and objectives to develop guidelines, which are validated using this model. These guidelines are then used to decrease the prevalence of infections and conditions due to poor hand hygiene, which would ultimately enhance the individual's quality of life (Green & Kreuter, 2005:9). Furthermore, Green and Kreuter (2005:9) emphasise that as one reviews the individual phases, one must keep in mind that they are truly parts of an ecological live planning system that depends on one another. Consequently, the Precede-Proceed model: combined with Theory of Planned Behaviour was a useful guide for directing this study from the beginning to the

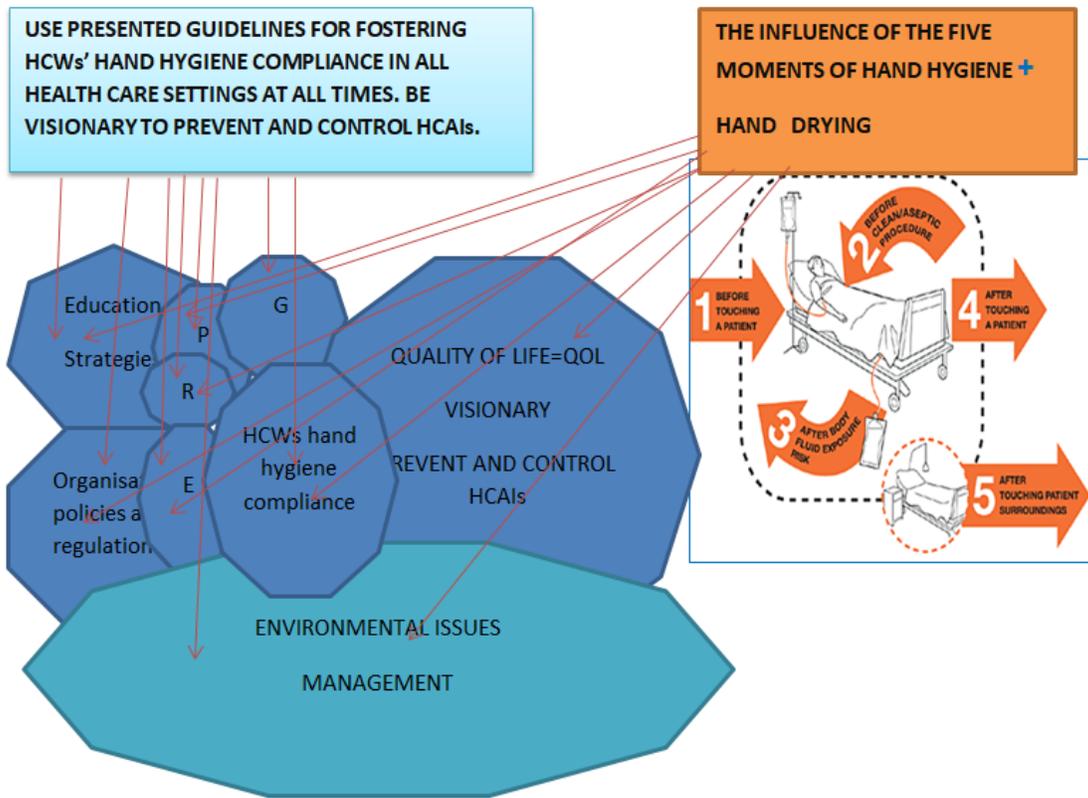
end, as it incorporates multi-disciplinary and multidimensional factors that underlie the guidelines for fostering HCWs' hand hygiene compliance (Green & Kreuter, 2005:10, Green & Kreuter, 2005 in Community Tool Box, 2018:1; Ajzen, 2005 in Polit & Beck, 2014:138).

1.7.1 How elements of guidelines and strategies integrate

Figure 1.4 shows guidelines for fostering HCWs' hand hygiene compliance with moments for hand hygiene (Sax, Allegranzi, Uckay, Larson, Boyce & Pittet, 2007: 13). Additionally, HCWs should dry hands thoroughly. Precede-Proceed model is used in this integration representing real life context (Green & Kreuter, 2005:137) where, P stands for Predisposing, R for Reinforcing, E for Enabling and G for Genetics to prevent and control infections towards the visionary quality of life.

Finally, ICD is used for reimbursement and resource allocation decision-making by countries for health and safety for all (WHO, 2015a:1). Furthermore Diercke, Beermann, Tolksdorf, Buda and Kirchner, (2018:806) state that ICD-10 even though it was endorsed in 1990 it does not always give enough additional information for analysing epidemiological data. However, HCAs such as health care associated pneumonia, catheter associated urinary tract infections and Methicillin Resistant Staphylococcal infections do not appear on the list of the 136 diseases evaluated in these reports (Lopez, Mathers, Ezzati, Jamison & Murray, 2001:1747).

Therefore use developed guidelines for fostering HCWs' hand hygiene compliance in all health care settings at all times. Be visionary as leaders to be empowered to prevent and control HCAs in specific health care contexts.



Researcher devised as adapted from (Green & Kreuter, 2005:137; Sax, Allegranzi, Uckay, Larson, Boyce & Pittet 2007: 13).

Figure 1.4 how elements of guidelines and strategies integrate to prevent and control HCAIs in contexts

1.8 INTRODUCTION TO METHODOLOGY

There are four basic elements to be taken into consideration for any research process (Crotty, 1998:4). There are four elements influencing one another namely epistemology the nature of knowledge alongside it, is ontology the nature of worldview reality, theoretical lens that informs the methodology anchoring the foundations of the study. Methodology involves philosophical assumptions (Cresswell & Plano Clark, 2011:5). Methodology means theory and analyses that determine the choice of methods, procedures, strategies and techniques that are used in generating information emanating from the chosen methods for the research process pathway. Figure 1.5 illustrates the methodology of the research process pathway followed by the researcher as emerged and the extent achieved by the researcher in integrating the research problem. Additionally research questions, objectives, timing and weight, mixing notation, sampling, data tools, data collection and data analyses are also integrated for the purpose. In this study data were collected from samples of populations being involved for which conclusions were drawn based on the study in the mixed multi –strands.

1.8.1 Research design

Lincoln and Guba (1985:41) clearly explain that research has as aim to allow data in a specific context to emerge, to flow, and unfold, rollover rather than to manipulate data in a predetermined fashion. This study followed a fixed mixed methodology approach combining qualitative and quantitative methods and ended with an emerged design. Therefore the study is naturalistic observational survey, non-experimental, exploratory, descriptive, nature study, contextual, and inferential, whereby the overall compliance with hand hygiene during routine patient care and HCAs prevention and control in the health care institutions in Zimbabwe were investigated among different categories of HCWs and in the two districts. The mixed methodology incorporating the mixed methods addresses a combination of quantitative, qualitative approaches, research techniques,

methods, concepts or language into one study or set of related studies (Johnson & Onwuegbuzie, 2004:17 in Onwuegbuzie & Combs, 2011:2). The research design establishes the problem of the study in context, conceptualisation and definitions of the study henceforth contributes to the development of guidelines for fostering HCWs hand hygiene compliance and alleviation of HCAs. Additionally the design is transformative and a multiphase strands. According to Creswell and Plano Clark (2011:64) the key four decisions involved in choosing mixed approach design is level of interaction between strands, priority of strands, timing of strands, and procedures for mixing. The researcher also considered five interwoven components when designing mixed approach study and these are: goals of the study, conceptual framework that is in this study Precede-Proceed model coupled with Theory of Planned Behaviour was utilised in context within the model, research questions, objectives, methodology that includes (mixed) methods and validity, reliability-trustworthiness issues that are operational (Creswell & Plano Clark, 2018:57). A summary of the devised and adopted emerged mixed methodology is indicated in section 1.12 of this chapter. The Figure 1.5 and Tables 1.1 to 1.4 serve as a framework for chapter 4 leading to the rest of the chapters in a succinct and coherent logical natural manner.

1.8.2 Research methods

Grove, Burns and Gray (2013:57) state that within a natural setting qualitative research allows exploration of depth, richness and complexity inbuilt in peoples' own lives in context reality cultural diversity.

In qualitative observations the researcher uses own senses as an insider-outsider; emic- etic minded human instrument to collect through the senses and mindedness and then transfer the occurrences or the constructions from the participants as sources of data on handwashing and rubs in HCWs hand hygiene compliances *vis- a- vis* infection control. According to Boyatzis (1998:4), Haralambos *et al.*, (2013:885), and Greene (2007:20) perceiving a pattern or occurrence can be providing a true picture of phenomena under study.

However the mixed approach researcher needs to manage many complexities starting with methodology that involves philosophical assumptions as background of mixing methods approach. Gather data from each strand and make meaningful inferences. Furthermore integrate the two or more strands to give a complete picture of the phenomenon under study (Baran & Jones, in Baran & Jones, 2016:292).

It is also of importance to take note that, the World Health Organization Department of Health Statistics and Information Systems document published in May 2014 estimated disability adjusted life years (DALYs). This is done by cause and sex but it does not mention HCAs (WHO, 2014:1).

When HCWs continue further research of hand hygiene compliance and HCAs prevention and control in own contexts on their own they could follow principles given in order to carry their own future evaluations in Box 1.1 below:-

BOX 1.1 THEMATIC ANALYSES GUIDELINES: CAPTURING THE CODE ABLE MOMENTS, LOGIC OF DISCOVERY AND LOGIC OF JUSTIFICATION

According to Boyatzis (1998:4) perceiving a pattern or occurrence can be considered a way of seeing then the coding of it that follows can be called seeing as like it is. The researcher first makes an observation that something worth noting is occurring. This precedes understanding; the researcher categorises or describes it which in turn precedes interpretation. This provides linkage to any or all patterns that others have observed and considered previously through literature review. In this study start with capturing the code able moments for HCWs hand hygiene compliance. Furthermore Boyatzis (1998:4) explains that purpose of it being: Perceiving- if others perceive it as just the same as researcher it is like magic, if empowered by it, becomes visionary for leadership, if disagreement occurs with the insight of the researcher it seems delusionary, a means of making sense out of seeing something as, a way of analysing qual information, a way of systematically observing an element situated in context, organisation or culture such as of HCWs' hand hygiene compliance, and a way of converting qual information into quan data by codes, categories numerals and vice versa. The above stance of transforming, transfiguring or converting information is well supported according to (Berger & Luckmann, 1979:86, Stern in Morse, 1991a:156, Boyatzis, 1998: vii, 145, Creswell & Plano Clark, 2011:69 Onwuegbuzie & Combs, 2011:5 and Ivankova, 2015:247).

In the present study the researcher observed hand hygiene practices and the nature and extent of patient contact, using an observational protocol that also serves as the checklist for assessing compliance to norms and standards. In the study, the observational survey form, in the form of a checklist is used for data coding, categorised numbered in the first qualitative (QUAL+QUAN) strand to determine the compliance of HCWs' hand hygiene. In the other strands of the study interviews will be used to determine the perceptions of patients. Self-administered questionnaires will be used to collect data from HCWs themselves on challenges faced by HCWs to comply with norms and standards of hand hygiene. Retrospective reviews of related mortalities associated with HCAs from records were conducted to determine which have a link to fostering hand hygiene compliance in health care institutions in the Mutoko and Mudzi districts. This was a multiphase design in which data obtained through the various strands were integrated and inform various stages (strands) of the study (Creswell & Plano Clark, 2011:70; Graff in Hall & Roussel, 2014:52).

The findings from the mixed methodology approach strands are utilised to interpret and discuss for deriving meanings and empower guidelines. Furthermore they are used to draw conclusions, and make inferences as well as recommendations henceforth development and presentation of guidelines for the whole study.

Moreover using the mixed methodology approach encapsulated within the Precede-Proceed model is according to Creswell and Plano Clark (2011:414) a strategy that occurred inclusive of Theory of Planned Behaviour and the model guiding the overall mixing of research approach design for the whole study. The details of the Precede-Proceed model and Theory of Planned Behaviour are addressed in Chapter 3. Data were collected using mixed methods in order to give clear, enhanced complimenting answers to the research objectives to fulfil the title and according to Creswell and Plano Clark (2011:154) to validate, corroborate and compare results for prediction because each aspect of the mixed

methods provides a part to answering the research questions and objectives. Further details are found in chapter 4.

1.8.3 Sampling

According to Yegidis and Weinbach in Lennon-Dearing and Neely- Barnes in Hall and Roussel (2014:6) studying the whole population is costly in terms of time, personnel, money and materials and therefore a portion of a given population is chosen by the researcher as a sample. However, sampling method affects representativeness of the population and generalising of results. There are two types of sampling: - probability and non-probability thereby according to Rubin and Babbie (2011:360) in probability sampling all elements of that population have an equal chance of being included in the sample. According to Creswell and Plano Clark (2011:174) nonprobability sampling deals with choosing individuals who happen to be available at the right time to be included in the sample.

The title and the purpose of the study guided in the identification of the population that comprises sampled or accessed population from which data were collected: - HCWs whose hand hygiene opportunities were considered as either compliance or non-compliance. Patients were interviewed face-to-face and from the HCWs who were on duty convenience sampled, a questionnaire with open ended questions was hand delivered, self- administered and collected in person. The data were analysed separately and then merged altogether to develop the guidelines. Associated mortalities related to HCAs from the records were also an accessed population that was reviewed retrospectively.

Therefore, the samples are the HCWs, the observed hand hygiene opportunities, the healthcare institutions in the context of settings of hand hygiene occurrences, the patients, and health care facility records including the reviewed HCAs related

mortalities from records. Further details of the sample and sampling methods are discussed in chapter 4.

1.8.4 Data collection procedure

Both qualitative (qual) and quantitative (quan) data collection strategies were applied in the mixed methodology approach (Graff, in Hall & Russel, 2014:56; Ivankova, 2015:214). In depth details of data collection procedures are found in chapter 4.

The researcher modified an instrument with evidence of having been used in the past, resulting in showing high validity, reliability and trustworthiness. Therefore the researcher used it for research process purposes (Creswell & Plano Clark, 2011:178). This is a mixed methodology approach and the instrument serves as a dual purpose of qual and quan combined. Moreover Sergi and Hallin (2011:191) are of the stance that exploration reveals that doing research is a rich, complex and multi-level mixed live experiences as true information from the participants and the researcher including the instruments took the form of a thick performance in information collection and analyses and not just thick descriptions, but also the processual nature that led into thick interpretations and discussions towards recommendations and conclusions of the study.

The study uses mixed methodology approach that involves a naturalistic observational survey and generated codified data on a form, in the first qualitative (qual+quan) strand into HCWs' hand hygiene and recording if compliance or non-compliance occurred. In the other strands (quan) structured interviews are used for collecting data from patients to fostering hand hygiene compliance; self-administered questionnaires are used to aid the collection of data from HCWs themselves; and retrospective record reviews of HCAs related mortalities data which have a link to fostering hand hygiene compliance in Mutoko and Mudzi districts health care institutions are examined. This is a

multiphase design in which strand one informs strand two and strand two informs strand three (Creswell & Plano Clark, 2011:70). According to Graff in Hall and Roussel (2014:52) this is multilevel mixed design in which data are collected from different levels of the same study simultaneously or sequentially. However Creswell and Plano Clark (2011:63) terms each level of the multiphase design, a strand and to qualify as a mixed methodology approach there should be a minimum of one qualitative strand, and one quantitative strand.

Moreover, using the mixed methods encapsulated in the mixed methodology and guided by the Precede-Proceed model is according to Creswell and Plano Clark (2011:414) a strategy that occurs inclusive of Theory of Planned Behaviour and the model guiding the overall mixing of research approach design for the whole study. However, data are collected using a mixed methodology approach in order to give clear, enhanced complimenting answers to the research questions and objectives to fulfil the title and according to Creswell and Plano Clark (2011:154) to validate, corroborate and compare results for prediction because each aspect of the mixed methodology approach plays a role in addressing the research questions and objectives with clarity from all strands. Further details are found in chapter 4.

1.8.5 Data analyses

Data analyses are done level by level separately and also in combination. However, further the findings from the QUAL, QUAN levels were utilised to interpret, discuss, draw conclusions and inferences as well as make recommendations. Onwuegbuzie and Combs (2011:2) have come up with 13 criteria used for analysing mixed data, and these are: purpose, underpinning philosophy, number of data types analysed, number of data analyses, time sequence, level of interaction, priority of analytical components, number of analytical phases, link to other designs, phase of the research process, type of generalisation, analysis orientation, and cross-over nature of analysis. In this

study data analyses were done strand by strand using the mixed methodology. According to Brink in Morse (1991a:178) analysing in this QUAL strand refers to objectification and ordering of information to make sense of the data and to writing the final report representing the true reality of the phenomena: - the core argument or question for debate and exploration, Lee (2010:52) being the contextual social construction of reality of HCWs hand hygiene compliance and HCAIs prevention and control. However, whereas data are the constructions of reality from the participants, data analyses become a reconstruction of those given constructions from the information sources (Lincoln & Guba, 1985:332).

However, according to Creswell and Plano Clark (2018:63) consider the following possibilities when analysing data that QUAN+QUAL=converge data in a convergent design. Alternatively it is possible to QUAN+qual or quan+QUAL. Regardless of the weighing on priority emphasis the overall purpose is to converge or compare results. QUAN→qual=explanatory quantitative results are for prediction as expected and for prevention and control of HCAIs. QUAL→quan= explores and generalises results from the findings. Data analyses also involved quan→QUAL. However, Johnson and Christensen (2017:477) explain that the notation system functions as a tool to explain the complex nature of the mixed methods.

With respect to this thesis, data analyses are directed towards addressing the research questions and objectives with the help of the statistician (Mulekar, Jezek & Fruh in Hall & Roussel, 2014:73). According to Grove, Burns and Gray (2013:691) data analyses are conducted to reduce, organise, and give meaning. In this thesis data were analysed and involved the use of inductive and deductive procedures and inferences, describing the study in order to provide answers to the research questions and objectives in respect to HCAIs and HCWs hand hygiene compliance. According to Lincoln and Guba (1985:333) data analyses are constructions of what emerged from participants and as an interaction with

the researcher these are reconstructed, and meaningfully interpreted and discussed to give meaning of the constructions as a new structure.

Precede-Proceed and Theory of Planned Behaviour guided the data analyses in strands. Statistical tests were done using SAS/STAT 9.2 (SAS Institute, 2009). This SAS/STAT System can be used to access data from any source such as clinical settings, perform data management, undertake statistical analysis, and then present findings in different ways such as reports and graphs in this thesis. SAS/STAT software enables evaluation of data from a variety of sources, such as health surveys (SAS Institute, 2015:1). However, according to SAS Institute Inc. (2013: 165, SAS/STAT 13.1) there are many procedures in SAS/STAT software that can be used for categorical data analyses such as was done in this study.

The data processing operation included resolution of inconsistencies and coding of open-ended questions and HCWs' hand hygiene opportunities. Hand hygiene compliance and non-compliance rates were manually calculated after data were graphically presented to recommend patterns and themes on data analyses in the QUAL strand of the study. Additionally, using the interview questionnaire tools, the patients' perception and attitudes with respect to HCWs hand hygiene compliance are assessed and collated. The findings of this are then categorically analysed. Also, HCWs challenges they faced to foster the best hand hygiene practices effectively and constantly with consistence such as lack of resources are collected and analysed. Computer data editing was also accomplished using SPSS version 16 software. SPSS is a Windows based programme. It was used to perform data entry and analyses in addition to creating tables and graphs that also involved range, median, mean, mode and standard deviation. SPSS can perform a variety of statistical analyses of large volumes of data (Georgia State University & University Library, 2015:1).

For further in-depth data analyses the statistician's input was taken into account. According to Mulekar, Jezek and Fruh in Hall and Roussel (2014:66), consulting a statistician and experienced researcher in planning research is of high importance. The rationale for consultation is that methods of data collection and data analyses depend on the type of data in the thesis and research questions or objectives. Therefore, the statistician assisted with the design of the study. However, according to Graaf in Hall and Roussel (2014:60) QUAN data can be analysed using parametric or non-parametric statistical procedures. Parametric statistics need that data meet rigorous assumptions to include interval or ratio scale measurements to be statistically analysed.

Non-parametric statistical analyses are used with nominal and ordinal scale data and do not involve rigorous assumptions as is done in parametric statistical analyses. According to Hollander, Wolfe and Chicken (2014:1) non-parametric procedures need just the ranks of the observations, instead of the actual magnitude of the observations, whereas parametric procedures require actual magnitudes to be used. This study followed the mixed methodology approach involving QUAL and QUAN data analyses that are categorically integrated.

According to Kumar (2011:292) analysed data are displayed in four ways, namely, text, tables, graphs and statistical measures. However, Mulekar, Jezek and Fruh in Hall and Roussel (2014:73) reveal three common methods in summarising quantitative data in the mixed methodology. For the collected data to be useful in making inferences they need to be summarised, and this could be in tabular, graphical, and numerical form. The results were presented in tables, bar graphs, and pie charts statistical measures and textually. However data collected could be transformed that is quantitising and or qualitising accordingly (Onwuegbuzie & Combs, 2011:5). In realism quantitising or qualitising or vice versa there is needed to understand the changing nature of programmes that is programme transfigurational morphogenesis from one state to the other (Archer, 1995:15; Boyatzis, 1998:5).

According to Berger *et al.* (1979:86) explain that the objectification of the experience in the language is its transformation into generally available objectified knowledge then this movement from one state to the other allows its incorporation into a larger body of tradition which can be generationally passed on from one generation to another. However, Ivankova (2015:247) explains that quantitised data from observations are first analysed inductively for codes, categories and thematically then assigned numbers or frequency counts thereafter the frequencies as seen as quantitised sets of data are integrated with the original QUAN data sets and statistically analysed altogether. However although numbers are assigned on data or frequency counts these characteristics remain categorical data (Mulekar, Jezek & Fruh in Hall & Roussel, 2014:71),

Data analyses were strand based to answer each research question aligned to the corresponding objective, in which the mixed analyses occur in one or more strands of the study. In mixed methodology analyses, either the qualitative or quantitative analyses, strands are given dominant status or approximately equal status for complementarity, expansion, enhancement and development (Onwuegbuzie & Combs, 2011:3).

1.9 ETHICAL CONSIDERATIONS

Permission from UNISA's Health Studies Research and Ethics Committee for Higher Education was allowed in order to collect data. In addition to that the College of Human Sciences, MRCZ and MOH & CW were clearly involved. Further details on all ethical considerations are discussed in Chapter 4 and there are also evidences included in the annexes to support the details.

1.10 SCOPE OF THE STUDY

Healthcare workers hand hygiene practices were investigated among HCWs and HCAs mortalities in the Mutoko and Mudzi districts in Zimbabwe, at four hospitals and 44 health care settings in order to alleviate the mortalities due to HCAs in the healthcare settings. Guidelines were developed for HCWs' hand hygiene compliance to prevent and control HCAs in context in the research wheel process. Retrospective records of mortality rates associated with HCAs from the registrar's mortality entries in the Mutoko and Mudzi districts were also reviewed. The researcher has devised, adopted mixed methodology framework showing how the research was actually conducted and is useful for leadership as well as audit trekkability by other researchers.

1.11 STRUCTURE OF THE THESIS

The structure of the whole thesis is summarised below. This main body of this thesis comprises of 9 chapters:

Chapter 1: Orientation to the study: introduction and serves as an overview.

Chapter 2: Literature review.

Chapter 3: Theoretical foundations of the study.

Chapter 4: Research design and methodology.

Chapter 5: Analysis, presentation and description of research findings.

Chapter 6: Interpretations and discussion of research findings.

Chapter 7: Trustworthiness, validity and developing guidelines.

Chapter 8: Presentations of guidelines.

Chapter 9: Summary, conclusions and recommendations.

1.12 SUMMARY OF THE DEvised AND ADOPTED EMERGED MIXED METHODOLOGY FRAME WORK

Details of the devised and adopted emerged mixed methodology frame work are summarised in Figure 1.5 and Tables 1.1 through 1.4 over-pages. It is provident

to present this Figure and Tables clearly outlining the strands of the study as per such a framework serves as a template for chapter 4 and exactly the same framework is used to present results in a coherent, concise and logical manner in subsequent chapters. Flow from chapter 4 to 9 is assisted in articulating the design and methods, data collection, analyses and ultimately enhance and give structure to presentation of valid trustworthy research results that lead to guidelines development.

Questions	Objectives	Time / Weight	Mixing	Notation	Sampling	Data tools	Data collection	Data analyses
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Figure 1.5 Integrating the research questions, objectives, problem, design, methods and tools for purpose

TABLE 1.1 INTEGRATING THE FIRST QUESTION, OBJECTIVES, PROBLEM, DESIGN, METHODS AND TOOLS FOR PURPOSE

Questions	Objectives	Time / Weight	Mixing	Notation	Sampling	Data tools	Data collection	Data analyses
What is the extent and nature of HCWs' hand hygiene compliance?	To explore compliance of hand hygiene standards by HCWs in rural health care facilities in Zimbabwe	Concurrent Qualitative and followed by Quantitising	Qualitative and quantitised observational Naturalistic and contextual Convergence Transformation n=95 HCWs and n=570 hand hygiene opportunities.	QUAL + QUAN	opportunistic n=95 HCWs and n=570 (doctors, nurses, nurse aides, porters, environmental health technician) Moments Bef. Pt.con Aft pt. con Aft con with pt.surr Bef.an aseptic Proc Aft body fluid expo risk Hand Drying	Researcher as participant observer observational tool/checklist with observed opportunities using data collectors as human instrument utilising the observable moments to observe the expected hand hygiene standards	hand hygiene opportunities observed from 95 HCWs , using moments of hand hygiene by strategies code, categorise and document using pen and paper the observed constructs as data	Compliance or non-compliance descriptive Analyses manual calculated using a formula to lead to Meaningful Thick descriptive interpretations and thick Discussions of the findings Validation and development of guidelines

TABLE 1.2 INTEGRATING THE SECOND QUESTION, OBJECTIVES, PROBLEM, DESIGN, METHODS AND TOOLS FOR PURPOSE

Questions	Objectives	Time / Weight	Mixing	Notation	Sampling	Data tools	Data collection	Data analyses
What are the key determinants of patients' perceived hand hygiene promotion among different categories of HCWs?	To determine Key determinants of hand hygiene promotion as perceived by patients among the different categories of HCWs	Embedded Emerging moods, feelings attitudes directed towards HCWs in context	Interviewed patients n=574 patients	QUAN → qual	Simple random n=574 patients	Interview guided	Categorical measuring attitudes and opinions of patients about HCWs hand hygiene in their own right	Contribute factors for fostering hand hygiene compliance in their own rights and contexts, experiences to be heard of as patients' expectation Descriptive and inferential Analyses Meaning, Interpretation Discussion on findings, validation and development of guidelines from patients' recommendations

TABLE 1.3 INTEGRATING THE THIRD QUESTION, OBJECTIVES, PROBLEM, DESIGN, METHODS AND TOOLS FOR PURPOSE

Questions	Objectives	Time / Weight	Mixing	Notation	Sampling	Data tools	Data collection	Data analyses
<p>What are the effective ways to foster HCWs hand hygiene?</p>	<p>To determine Key factors of hand hygiene promotions by different categories of HCWs in order to improve compliance to hand hygiene</p> <p>(i) analyse the existing practices, relevant to HCWs hand hygiene, and compare with international standards</p>	<p>Follow up explanations</p> <p>Participant sampling</p> <p>Sequential qualitative quantitative</p>	<p>Qualitative and quantified</p> <p>Connect the data with the other strands</p>	<p>qual → QUAN</p>	<p>Convenient n=189 HCWs</p>	<p>HCWs Hand hygiene compliance questionnaire</p>	<p>Categorical measuring of challenges faced by HCWs</p> <p>Measuring their perspectives self completed and all handed to researcher of HCWs and what they would recommend completely filled in data on questionnaires were collected for analyses</p> <p>Poster Data</p> <p><u>ENDORSE</u> D Unicef, Australian Aid, World Vision, Action Aid, Care, Africare, Mercy Corps and the Zimbabwean government</p>	<p>Challenges faced for thick interpretations and Meanings</p> <p>Discussions of findings, validation develop guidelines</p> <p><u>POSTER</u> Wet hands Rub soap or ash on the palms Rub palms together Rub outside hands and between fingers Rub inside hands and between fingers Rub the tips and back of fingers Rub between index thumb finger nails Rinse hands under running clean water Shake hands to dry</p>

TABLE 1.4 INTEGRATING QUESTION FOUR, OBJECTIVES, PROBLEM, DESIGN, METHODS AND TOOLS FOR PURPOSE

Questions	Objectives	Time / Weight	Mixing	Notation	Sampling	Data tools	Data collection	Data analyses
What are the HCAs associated mortalities?	Investigate in retrospect HCAs related mortalities	Convergence Transformative Multi strands Leading to generalisation of knowledge	Merge data during analyses, and combine all three strands data informing each other	<p>QUAN</p> <p>QUAL + QUAN</p> <p>→</p> <p>qual</p> <p>→</p> <p>QUAN</p> <p>Strands integrated as they informed each other in a research wheel</p> <p>=</p> <p>Explain guidelines</p>	<p>Deaths in the Mutoko and Mudzi districts</p> <p>Top ten conditions</p> <p>Health facility Statistics</p> <p>T5 health facility records Registrar's offices mortality records</p>	<p>Document analyses at Registrar of births and deaths office</p> <p>T5 tally sheets</p>	<p>Document analysis for confirmatory outcome based Descriptive statistics and inferential statistics. Also data collection to identify themes, categories and to look for connectedness among categories for particular contextualisation of interpretation of what it means in order to understand the phenomena under study</p>	<p>Categorical data analyses using SAS/STAT and SPSS software to derive Meaning Discussion of findings, Validating data Trustworthiness leading to the development of guidelines, recommendations and conclusions</p>

1.13 CONCLUSION

This chapter has provided an overview of the study, as well as providing background information on the importance of promoting compliance with hand hygiene and infection prevention and control among HCWs. This chapter has also addressed the research problem, purpose, research questions, objectives and hypothesis underpinning the study. Further, descriptions of the significance of the study, definitions of key concepts and operationalisation, as well as a review of the devised and adopted emerged mixed methods frame work, have been provided. The ethical considerations of the project have also been briefly described and will be discussed further in chapter 4. The next chapter presents the detailed literature review guided by the Precede-Proceed model concepts and Theory of Planned Behaviour.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews literature related to fostering hand hygiene compliance among Healthcare Workers (HCWs), and the prevention and control of healthcare associated infections (HCAIs). The review draws from various literature sources. According to Denzin (1989:62) deconstruction, capturing, bracketing, constructing the information and contextualising integrates the phenomena to illuminate sharpest under the investigation for scrutiny. In deconstructing the research title in concepts from the title were used, guided by Precede-Proceed model coupled with Theory of Planned Behaviour following the mixed methodology approach. The focus was to find what has been done by others in prior literature about the phenomenon under investigation (Denzin, 1989:54). So, literature review helps to identify from prior and current research international trends, significant gaps in the literature and under examined areas of research, which this study helped address related to HCWs hand hygiene practices, infection control and reductions of HCAIs. Literature review further indicates ways to improve and guide follow up research needs to effectively address particular areas of interest or where major gaps exist. Literature databases used for this thesis are Ovid EMBASE, Ovid MEDLINE search strategy, EBSCO CINHAL, Knowledge Network library search databases Scotland, University of South Africa Library databases and Google Scholar.

The literature review focussed on the following aspects: description of healthcare associated infections (HCAIs), infection control in the health care settings, health hygiene in the health care settings, methods of cleansing hands. Additionally hand hygiene, healthcare workers' overall hand hygiene compliance during patient care, hand hygiene compliance by HCWs: models of hand hygiene,

adhering to hand hygiene. Further discussed are barriers or challenges to hand hygiene compliance, methods used to evaluate hand hygiene, and HCWs hand hygiene in relation to HCAs prevention and control. The Precede-Proceed model concepts coupled with the Theory of Planned Behaviour guided this literature review linking it with the research topic, research problem, questions, objectives and purpose (Green & Kreuter, 2005:10, Green & Kreuter, 2005 in Community Tool Box, 2018:1; Ajzen, 2005 in Polit & Beck, 2014:138).

However, according to Parahoo (2014:116), literature review puts the research project in the context of what is known. The literature review exposes the strengths and weaknesses of previous studies in terms of designs and methodology, which the researcher can integrate in one's own study.

2.2 HEALTHCARE ASSOCIATED INFECTIONS

2.2.1 The global burden of healthcare associated infections

HCAIs often result in adverse and sometimes life threatening consequences (Rothe, Schlaich & Thompson, 2013:257). The WHO (2009b:2) states that, “the global burden of HCAIs is unknown because surveillance systems are virtually non-existent in most countries”. According to Gluyas (2015:40) HCAIs continue to be a challenge in both developed and developing countries. Hand hygiene compliance is considered the most effective strategy to prevent and control HCAIs, but HCWs compliance rates remain low. Gould and Drey (2013b:88) report that, hand hygiene is the most efficacious way of preventing HCAIs.

2.2.2 Prevalence of healthcare associated infections

2.2.2.1 Healthcare associated infections in developed countries

According to WHO (2009b:2) the rates of HCAs in developed countries are as follows: Canada, 11.6%; Switzerland, 10.1%; Greece, 9.3%; Finland, 9.1%; Italy, 8.3%; Cyprus, 7.9%; UK and Ireland, 7.6% and in Scotland, 9.5%; France, 6.7%; Norway, 5.1%; USA, 4.5%; and, Korea, 3.7%. WHO (2009b:2) does not specify the nature of all the types of HCAs. HCAs although include central line-associated bloodstream infections, catheter-associated urinary tract infections, and ventilator-associated pneumonia. Further examples include bacteremia, Gram-negative bacteria, *Clostridium difficile* infection, *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella* species, *Staphylococcus aureus* (*methicillin resistant*) or MRSA and surgical site infection (Goto, Ohl, Schweizer & Perencevich, 2014: 688). However, high morbidity and mortality rates are associated with HCAs across the globe due to the significant impact on the quality of life (QOL) HCAs potentially can have if they are not effectively controlled.

2.2.2.1.1 Clostridium difficile

Clostridium difficile is a gram-positive, spore-forming bacterium. It forms toxins when infection transpires. Healthcare associated *Clostridium difficile* infections in the last eight years in England have decreased by 85%. *Clostridium difficile* infection can cause diarrhoea, discomfort and distress and exposure prone to superinfections and other ill effects such as dehydration and colitis (Nazarko, 2015:20). Highest quality treatment, monitoring and care reduce these risks, improve the quality of life, reduce infection risk and enable recovery physically and psychologically (Nazarko, 2015:20).

2.2.2.2 Healthcare associated infections in developing countries

Higher rates of HCAs have been reported for the following developing countries: Albania, 19.1%; Mali, 18.7%; Tunisia, 17.8%; Morocco, 17.8%; Tanzania, 14.8%; Brazil, 14.0%; Malaysia, 13.9%; Turkey, 13.4%; Lithuania, 9.2%; Lebanon, 6.8%;

and, Latvia, 5.7% (WHO, 2009b:3). Latvia has the lowest prevalence of HCAs, followed by Lebanon. Worldwide, around 1 in 4 patients on average acquire an infection during their stay in hospital. There are at least 7 million cases of HCAs per year globally. In developing countries, the rate is usually double that of developed countries (WHO, 2009b:2). In this study it was found that Tanzania has the highest rate of HCAs prevalence, 14.8% compared to developing countries due to the lack of proper strategies, insufficient resources such as antiseptics and limited or no surveillance and monitoring programmes.

2.2.2.2.1 Healthcare associated infections and statistics for Sub-Saharan Africa

South Africa as a Southern Africa Development Committee (SADC) country has one of the highest incidences of tuberculosis (TB) in the world, which can partly be ascribed to poor infection control in primary healthcare (PHC) facilities that means centres for diagnosis, treatment and management of tuberculosis (TB) and multidrug-resistant TB (MDR TB). With a TB incidence of 834 cases per 100,000 populations, there is 61% HIV co-infection rate and 18.8% HIV prevalence among adults aged 15 to 49 years the healthcare system is overburdened. (Engelbrecht & Van Rensburg, 2013:221; Engelbrecht, Kigozi, van Rensburg, van Rensburg, 2018:1). This includes hand hygiene compliance issues among HCWs in the health care settings.

People may cough and cover their mouth with their hands but do not always decontaminate their hands as soon as possible before contact with other people. When TB is not regulated or monitored by robust infection control practices it can spread at an alarming rapid rate. This will put other people at risk of also acquiring TB. Decontaminating hands with alcohol gels has been found to be the best way to prevent the spread of TB as it is microbicidal against *Mycobacterium tuberculosis* on contaminated hands because from the contaminated hands the bacteria can be ingested with food leading to intestinal tuberculosis and if inhaled causes lung or miliary tuberculosis and if in the blood stream can affect kidneys,

bones, brain and other multiple organs dysfunctions. Alcohol has a fast speed of microbicide action on alcohol acid fast bacilli when used as alcohol gel rubs on hands of HCWs (WHO, 2009a:45).

Although it seems to be difficult to fully classify TB as a healthcare associated infection because it is mainly treated at community level, it is important that people be educated to wash their hands after coughing and in so doing stop carrying infections over to other people. Historicity suggests that according to Dormer (1948:63) explains that tuberculosis is not prevalent in Europeans of South Africa and it is not very common in Indians but the incidence is increasing in Africans. Death rate in Africans living in urban areas was 4 to 5 per 1000 population until 1939 but in 1945 it was 8. Death rates for coloured people are similar but not so high. From the year 1937 to 1947 in rural and urban Africans the incidences increased from 0.25 to 0.8% for rural based and from 1.5 to 2.3% for Africans dwelling in urban areas.

Moreover in South Africa, Dormer, Friedlander and Wiles 1943 in Oswald (1946:102) when combined the statistics for public health sector for Cape Town, Johannesburg, Durban and Port Elizabeth, show that on average tuberculosis mortalities for the Bantu for the period 1933 to 1942 was about 225 per 100,000 per annum, and for the Coloured, 385 per 100,000 per annum. Dormer's suggestions for improvement includes, housing, proper feeding nutritional-wise, induction to heavy work such as in the gold mines and industries, family life provision as well as for leisure and providing enough treatment and finally a proper policy for agriculture in the African communal lands.

According to Rothe, Schlaich and Thompson (2013:257) at the University of Malawi Medical School in Blantyre, HCAs are a very high risk to the health of both patients and HCWs as they exhibit the most profound detrimental effects on healthcare globally. Countries that have poor resources already with

overstretched healthcare system and a high burden of community acquired infections definitely suffer the effects of HCAs. The burden of HCAs in Sub Saharan Africa is not monitored and managed effectively. Similarly following the very long complex history of tuberculosis infections numerous suggestions for the burden of HCAs in Sub Saharan Africa are according to (Malotle, Spiegel, Yassi, Ngubeni, O'Hara, Adu, Bryce, Mlangeni, Gemell & Zungu, 2017:259; Engelbrecht, van Rensburg, Kigozi & van Rensburg, 2016:1; Mahomed, Mahomed, Sturm, Knight & Moodley, 2017:1; Burke, Lass, Thistle, Katumbe, Jetha, Schwarz, Bolotin, Barker, Simor & Silverman, 2014:1; Weng, Bhembe, Chiou, Yang & Chiu, 2016:1; Claassens, van Schalkwyk, du Toit, Roest, Lombard, Enarson, Beyers & Borgdorff, 2013:1; Dormer, 1948:63; Dormer, Friedlander & Wiles, 1943 in Oswald, 1946:102).

According to Uneke, Ndukwe, Oyibo, Nwakpu, Nnabu and Prasopa-Plaizier (2014:21), HCAs remain a significant hazard for patients. Maintaining hand hygiene is a fundamental action for ensuring that patients are safe in health care systems. The Uneke *et al.* (2014:21) study design was a cross sectional intervention in a Nigerian hospital. Interventions involved training; introduction of hand rub; and hand hygiene reminders. The researchers assessed the influence of interventions and hand hygiene compliance using World Health Organization direct observation (Uneke *et al.*, 2014:21).

The study of Robertson, Maruta, Mashamba, Mutsvangwa, Jubenkanda, Chasokela, Gomo and Dhliwayo (2014:5) concurs with the findings of UNAIDS Global report (2013), WHO (2013), MOH & CW (2009-2013) that respiratory infections, intestinal infections, pulmonary TB, HIV/AIDS are amongst the top ten causes of morbidity and mortality within the health status of Zimbabweans. HIV prevalence rate fell from 24.6% in 2003 to 14.7% in 2012 but 1.2 million adults and children are infected with HIV. An estimate of incidence rate of TB 552/100,000 is considered significant. Estimates of multi drug resistant (MDR)-

TB burden among notified pulmonary TB cases: 520 new cases (1.9% TB cases) and 300 retreatment cases (8.3% TB cases). TB is among the top five leading causes of hospital admission and out-patient consultation. Patients with HIV occupy up to 70% of all hospital beds in Zimbabwe; since these patients are immunocompromised they have a risk of acquiring HCAs in addition to infections that can ultimately lead to mortalities.

Following intervention strategies in Nigeria, the statistics show that hand hygiene compliance rate was 65.3%. The highest compliance rate of hand hygiene was 'after body fluid exposure' (75.3%) and 'after touching a patient' (73.6%). The least compliance rate was found in the 'before touching a patient' (58.0%) objectification. Nurses (72.9%) showed hand hygiene compliance rate significantly higher than doctors (59.7%). Hand hygiene promotions using the WHO tools and methodology can be successfully applied in a low-income healthcare setting leading to significant improvements with regard to HCWs hand hygiene compliance (Uneke *et al.*, 2014: 23).

2.2.2.2.2 Infections and mortalities in Zimbabwe

The World Health Organization Country Cooperation strategy is integrated in policies and the health system in the Republic of Zimbabwe (WHO, 2009d: 1). Healthcare policies and systems of the country are focused on planning, implementation and surveillance of healthcare performance that should include hand hygiene to alleviate the disease burden (WHO, 2009d: 3).

2.2.2.2.3 Promotion of Hand Hygiene in Developing Countries

The African region has the highest prevalence of HCAs (WHO, 2009b:3). In developing countries the reported HCAs incidence rates are questionable due to unreliable laboratory data, limited access to diagnostic facilities, and poor healthcare record keeping (WHO, 2009b:3). Zimbabwe joins the rest of the world

in commemorating yearly Global Handwashing Day every 15th of October in 2012 up to 2015 and beyond (WHO, 2015c:1). The WHO Regional office for Africa has a responsibility to promote the health of millions of people in Africa to clean hands.

2.2.3 Developed countries statistics of associated mortalities in USA and UK)

There is no one USA surveillance system that can approximate the burden of various HCAs in all healthcare settings (Magill, Edwards, Stat, Bamberg, Beldavs, Dumyati, Kainer, Lynfield, Maloney, McAllister-Hollod, Nadle, Ray, Thompson, Wilson & Fridkin, 2014:1198). Moreover on a daily basis, an estimated one in 25 patients in the USA gets at least a single infection during their hospital care. This statistic is intolerable with regard to the fact that HCAs are mostly preventable. The National and State HCAs Progress Report contains infection data which conveys progress made and the developments necessary to eradicate HCAs on a state-by-state basis (Editorial, 2015:304). Data indicate that integrating the current infection prevention strategies could lead to a 70% decrease in HCAs and savings of US\$25–31.5 billion in medical costs. Evidently however, more prevention efforts to eliminate HCAs are essential, predominantly the collaboration between hospitals, health care facilities, and US federal government (Editorial, 2015:304). HCAs are high on the list of devastating and costly illnesses as a result of the enormous clinical and economic burden they cause. Therefore, they require further research and resilient efforts to contain such a healthcare problem (Marchetti & Rossiter, 2013:1399; Gould & Grey, 2013b:88; Pawson, 2013:87).

2.2.3.1 Healthcare associated infections mortalities

According to the WHO (2009c:5) HCAs affect hundreds of millions of people around the world. HCAs account for an estimated 99,000 deaths every year in

the USA alone where 1.7 million patients are affected (WHO, 2009a:6). HCAs are common, remain a burden and an invisible danger in all healthcare institutions, against which no institution or country can yet claim any victory (WHO, 2009b:2). HCAs are estimated to affect over 1.4 million people worldwide at any one time, causing longer hospital stays, increasing health care costs, and increased mortalities (WHO, 2009a:6). Awareness of HCAs and infection control through hand hygiene guidelines and policies must be one of the key priorities in national health programmes, particularly in developing countries especially in remote rural areas (WHO, 2009a:7; McLaws, 2015:7; Mathur, 2011:611; Newitt, Myles, Birkin, Maskell, Slack, Nguyen-Van-Tam & Szatkowski, 2015:28; van Bunnik, Ciccolini, Gibbons, Edwards, Fitzgerald, McAdam, Ward, Laurenson, Woolhouse, 2015:832; Durlach, McIlvenny, Newcombe, Reid, Doherty, Freuler, Rodríguez, Duse & Smyth, 2012:217; WHO, 2009a:12).

2.2.3.2 Strategies to prevent and manage poor hand hygiene

Hand hygiene compliance helps to effectively reduce or prevent the spread of HCAs, which are a hidden unforeseen danger in the top ten causes of death in Mutoko and Mudzi districts. HCAs high prevalence such as TB causes a lot of people according to Fitzpatrick and Kazer (2011:320) to get admitted into healthcare settings for treatments. Healthcare settings are high risk environments for HCAs such as exposure to the TB for HCWs, patients, relatives, friends and family members.

2.2.3.3 Healthcare workers should have the following attributes

According to Green and Kreuter (2005:14) these attributes are what health workers should have knowledge, beliefs, attitudes, values, and skills that improve HCWs hand hygiene compliance to alleviate the HCAs in Mutoko and Mudzi districts in Zimbabwe to be ingrained in HCWs' social cultures and communities and to be in possession of experiences that created the attitudes, values and

perceptions in context. Data was obtained by the researcher from HCWs and patients regarding behaviours with regards to how patients felt at each of the moments of hand hygiene by HCWs, values and also how patients did not want their values to be violated by HCWs hand hygiene non-compliance. They would remind or not at all HCWs to wash their hands, because these are knowledgeable skills of how proficient HCWs are at hand hygiene compliances and infection control.

2.2.4 Results of poor hand hygiene to alleviate healthcare associated infections

2.2.4.1 Statistics in Canada: costs, HCWs' poor hand hygiene, and mortalities

Health spending in Canada was expected to reach \$211 billion in 2013 (compared to \$207 billion in 2012). Per person, this will be \$5,988 according to the Canadian Institute for Health Information. Overall, this proportion signifies 11.2% of Canada's gross domestic product. About 60% of the overall health spending is allocated to hospitals (30%), drugs (16%) and physicians (15%). Though it is not easy to estimate, the fraction of this spending ascribed to managing HCAs, overuse and misuse of antimicrobials and infections because of multidrug-resistant bacteria is significant. Although there are efficient strategies targeting all these aspects, large-scale was not found (Valiquette, Chakra & Laupland, 2014:71).

A hand hygiene programme is far greater than a poster campaign. For health care providers to improve their hand hygiene, cleaning hands must become part of their organisational cultural habits. It takes more interventions to change HCWs hand hygiene compliance behaviour. It is multidimensional (Public Health Ontario, 2011:5).

2.2.5 Antibiotic-resistant *Clostridium difficile* and Methicillin Resistant *Staphylococcus aureus*-related mortalities in the United Kingdom

However, when there is *Clostridium difficile* infection in a ward there is need to barrier nursing the patient in order to protect other patients from getting the infection. At the same time the patient needs to be medically team reviewed. It is of utmost importance to wash hands with soap and water, not alcohol gels (Hawtin & Hoadley, 2014:12).

Methicillin-resistant Staphylococcus aureus (MRSA) blood stream infection (BSI) is a huge healthcare burden in most healthcare settings and is linked to 10% to 20% of mortality. The mandatory reporting in England of MRSA blood stream infection was introduced in 2001. In 2004 the setting of target reductions for all National Health Service hospitals was introduced. A 50% decrease in MRSA BSI was set as a national target but this was regarded by many experts to be unachievable. Contrary to this, that goal was exceeded. The transformation from endemic to sporadic MRSA blood stream infections comprised of implementing serial national infection prevention directives, and the deployment of expert improvement teams in organisations could not meet the set improvement trajectories. In England the constituents of the major public health infection prevention campaign produced major reductions in MRSA infection. This was done to enable significant opportunities and lessons to be learnt by other healthcare systems where MRSA infection was still prevalent (Duerden, Fry, Johnson & Wilcox, 2015: ofv035).

2.2.6 MRSA and Mode of Spread

Patients at high risk for MRSA carriage have to be swiftly identified through the screening process as it is a significant component of MRSA control programmes, (a prediction tools is used to recognise those high-risk patients). The majority of risk studies previously undertaken reported a considerable number of patients

who are eligible for screening, but failed to be enrolled. The characteristics of such patients are rarely described (Pasricha, Harbarth, Koessler, Camus, Schrenzel, Cohen, Pittet, Perrier & Iten, 2013:17). The findings of the present study highlighted the potential bias that “missed” patients may cause with respect to the *MRSA* risk scores. The proportions and characteristics of missed patients must be reported as it is crucial for accurate interpretation of *MRSA* prediction tools (Pasricha *et al.*, 2013:17).

2.2.7 TB

2.2.7.1 Definition and cause

TB is an infectious disease that can affect various organs in the body, but mainly the lungs. It is caused by the alcohol acid fast bacillus *Mycobacterium tuberculosis* (Waziri, Cadmus, Nguku, Fawole, Owolodun, Waziri, Ibrahim, Biya, Gidado, Badung, Kumbish & Nsubuga, 2014:5). TB is one of the most widespread infectious diseases and is the second leading cause of death from an infectious disease globally. In 2011, there were an estimated 8.5 to 9.2 million cases of tuberculosis and 1.2 to 1.5 million deaths from the disease globally. Most of the estimated number of cases occurred in Asia (59%) and Africa (26%) (Waziri *et al.*, 2014:5). Despite the availability of efficacious treatment for decades, tuberculosis remains a major global health problem especially in resource poor nations and is threatening to re-emerge in developed nations as well (Waziri *et al.*, 2014:5).

2.2.7.2 Mode of Spread

Transmission in health care settings occurs mainly via respiratory droplets from infected patients, and therefore airborne TB needs airborne transmission precautions and airborne infection isolation (Zelman & Milne-Zelman, 2014:56). It

can spread through lymph nodes and via bloodstream to any organ of an individual (Waziri *et al.*, 2014:5).

2.2.7.3 Signs and Symptoms

Its signs and symptoms include coughing, blood in sputum, chills and fevers plus night sweats, chest pain, weight loss, and tiredness (Zelman *et al.*, 2014:136).

2.2.7.4 Infection Control Measures for TB

Infection control measures include screening of staff and of patients at risk, isolation of infected patients, hand hygiene compliance (especially use of alcohol gel rubs following coughing and sneezing etiquette), the wearing of face masks and gloves, disinfection of bronchoscopes, and urgent treatment of newly diagnosed patients (Zelman *et al.*, 2014:136). According to Zelman *et al.* (2014:56) there are three levels of control for TB as guidelines, administrative control, environmental control, and protective respiratory equipment in link with hand hygiene compliance.

During 2008–2013, a total of 68 global positioning system radio collars were deployed on African buffalo captured in Southern Gonarezhou National Park; in Northern Kruger National Park, South of the Limpopo River; and in Zimbabwe, North of Limpopo River on Sengwe communal land. Of the 68 buffalo, 47 were adult females, selected because their behavior is representative of core herd movements (Caron *et al.*, 2016: 277).

The observations confirm that bovine tuberculosis and other diseases can spread between buffalo populations across national parks, communal land and countries in view of wild life environmental health prevention and control; therefore this has a high risk to veterinary animals, human health in surrounding wild life areas and to countries' health systems (Caron, Cornelis, Foggin, Hofmeyr & de Garine-Wichatitsky, 2016: 277).

Findings strengthen the hypothesis that bovine TB was spread from Kruger National Park to Gonarezhou National Park through buffalo-to-buffalo transmission by sub-adult females that dispersed from their native herds. Buffalo populations in Kruger and Gonarezhou National Parks are connected through long-distance movements of individuals, specifically pre-breeding heifers (Caron *et al.*, 2016: 277). There is a close link between communities and communal herd, game meat, cattle milk and need for pasteurising, veterinary services and human health and hand hygiene in particular to prevent and control TB and above all HCAs in contexts.

2.2.8 *Norovirus*

2.2.8.1 *Definition and cause*

The *Norovirus* is highly contagious, and causes diarrhoea, vomiting and abdominal pain.

2.2.8.2 *Mode of Spread*

Transmission is via the faecal-oral route cycle.

2.2.8.3 *Treatment; Prevention and Control*

Due to its ill effects including loss of water and essential electrolytes, dehydration results, and the patient shall require rehydration therapy either oral as oral rehydration solutions (ORS) such as drinking salt, sugar solutions (SSS) or intravenous infusions (IVI) as treatment prescribed by the HCWs. Infection control is carried out by hand hygiene compliance, use of gloves during patient contact, environmental hygiene, use of contact precautions with incontinent patients, and disinfection of surfaces using bleach (hydrogen peroxide or sodium

hypochlorite: chlorine based chemical) and heat disinfection in instrument sterilisation (Zelman *et al.*, 2014:135).

2.2.9 HIV

2.2.9.1 Definition

HIV is a lentivirus, a subgroup of retrovirus that stimulates HIV infection. Over a period time results in Acquired Immune Deficiency Syndrome (AIDS) with CD4 cell decrease that are affected in immunity of individuals as an immune- interaction to HIV particles, giving rise to AIDS. The virus changes host immune cells, using them to spread the virus particles and cause the progression from HIV to AIDS henceforward exposure of host to opportunistic infections and cancers leading to death if individuals are not given antiretroviral therapy (Olson, Meyer, Prins, Thiebaut, Gurdasani, Guiguet, Chaix, Amornkul, Babiker, Sandhu, Porter, 2014:1; Galloway, Doitsh, Monroe, Yang, Muñoz-Arias, Levy, Greene, 2015:1555).

2.2.9.2 Cause

HIV is stimulated by human immunodeficiency viruses types 1 and 2 resulting in the adverse interaction between host cellular immunity and HIV particles leading to AIDS (Olson *et al.*, 2014:1; Galloway, *et al.*, 2015:1555).

2.2.9.3 Mode of Spread

HIV is spread via sexual contact, blood-borne exposure (such as blood transfusion, shared needles), and perinatal transmission. A hallmark of HIV at its advanced stage is immunodeficiency due to progressive reduction of CD4 cells lymphocytes. HIV infiltrates and destroys human helper T lymphocytes, which are necessary for the production of antibodies and the activation of killer T

lymphocytes (CD8 cytotoxic cells that attack and kill cells infected with viruses). HIV disease reaches an advanced stage when the CD4 T-cell count falls below 200 per microliter of blood, and renders the patient susceptible to opportunistic infections such as *MRSA* and *Pneumocystic carinii* pneumonia. Individuals with HIV are immunocompromised, therefore effective hand hygiene compliance should be rigorously undertaken to prevent the spread of HCAs, thereby protecting their body systems (Ford, Shubber, Meintjes, Grinsztejn, Eholie, Mills, Davies, Vitoria, Penazzato, Nsanzimana, Frigati, O'Brien, Ellman, Ajose, Calmy & Doherty, 2015:438; Galloway *et al.*, 2015:1555).

2.2.9.4 Prevention and Control

The consequence of this is that there is no more cell mediated immunity, and so the spread of opportunistic infections must be contained. This is another reason why hand hygiene compliance among HCWs is of a highest priority. Whether gloves are used or not, hands should be cleaned when caring for immunosuppressed patients. This is particularly crucial in the many countries worldwide that are struggling to control the spread of HIV/AIDS. Symptoms of HIV and AIDS at an early stage include flu like symptoms; recurrent opportunistic infections (including pneumocystic pneumonia), acute TB, diarrhoea, candidiasis, Kaposi sarcoma, and weight loss. Infection control measures include standard precautions; post exposure prophylaxis depends on the severity of exposure (Zelman *et al.*, 2014:133).

It is vital for HCWs to adhere seriously and strictly to hand hygiene compliance by following evidence-based guidelines to control HCAs. Compliance with hand hygiene is reported globally as the most important factor in the control of infection to patients in health care settings. Despite this, there is no standardised method for measuring compliance to hand hygiene among HCWs worldwide (Schmitz, Kempker, Tenna, Stenehjem, Abebe, Tadesse, Jirru & Blumberg, 2014:8; Contzen, Meili & Mosler, 2015:103).

2.2.9.5 Transmission of bacterial infections and mode of action

Hands are an important route of transmission of microbes and are responsible for a large proportion of cross infection. Skin is a common habitat for some bacteria such as *Staphylococcus epidermidis*-gram positive cocci, micrococci, and diptheroids. The majority of resident organisms on the skin are harmless, but they may become pathogenic if allowed to penetrate through the skin via a wound or an invasive procedure. Transient organisms that can survive for several hours on hands unless washed off include *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas*. Transient bacteria are mostly removed from the skin by washing with soap and water. Resident skin bacteria such as *Staphylococcus aureus* are best removed by rubbing the hands with a bactericidal alcoholic solution such as chlorhexidine (Davis, Sevdalis & Drumright, 2014:227; Calfee, Salgado, Milstone, Harris, Kuhar, Moody, Aureden, Huang, Maragakis & Yokoe, 2014:772).

2.2.10 Multi-drug resistant organisms in link with hand hygiene compliance and healthcare associated infections

According to the Health Protection Agency (2012:1), *ESBLs* are enzymes that can be produced by *Klebsiella pneumoniae* (*K. pneumoniae*), *Klebsiella oxytoca* (*K. oxytoca*) and *Escherichia coli*, (*E.coli*) making them resistant to cephalosporins such as cefuroxime, cefotaxime and ceftazidime, which are the most widely, used antibiotics in many hospitals globally. In light of this, hand hygiene is a cornerstone in the control of HCAs, and policy updates for microbiology specimens and hand hygiene together with *standard precautions bundle* is crucial (Shaikh, Fatima, Shakil, Rizvi & Kamal, 2015:90).

2.2.10.1 Most common bacteria that cause healthcare associated infections

Globally, the most predominant bacteria that induce HCAs are: *Methicillin Resistant Staphylococcus aureus (MRSA)*; *Vancomycin resistant Enterococci (VRE)*; *Extended-spectrum beta (β)-lactamase gram-negative organisms (ESBL)*; *Carbapenems resistant Enterobacteriaceae (CRE)*, and *Multi-resistant Acinetobacter baumannii (MRAB)*.

The development of resistance in these microorganisms has principally been caused by an inappropriate use of antibiotics in general; especially use of broad spectrum antibiotics. Additionally, the spread of MDROs in health-care settings frequently occurs predominantly via HCWs contaminated hands, contaminated items, equipment and environment. This usually results in outbreaks and severe infections particularly in critically ill patients. Therefore, it is always important to implement standard precautions for all patients to inhibit the spread of all microorganisms especially of MDROs. Hand hygiene performance with respect to recommendations is the most significant measure among standard precautions. There is evidence of hand hygiene to reduce transmission and infections by multidrug resistant organisms in health-care settings (WHO, 2013:1; Huttner, Harbarth, Carlet, Cosgrove, Goosens, Holmes, Jarlier, Voss & Pittet, 2013:4; Pittet, Allegranzi & Boyce, 2009: 616).

2.2.10.2 Antibiotics resistant threats in the USA

Antibiotic resistance threats in the USA alone are as follows as per Centres for Disease Control and prevention estimates that annually there at least two million illnesses and 23,000 deaths caused by antibiotic-resistant bacteria in the United States alone (CDC, 2013:51; Frieden, 2014:4,25). Poor hand hygiene contributes to antibiotic resistance. Therefore, behavior changes such as handwashing should be thoroughly undertaken.

2.2.10.2.1 Carbapenem-resistant Enterobacteriaceae

These species belong to the Gram-negative bacteria family. They are prominent in individuals' guts and are becoming more resistant to virtually all types of antibiotics.

2.2.10.2.2 Drug-resistant Neisseria gonorrhoeae

Gonorrhoea, a sexually transmitted disease, is becoming progressively resistant to the last type of antibiotics that currently can treat it. Less potent antibiotics have already become ineffective in treating it. Strains of the disease that are resistant to cephalosporins (a class of antibiotic drugs) have been found in many countries.

2.2.10.2.3 Multidrug-resistant Acinetobacter

Acinetobacter are a genus of Gram negative bacteria and can cause pneumonia to severe blood or infections in wounds. They were found in the US following the return home of war veterans from the Iraq and Afghanistan war. These are tough enough to survive on dry surfaces like dust particles, which enable them to pass from host to host, particularly in hospital environments.

2.2.10.2.4 Drug-resistant Campylobacter

Campylobacter is the fourth major cause of foodborne illness found in the US. Campylobacter bacteria secrete an exotoxin that is alike to cholera toxin – this is their unique characteristic.

2.2.10.2.5 Extended spectrum beta-lactamase producing Enterobacteriaceae

ESBLs are enzymes created by particular species of bacteria, which induce the bacteria to be resistant to the antibiotics used to counteract them. For instance,

ESBL-producing *E. coli* is resistant to penicillins and cephalosporins, and is increasingly being found in urinary tract infections.

2.2.10.2.6 Multidrug-resistant Pseudomonas aeruginosa

Associated to severe bloodstream infections and surgical wounds, and result to pneumonia and other complications; some are resistant to virtually all the families of the antibiotics. Occur mostly in hospitalised people with immune compromised systems leading to blood stream infections and pneumonia following surgery.

2.2.10.2.7 Drug-resistant Shigella

Shigella is an infectious disease, classically with diarrhoea, caused by *Shigella* bacteria.

2.2.10.2.8 Clostridium Difficile (C. Diff)

C. Diff can take habitat in the gut without inducing any symptoms, but attacks whenever the immune system becomes weaker; *C. Diff* cases are increasing - infections augmented by 400 percent between 2000 and 2007. *C. Diff* is becoming progressively antibiotic-resistant.

2.2.10.2.9 Methicillin-resistant and Vancomycin-resistant Staphylococcus Aureus

Gram-positive bacteria infect around 80,000 people every year, and can result to sepsis and death. They are augmenting in communities but in hospitals have been decreasing over the last 10 years; *MRSA* is also a substantial risk for pets. *Vancomycin-resistant Enterococcus* (VRE) is occurring more frequently in hospital settings.

2.2.10.2.10 Drug-resistant Streptococcus pneumoniae

This is a major cause of pneumonia, bacteremia, sinusitis, and acute otitis media.

2.2.10.2.11 Drug-resistant TB

Extensively drug resistant TB (XDR) causes a 40 percent mortality rate and is increasing worldwide. TB is one of the leading infectious diseases because it can be transmitted easily through the air when people with tuberculosis cough or sneeze.

2.2.10.3 Multi-drug resistant organisms in Nigeria in link with hand hygiene compliance and healthcare associated infections

Despite the availability of efficacious treatment for decades, TB remains a major global health problem. This is so especially in resource poor nations and is threatening to re-emerge in developed nations as well (Waziri *et al.*, 2014:5). In a study done in Nigeria Akingbade, Olalekan, Okerentugba, Innocent-Adiele, Onoh, Nwanze and Okonko (2012:38) the most common multi-drug resistance patterns included resistance to all the antibiotics tested in this study. The presence of multidrug resistant pathogens such as *Escherichia coli*, *Enterococcus species*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Staphylococcus saprophyticus*, *Pseudomonas aeruginosa*, *Candida albicans*, and *Proteus species* encountered in this study is astonishing.

2.2.10.4 Multi-drug resistant organisms in India

Multi-drug resistant organisms can easily spread from HCWs hands to patient and to other patients if hands are not fully decontaminated before touching patient, after touching patient, after touching patient surroundings, after body fluid exposure and then drying hands fully (Sunkesula, Kundrapu, Zabarsky, McKee,

Macinga & Donskey, 2015:16; Mazi, Senok, Al-Kahldy & Abdullah, 2013:15). Therefore it is important to maintain optimal hand hygiene compliance to alleviate HCAs in both medical and surgical clinical healthcare arenas.

2.2.11 Infection control in the health care settings

2.2.11.1 Prevention and control measures

According to Siegel, Rhinehart, Jackson and Chiarello in Zelman *et al.*, (2014:53), overall hand hygiene should be carried out after touching blood, body fluids, secretions, things that are contaminated, shortly after removing gloves, and when observing moments of hand hygiene. Gloves are recommended for touching blood, body fluids, secretions, excretions, things that are contaminated, for touching mucous membranes and broken skin. Whilst carrying out procedures on patients, fresh gowns should be worn when in contact with clothing, or when exposed to blood, skin, body fluids, secretions and excretions. During activities likely to produce splashes or sprays of blood, mouth and eye protection (that means that face masks and eye goggles) should be used. Face masks are also recommended for catheter insertions and during lumbar puncture procedures, to protect from body fluids splashes or sprays. Siegel *et al.* in Zelman *et al.* (2014:53) further recommend that when handling soiled patient equipment, gloves should be used if the equipment is visibly soiled, and hand hygiene procedures should be performed. Environmental standards should be maintained via cleaning and disinfecting frequently touched surfaces in patient surroundings. Laundry must be regularly washed in order to prevent transfer of microorganisms. HCWs should refrain from bending, breaking or manipulating used needles. They should use safety features if available, and place sharps in puncture-resistant bins. They should use devices that prevent contact with oral secretions in resuscitation procedures in acute care. They should prioritise single patient room use for patients who are at risk of transmission or acquiring infections due to immune system collapse. Everyone in a health care setting

should cover their mouths and noses when sneezing or coughing, dispose of tissues in foot-operated bins, and carry out hand hygiene procedures.

2.2.11.2 Hand hygiene: transmission of pathogens by hands, methods used for hand hygiene

HCWs are accountable for their own hand hygiene compliances to alleviate HCAs. HCWs responsible for patient care, have a duty to take care, and their own hand hygiene compliance must consider how often one carries out hand hygiene procedures in health care settings, depending on the risk assessments of the procedure one has just carried out, and the actions involved in the next procedure when following the moments of hand hygiene (WHO, 2009a:113; Sunkesula, Meranda, Kundrapu, Zabarsky, McKee, Macinga & Donskey, 2015:16).

Hand hygiene compliance remains a serious problem, because compliance remains low and low compliance to hand hygiene contributes in spreading HCAs, prolonged suffering of patients, and significantly increased health care costs financially (Pfoh, Dy & Engineer, in Shekelle, Wachter, Pronovost, Schoelles, McDonald, Shojania, Reston, Berger, Johnsen, Larkin, Lucas, Martinez, Motala, Newberry, Noble, Ranji, Rennke, Schmidt, Shanman, Sullivan, Sun, Tipton, Treadwell, Tsou, Vaiana, Weaver, Wilson & Winters, 2013:67). HCAs are estimated to affect over 1.4 million people worldwide, causing longer hospital stays, increasing health care costs, and increased mortalities (WHO, 2009a:6).

Furthermore HCWs should prevent and control infection by hand hygiene, nursing patients in separate rooms and using personal protective equipment. It is also important to ensuring prescribers adhere to antibiotic policies for treatment of patients, sterilisation of equipment and aseptic techniques, and lastly ensuring

environmental care such as cleaning and waste disposal (including sharps and sharps bins) (Schmitz *et al.*, 2014:8; Aziz, 2014:428).

2.2.11.3 Healthcare workers' hand hygiene to prevent and control healthcare associated infections

HCWs hand hygiene compliance prevents and controls HCAs in healthcare settings. This helps to reduce morbidity and mortalities associated with HCAs.

2.2.11.3.1 Hand Hygiene link to prevent and control healthcare associated infections

Outbreaks of HCAs are easily preventable, and hand hygiene has been shown to be the single most effective way to prevent cross transmission of microorganisms, and to prevent and control infections from patients (Gluyas, 2015:40). The role of hand hygiene is to reduce and prevent the spread of microorganisms such as TB, Clostridium difficile, methicillin resistant staphylococcal aureus (MRSA), the common cold viruses, and micro-organisms causing diarrhea and vomiting such as noroviruses in addition dysentery. According to Fuller, McAteer, Slade, Cookson, Michie, Savage and Stone (2009:3) the overall compliance is calculated as follows:

Overall compliance (%): = $\frac{\text{Number of soap + AHR behaviours}}{\text{Number of soap + Number of AHR + Number of no actions}} \times 100$

Number of soap + Number of AHR + Number of no actions

Where AHR means alcohol hand rubs.

However according to Berger *et al.* (1979:78) there is needed to understand the objective and the subjective social consciousness reality and that the institutional world (of hand hygiene) is objectivated human activity and so is every single institution. The relationship between man as the producer and the social world his product, is and remains a dialectical one that is man and his possessions and

his social world activities interact with each other. This relationship also focuses on availability of resources for HCWs to use *vis -a- vis* hand hygiene compliance in contexts to alleviate HCAs. The product acts back upon the producer. Externalisation and objectivation are moments in a continuous dialectical process. Whilst society is a human product it is also an objective reality and man is a social product. Additionally Berger *et al.* (1979:72) explain that in institutions there are further implications of historicity and control.

2.2.11.3.2 High healthcare associated infections and low hand hygiene compliance of Healthcare Workers

According to Chassin, Mayer, and Nether (2015:4) healthcare institutions and infection prevention specialists have for many years tried to achieve high levels of compliance with hand hygiene protocols. For all these efforts, hand hygiene compliance is disappointingly low. Furthermore, the authors list twenty four causes of non- compliance in the eight hospitals studied in USA (Chassin, Mayer, & Nether, 2015:8). The causes found are similar to findings listed by WHO and CDC in the literature review. It is sobering to reflect that throughout the world there are substantial HCAs incidence rates and low HCWs' hand hygiene compliance rates. Even though HCAs outbreaks can be easily prevented, many HCWs do not remain continually vigilant in terms of hand hygiene compliance. It is of essential for HCWs to follow the 'five moments of hand hygiene', by ensuring that their hands are clean before patient contact, after patient contact, after contact with patient surroundings, before an aseptic task, and after body fluid exposure risk.

HCAs prevention measures also include the correct use of personal protective equipment such as gloves, aprons, decontaminating equipment. There is also proper management of blood and body fluid spillages, protective isolation, respiratory hygiene, safe sharp practices, disposal of clinical waste, and safe

handling of linen and laundry (Ross & Furrows, 2014:4; Ellingson *et al.*, 2014:937).

TB continues to be one of the leading causes of morbidity and mortality in Zimbabwe. Incidence rates increased to 782 per 100,000 people in 2007, most likely because of HIV co-infection. However, by 2010, TB incidence rates had decreased to 633 per 100,000 persons, since various interventions such as the rehabilitation of diagnostic centres were scaled up. Despite that, the incidence of TB in Zimbabwe remains high (Zimbabwe: MDG, 2012:54).

2.2.12 Organisations

Organisations are micro-societies with values and culture in contexts, power and sources of power, communication and persuasion-politics, economics and religiosity (Handy, 1999:9). However, organisations are not objects staffed by inconvenient things called individuals easier to deal with if they were really just human resources who would be as docile as fork- lift trucks or as programmable as computers and words like strategy, structure and systems can easily deceive that if one gets those things right in the organisation the rest will follow in place (Handy, 1999:9). Organisations link with the healthcare settings of Mutoko and Mudzi districts where research title, questions, objectives are set in order to find solutions to research problem in Zimbabwe as contextualised. The research process was guided by the Precede-Proceed model with the Theory of Planned Behaviour as shown in Figures 1.4, 3.1 to 3.3 and 7.1.

Organisations need visionary leadership strategies to become more successful in ensuring hand hygiene compliance within the micro-societies full of values, culture and politico, religious and economic power as influenced by the communication systems. Organisations need the assistance of individual HCWs who have the right skills mixture and attitudes to be able to implement and deliver what the whole organisation expects in line with the hand hygiene

compliance vision as a value. Although compliance with hand hygiene is widely known to be the most important factor in controlling HCAs in patients and HCWs themselves, there is no standardised method for measuring compliance. Three common methods of hand hygiene product usage include direct observation, self-reporting, and indirect measurement (Gluyas, 2015:40; Ellingson *et al.*, 2014:937).

Practices such as surveillance, auditing and feedback, with a focus on monitoring the effectiveness of infection control practices can be implemented. Furthermore the most important part of surveillance is to make sure that the information is passed on in a timely way to those who influence practice such as HCWs, and such as organisations that make system changes and provide financial resources as well as management back-up necessary to improve outcomes (Gluyas, 2015:40; Ellingson *et al.*, 2014:937; Aziz, 2014:428).

2.2.12.1 Surveillance and control

The control of infections in health care settings is of the utmost importance. Empirical evidence on the effectiveness of admission screening for MRSA produced by the healthcare institutions in countries such as Australia, United Kingdom and Switzerland helped to pave the way for routines for screening all new patients being admitted into a health institution. All patients should be screened on admission, and if someone is identified as being at risk of infection, they must have swabs taken for further laboratory testing. High-risk patients, including those in intensive care, are routinely tested using swabbing. In cases of planned admissions for surgery, patients must be screened beforehand (Marimuthu, Pittet, Harbarth, 2014:34; Paterson, Harrison & Holmes, 2014:42; Sarma, Marshall, Cleeve, Tate & Oswald, 2013:2).

Increasing rates of HCAs in health care settings prompted the introduction of a mandatory surveillance programme for Scotland. All NHS Scotland laboratories

are required to report all cases of CDAD, from mild diarrhoea to severe cases in patients aged 65 years and over. The operational definition of CDAD is someone in whose stool *Clostridium difficile* toxin (CDT) has been identified, and who has experienced a form of diarrhoea not attributable to any other cause; or, from whom *C. diff* in stool samples has been cultured at the same time when they are diagnosed with pseudomembranous colitis (Taori, Wroe, Hardie, Gibb & Poxton, 2014:134; Marwick, Yu, Lockhart, McGuigan, Wiuff, Davey & Donnan, 2013: 2927).

2.2.12.1.1 Methods used to evaluate hand hygiene

Hand hygiene could be evaluated by direct observation of practice, monitoring hand hygiene product usage, and by the collection of data from electronic counting devices on dispensers. Additionally surveys can be used to gather information on HCWs perceptions, attitudes, and practices related to hand hygiene, as well as patients' and families' attitudes and perceptions related to the hand hygiene practices of HCWs. Furthermore assessing the thoroughness of HCWs hand hygiene also evaluates hand hygiene (WHO, 2009a: 66; Gluyas, 2015:40; Ellingson, Haas, Aiello, Kusek, Maragakis, Olmsted, Perencevich, Polgreen, Schweizer, Trexler, VanAmringe & Yokoe, 2014:937).

2.2.12.2 Infection control and safety plan elements

Several elements of a safe working environment plan need to be integrated in order to protect HCWs as employees in their occupations and patients as consumers of healthcare services. According to OSHA (Occupational Safety and Health Administration) in Zelman *et al.*, (2014:4) these elements include the following: engineering controls such as planning and designing ventilation; safe work practices by following best practices in documented procedures and standard operating procedures. Also included the use of personal protective equipment (PPE) when needed; other standard precautions; and aseptic

techniques when HCWs need to follow guidelines absolutely, written standard operating procedures, defined responsibilities, and incident reporting procedures. HCWs should also keep accurate records, and undergo inspections and training. HCWs, especially nurses, are crucial to the success of health care transformations in terms of fostering hand hygiene compliance. Immersed in the patient care experiences, nurses are well positioned to lead a system redesign that enhances access, quality and patient safety (Dearmon in Hall & Roussel, 2014:142).

2.2.12.3 Policy for the management of Clostridium difficile infection related to control and surveillance measures

According to Hawtin and Hoadley (2014:12) management of *Clostridium difficile* 027 outbreaks when patient is symptomatic with diarrhoea there is need to notify infection control team, medical team and commence on stool chart. Simultaneously carry out the following, contact precautions, barrier nurse or cohort, disinfect, cleaning and allocate equipment, antibiotic review, diligent hand washing with safe soap and water only, send stool for microscopic examination, culture and sensitivity to include *C. diff* toxin tests.

Handy (1999:142) reports on an individual's response towards any action namely: compliance, identification, and internalisation. The onus of seeing that one does what one is supposed to do remains with the initiator of influence. In internalisation the recipient adopts the idea as own, internalises it so that it becomes part and parcel of his possessions. Therefore, in this way the recipient exercises the will power in the consciousness of what one wants to do.

Compliance also brings about the question of origins of institutionalisation whereby all human activity is subject to habitualisation (Berger *et al.*, 1979:70). Any action that is repeated frequently becomes cast into a pattern which can then be reproduced with an economy of effort and by the fact itself, is

apprehended by the performer recognised as that pattern. Habituation implies that the action in question such as HCWs hand hygiene compliance may be performed again and again in the future in the same manner and with the same economical effort. Institutions or organisations also, by the very fact of their existence control human conduct by setting up predefined patterns of conduct, which channel it in one direction as against the many other directions that would theoretically be possible. Furthermore, Berger *et al.*, (1979:78) explain that the objectivity of the institutional world is a humanly produced, constructed objectivity and that internalisation by which the objectivated social world is retrojected into consciousness in the course of socialisation.

2.3 POLICIES AND STANDARDS

2.3.1 Leadership affecting healthcare workers' hand hygiene compliance

Policies and standards are set by organisations in order to determine course of actions in HCWs hand hygiene and alleviation of HCAs. Guidelines aim to streamline particular processes according to the set routine, in the organisations, on sound practice to meet the needs of the consumers of care.

Policies, procedures, protocols and guidelines usually do not have a legal standing in any court of law. Professional judgement is required and circumstances must be documented when guidelines are not entirely appropriate to be followed (Dimond, 2008:46). The same principle should apply to them all. In general they should be followed if it would be reasonable to do so (Bolam v Friern Hospital Management Committee: 1957 in Brazier & Cave, 2007:110). In dealing with standards of care considering an action of negligence is to apply the Bolam test. This comes from a case in which the judge elaborated that the standard of care expected is the standard of the ordinary skilled person exercising and professing to have that special skill. In order to establish what would be the reasonable standard of care in individual cases, expert evidence is

provided to the court of law where duty of care was owed and harm occurs due to negligence in HCWs' hand hygiene non compliance.

If the organisation has no policy or leadership models such as the leadership in five moments of hand hygiene WHO (2009a:101) with a focus to alleviate HCAs, it will be impossible to carry out surveillance on hand hygiene and HCAs. The following is an example of an effective hand hygiene policy. Alcohol hand rubs were found to be effective in cleaning hands. HCWs on duty are mainly encouraged to have bare hands below the elbows to allow hand hygiene. HCWs should wet hands under continuously running, safe, warm water, and use soap. They should position their hands so that water flows downwards away from the elbows in washing away germs to avoid contaminating the arms and hands again. When washing hands they should rub hands well together. Then they should rinse their hands thoroughly drying, preferably using paper towels (Alcohol gel rubs follow the same sequence, except that there is no need of water, soap and drying paper towels (WHO, 2009a:152; Parriot, Saint, Olmsted & Krein, 2015:S3).

To date, strategies to reduce HCAs and improving infection control practices of HCWs have focused mainly on unilateral implementation of prescriptive rules by management in the form of policies and procedures, under the misguided belief that these would promote behaviour modification. Optimising infection prevention and control and sustaining such improvements can only be achieved by optimising the behaviour of the staff employees, patients and visitors, who altogether are the organisation.

Making policy a reality, from the board room to clinical working areas in health care settings, requires strong commitment in financial management and leadership from authorities and senior managers. Consequently, it is important to undertake regular checks to ensure that compliance on issues such as hand hygiene are being met and that the guidelines are being used and feed backs

given (Parriot *et al.*, 2015:S3; Su, Hu, Rosenthal, Li, Hao, Pan, Tao, Gao & Liu, 2015:979). According to Serrant-Green (2007:3) the place in which experiences occur is an important strength of the value of society to enable service users, service providers, HCWs focusing on guidelines for fostering hand hygiene compliance and infection control, including policy makers to use research results in initiating, evaluating healthcare and social care practice.

2.3.1.1 Collected information leading to guidelines

Diagnostic data collected for the needs assessment of HCWs and the population at Mutoko and Mudzi districts were analysed and linked to the development of guidelines to meet the assessed needs of the HCWs and the community health. However according to Green and Kreuter (2005:244) there is needed to match the ecological levels of programme focus with types of guidelines as interventions theory. Furthermore, align interventions to the predisposing, enabling and reinforcing factors by mapping. Researcher mapped out what was best for HCWs in order to achieve hand hygiene practices and HCAs prevention and control, then pooled and patched in the logic model to fit in the identified gaps in the best practice literature (Green & Kreuter, 2005:244). According to Pawson (2006:26; 2013:88) guidelines, as standards of interventions in clinical practice, are theories of the HCWs hand hygiene programme nature, connecting theory driven investigations around the research wheel of evaluation science- from being best hypothesis to being a theory, guidelines are active as action verb theories with a to do something for the outcome of quality of life, guidelines chains are long and thickly populated.

In addition to the above guidelines are non-linear and sometimes go into reverse, guidelines are embedded in multiple social systems meaning that there are four layers in the context of the Precede- Proceed model (Figure 1.4) that links well with the organogram. Figure 7.1 involves the organogram and context as follows, individual capabilities, interpersonal relationships supporting the guidelines,

institutional settings, does the politico-cultural ethos and professional practice support the guidelines? And wider infra-structural system: that is, do the guidelines have political backing of the government's parliament? Guidelines are leaky and are prone to be borrowed or to borrow.

According to Crosby and Noar (2011:S7) theory is not in a static mode, it is dynamic leading to new changes, new refinements, and new improvements that increases understanding of a given phenomenon as epistemology and in this study focussing on HCWs hand hygiene compliance and infection prevention as well as control with a focus on HCAs in healthcare settings. Finally Pawson (2006:26) explains that guidelines are open systems found in every phenomenon and are all a part of the larger system open to anew circumstances henceforth guidelines are never used twice as the same in both form and context.

According to Pawson (2013:87) theories are thought provoking to research questions cast in hypotheses, investigated for the research problem in research designs and methodologies that organise data gathering and analyses allowing the hypotheses to be tested and revising anew the original theories in refinement of the continuum scientific research wheel of evaluation science. Therefore the operationalisation method of evaluation science for the guidelines for fostering hand hygiene compliance and infection prevention and control must follow the logic of scientific discovery because scientific theories are arrived at by the induction logic of discovery rather than deduction logic of justification in the mixed methodology approach thematic analyses and statistical conclusions. Data depends on the purpose and questions answered to fulfill the research objectives to find solution to the research problem. Timmermans and Tavory (2012:167) opt for abduction analyses rather than induction, as the guiding principle inferential process that produces a new hypothesis of the scientifically based theory construction to the best explanation of the reality phenomenon in contextualisation.

The guidelines are based on the findings of this study. The guidelines arose because of the conclusions drawn and recommendations made on the study. The findings were validated and corroborated using the Precede-Proceed model (Figure 7.0), (Green & Kreuter, 2005: 10), coupled with the Theory of Planned Behaviour (Ajzen, 2005 in Polit & Beck, 2014:138), as well as validated with other researchers' findings in the literature review in books and journal reports. According to the National Institute for Health and Care Excellence (NICE) (2014:108), each evidence statement should stand alone as an accessible, clear summary of key information used to support the recommendations based on conclusions derived from the study. The guidelines should ensure that the relationship between the recommendations and the evidence statements is clear, and that the guidelines are clear without cross references to other supporting matters. Guidelines should be based on the validated evidence of research, and in this study, the focus was on the guidelines for fostering hand hygiene compliance and HCAs alleviation among HCWs for patients' and HCWs safety at the Mutoko and Mudzi district health care institutions in Zimbabwe. Therefore patch in the Precede-Proceed model to fit in the identified gaps in the best practice literature (Green & Kreuter, 2005:244). Bartholomew *et al.* (2015:365) express the same viewpoint to patch or fill the gaps as identified.

The presented guidelines are a feedback to the research participants following the granted permissions by the MRCZ, MOH & CW, PMD and PNO Mashonaland East, the DMO, and DNO of Mutoko and Mudzi districts healthcare institutions. The researcher used the Precede-Proceed model (Green and Kreuter, 2005:10) coupled with the Theory of Planned Behaviour (Ajzen, 2005 in Polit & Beck, 2014:138) to guide the study for the purposes guidance gives clarity, simplicity, generality, and empirical precision for the guidelines. The model is an application of theoretical concepts in guiding research, practice, education, and administration (Meleis, 2012:195). Moleki (2008:175) clearly outlines how guidelines should be evaluated for clarity, simplicity, generality,

relational structures and operational adequacy, and uses a study framework adapted from (Dickoff, James & Wiedenbach, 1968 in Moleki, 2008:176). Moreover, this is supported by Chinn and Kramer (2004) in (Meleis, 2012: 185; Grove, Burns & Gray, 2013:638). According to Chinn and Kramer (2011) in Alligood (2014:9) Clarity means how clear? Simplicity: How simple? Generality: How general? Accessibility: How accessible? Importance: How important these guidelines are?

The guidelines are presented in relation to the findings that stemmed from the data analyses in this study. The first step in the development of guidelines was the incorporation of conceptual and operationally defined terms. The operationalised concepts of the study linked to Precede-Proceed model coupled with the Theory of Planned Behaviour were used to provide a logical, articulate structure in each guideline.

2.3.1.2 Gaps in the literature

Healthcare settings are high risk environments for HCAs. There is no surveillance of hand hygiene compliance against HCAs in Zimbabwe. There are gaps contributing to the unknown burden of HCAs and poor HCWs hand hygiene compliance globally escalating HCAs transmission cycle. The transmission cycle of HCAs should be empirically and ethically broken. Unfortunately the burden of HCAs is unknown and not surveillanced nor monitored robustly in context. Therefore, patients with various conditions such as TB can be admitted into hospital or may walk into a healthcare setting from the communities, and unexpectedly acquire HCAs, and die because of there being no surveillance in place to monitor patients with HCAs; the clinicians may even think and record that the patient(s) died of only TB without even consideration of HCAs as co-morbidities to add to as *C. difficile*, flu or bacteraemia. Mortality rates will be accounted to the conditions that the patients are admitted with from their homes not the HCAs (the underlying co-morbidity) patients may have acquired in healthcare settings in Mutoko and Mudzi districts. In some developed

countries they survey, monitor and document HCAs and their mortalities robustly.

In the Mutoko and Mudzi district health care institutions, national guidelines and surveillance policies for hand hygiene compliance among HCWs and for the prevention and control of HCAs seemed scarce. This was an egregious knowledge gap identified through Precede-Proceed Model concepts and other literature search (Green & Kreuter, 2005:9), coupled with the Theory of Planned Behaviour (Ajzen, 2005 in Polit & Beck, 2014:138), which brought in limelight and other related literature review.

Hand hygiene compliance helps to effectively reduce or prevent and controls the spread of HCAs, which are a hidden unforeseen danger in the top ten causes of death in Mutoko and Mudzi districts. HCAs high prevalence such as TB causes many people, according to Fitzpatrick and Kazer (2011:320), to get admitted into healthcare settings for treatment and therefore healthcare settings' environments are high risks for exposure to such HCAs.

2.3.2 Standard precautions

Standard precautions should be implemented thoroughly and consistently by HCWs with respect to counteracting and eradicating HCAs. HCWs should take strict precautions on a daily basis as they care for their patients. This would help to ensure patient safety due to the fact that their health would not be compromised by poor standard precautions. Hand hygiene practices should be meticulously done every time before, during and after patient contact by all HCWs during caregiving. This thesis used standard precautions as a strong basis to observe healthcare workers compliance to good hand hygiene practices, to assess if they were complying well with the standard precaution and if the hand hygiene compliance rates were not optimal to then establish the reasons

why they were not able to achieve this then consequently implement measures aimed at improving the hand hygiene compliance rates.

Standard precautions are used to reduce the risk of micro-organisms transmitted from both recognised and unrecognised sources to a susceptible host, since a combination of micro-organisms, source, transmission and a susceptible host, are required in order for infection to occur (Ghareeb, Bourlai, Dutton & McClellan, 2013:321). Standard precautions help to break the chain of the infection cycle. Standard precautions are the measures applied at all times when performing health care activities in order to prevent and control HCAs, so as to keep patients, HCWs, relatives and visitors safe. The standard precautions include the following: hand hygiene; the use of personal protective equipment; prevention of occupational exposure to infection; management of blood and body fluid spillages; management of equipment utilised during care; environmental control; safe disposal of waste that includes sharps and linen; and, appropriate patient placement. High environmental standards also prevent the spread of some pathogens (Rosenthal, Viegas, Sztokhamer, Benchetrit, Santoro, Lastra, Romani, Di Núbila, Lanzetta, Fernández, Rossetti, Migazzi, Barolin, Martínez, Bonaventura, Caridi Mde, Messina, Ricci, Soroka & Frías, 2015:E17; Parriot, *et al.*, 2015:S3).

Other standard precautions include respiratory hygiene and cough etiquette, According to Zelman *et al.* (2014:53) explain that alcohol based hand rubs are sufficient for ensuring effective hand hygiene in all patient care situations, except when hands are visibly soiled with blood or other body fluids or after using the toilet, or if the patient is experiencing vomiting or diarrhoea, or if there is an outbreak of norovirus, *Clostridium difficile* or other diarrhoeal illnesses. Again, the rationale here is that hand hygiene is frequently referred to as the single most important action to prevent, control and manage HCAs (Copeland, Cartner, Edmonds & Tian, 2015:S38; Aldeyab, McElney, Scott, Darwish & Elhajji,

2014:404; WHO, 2009a:45).

2.3.3 Policy for the management of *Clostridium difficile* infection

When the infection control team notifies that patient in a ward is *C. diff* toxin positive, carry on to barrier nursing and arrange for transfer to a cohort ward within two hours. At the same time patient needs urgent medical team review. If diarrhoea persists continue barrier on original ward (and it is important to wash hands with soap and water, not alcohol gels) (Hawtin & Hoadley, 2014:12).

2.4 PRINCIPLES FOR EFFECTIVE HAND HYGIENE

More than a century since 1847 has passed when hand hygiene was recognised as a key to any successful infection control programme after the pioneer works of obstetrician Semmelweis (1847). He benefited nothing except famous name now and instead suffered for his contribution to knowledge. His works were recognised after his death and yet there remains much reluctance and poor hand hygiene compliance among HCWs in performing this simple basic remedy (Semmelweis Society International, 2009:1; Huang, Ma & Stack, 2012:791; Mathur, 2011:611). Hand hygiene represents the single most effective way to prevent healthcare-associated infections. In order to increase compliance with hand hygiene, the WHO, as part of its First Global Patient Safety Challenge, recommended the implementation of multi-faceted strategies (WHO, 2009c:8; Parriot *et al.*, 2015:S3).

2.4.1 Actions and Indications for hand hygiene

Prevention and control measures include using clean water and soap under a running tap. It only takes 40 to 60 seconds to wash hands thoroughly by following these steps: wet hands under clean tap water, apply soap to lather, wash and rinse hands; then dry hand properly, or apply alcohol gel hand rub lotion for 20 to

30 seconds follow the stages until hands are dry. This is based on the 'five moments for hand hygiene' (Figure 1.4) and according to (WHO, 2009a: 155; WHO, 2009b: 13).

It is essential for HCWs to follow the moments of hand hygiene, by ensuring that their hands are clean before patient contact, after patient contact, after contact with patient surroundings, before an aseptic task, and after body fluid exposure risk and additionally (to dry hands) (WHO, 2009b: 13; Tan & Olivo, 2015:108; Aziz, 2014:428; Schmitz, Kempker, Tenna, Stenehjem, Abebe, Tadesse, Kacha Jirru & Blumberg, 2014:8).

HCAI prevention measures also include the correct use of personal protective equipment such as gloves, aprons, decontaminating equipment, proper management of blood and body fluid spillages, protective isolation, respiratory hygiene, safe sharp practices, disposal of clinical waste, and safe handling of linen and laundry (Ross & Furrows, 2014:4).

2.4.2 Use of cleaning products on patients' surroundings in health care settings

According to CDC (2013:1) there are various cleaning products which could be used to clean patients' surroundings that mean environments):

2.4.3 Cleaners or detergents

These are products that are used to remove soil, dirt, dust, natural matter that is organic in nature, and germs like bacteria, viruses, and fungi. Cleaners or detergents work by washing the surface to lift dirt and germs off surfaces so they can be rinsed away with clean water. The same thing happens when one washes hands with soap and water.

2.4.4 Sanitisers

Sanitisers are used to reduce germs from surfaces but not totally get rid of them. Sanitisers reduce the germs from surfaces to levels that are considered safe (CDC, 2013:1).

2.4.5 Disinfectants

These are chemical products that destroy or render germs incapable of normal function and prevent them from growing. Disinfectants have no effect on dirt, soil, or dust. Disinfectants are regulated by the USA Environmental Protection Agency (EPA) in USA or the country of origin. One can use a disinfectant after cleaning for surfaces that have visible blood or drainage from infected skin (CDC, 2013:1).

2.5 METHODS OF CLEANSING HANDS

2.5.1 Universal infection control procedures

According to Zelman *et al.* (2014:3), universally employed infection control procedures significantly reduce HCAI transmission. It is important to use liquid soap until a good lather is evident, rather than a bar of soap. HCWs should use disposable cartridges for liquid soap containers rather than topping up liquid soap, so as to avoid contamination. It is also important to avoid using a bar of soap because the bar can easily become contaminated and will become a vehicle for the spread of HCAIs (Aziz, 2014:428; Salmon, Pittet, Sax, & McLaws, 2015:98; Sunkesula, Meranda, Kundrapu, Zabarsky, McKee, Macinga, & Donskey, 2015:16).

Piped water, in addition to being a possible source of microbial contamination, may include substances that may interfere with the microbicidal activities of antiseptics and disinfectants such as the chlorinated water or the use of ultraviolet rays from the sun. Nevertheless water in health-care institutions can

become contaminated from the geographical conservation water bodies acting as a reservoir source of healthcare associated infections (WHO, 2009a: 30).

Drying hands after washing or rubbing alcohol gel on hands is crucial; in fact, this could be considered as a sixth hand hygiene 'moment', without which hand hygiene compliance cannot be satisfactorily achieved. Disposable soft paper towels are the method of choice for drying hands, since communal towels are also a source of cross-contamination. Paper towel drying helps to remove bacterial counts on wet hands. Paper towels must be discarded into an appropriate foot-operated waste bin. Bacterial counts increase when the skin is damaged; therefore it is important to use hand moisturiser to keep the skin in good condition. Improper decontaminating and drying of hands is an act of negligence that can put patients, clients, and healthcare workers themselves at risk of infection, which in turn may lead to complaints and litigation, especially if HCWs know the risks of hand hygiene non-compliance but in turn do not inform the patients of the risks when touching them. When patients acquire infections in health care settings they are bound to complain, and such complaints may be upheld in courts of law on grounds of negligence.

The designated hand hygiene methods should be agreed upon following an assessment of the risk in each individual circumstance (Tan & Olivo, 2015:108; Aziz, 2014:428; Salmon, Pittet, Sax & McLaws, 2015:95). In addition to the stated risk assessment, hand hygiene moments are classified under the hand hygiene observation tool (HHOT), a revised version which incorporates the WHO's moments for hand hygiene. A hand hygiene moment is a point in time when hands should be cleaned and dried to break the infection cycle from spreading opportunistic organisms. According to the WHO (2009:123) and Fuller, McAteer, Slade, Cookson, Michie, Savage and Stone (2009:5) hand hygiene should occur before patient contact, after patient contact, after contact with patient surroundings, before an aseptic task, and after body fluid exposure risk

(Aziz, 2014:428; Schmitz, Kempker, Tenna, Stenehjem, Abebe, Tadesse, Kacha Jirru & Blumberg, 2014:8; Sunkesula *et al.*, 2015:16).

Allegranzi, Gayet-Ageron, Damani, Bengaly, McLaws, Moro, Memish, Urroz, Richet, Storr Donaldson & Pittet (2013:843) agreeably report that HCAs are a major threat to patient safety worldwide. Transmission is mainly via the hands of healthcare workers, but compliance with recommendations is usually low and effective improvement strategies are needed. Allegranzi *et al.* (2013: 843), further explain that a quasi-experimental study was carried out at six pilot sites (55 departments in 43 hospitals) in Costa Rica, Italy, Mali, Pakistan, and Saudi Arabia. A step-wise approach in four 3–6 month phases assessed the hand-hygiene compliance of HCWs and their knowledge, by questionnaire, of microbial transmission and hand-hygiene principles. Compliance was expressed as the proportion of predefined opportunities met by hand-hygiene, actions that are handwashing or hand rubbing alcohol gels.

Patient-to-patient transmission of pathogens by HCWs hands comprises five sequential steps: initially, organisms are present on the patients' skin or have been shed onto fomites in the patient's immediate environment. The organisms must then be transferred onto HCWs' hands. Third, organisms must be capable of surviving on HCWs' hands for a few minutes. This will be prolonged by inadequate washing of hands or hand antiseptics by the HCWs (or by no cleansing at all). Finally, HCWs' contaminated hands must come into direct contact with the patient. Allegranzi *et al.* (2013: 843), reviewed the evidence supporting each of these steps, and proposed a dynamic model for hand hygiene research and education strategies, together with corresponding indications for hand hygiene during patient care. However on another study the researchers after implementing a WHO-recommended multimodal hand hygiene in Ethiopia there was a significant increase in hand hygiene adherence among the HCWs (Schmitz, Kempker, Tenna, Stenehjem, Abebe, Tadesse, Kacha Jirru & Blumberg, 2014:1).

2.5.2 Alcohol gels against microbes

Alcohol gels are not effective against spores and when caring for a patient with *C.diff* organisms in stool. However, alcohol gel is more effective against gram positive and negative bacteria, mycobacteria, TB, fungi and viruses. Alcohols are not effective against spores (CDC, 2002:45; WHO, 2009a:45; WHO, 2009b:29; Aldeyab *et al.*, 2014:404; Copeland, *et al.*, 2015:S38).

2.6 HAND HYGIENE: TRANSMISSION OF PATHOGENS BY HANDS, METHODS USED FOR HAND HYGIENE

HCWs responsible for patient care and their own hand hygiene compliance must consider how often one carries out hand hygiene procedures in health care settings, depending on the risk assessments of the procedure one has just carried out, and the actions involved in the next procedure when following the “five moments of hand hygiene” (WHO, 2009a:113; Sunkesula, Meranda, Kundrapu, Zabarsky, McKee, Macinga & Donskey, 2015:16).

Poor Hand hygiene compliance remains a serious problem, because compliance remains low and this contributes to spreading HCAs, prolonged suffering of patients, and significantly increased health care costs (Pfoh, Dy & Engineer, in Shekelle, Wachter, Pronovost, Schoelles, McDonald, Shojania, Reston, Berger, Johnsen, Larkin, Lucas, Martinez, Motala, Newberry, Noble, Ranji, Rennke, Schmidt, Shanman, Sullivan, Sun, Tipton, Treadwell, Tsou, Vaiana, Weaver, Wilson & Winters, 2013:67). HCAs are estimated to affect over 1.4 million people worldwide, causing longer hospital stays, increasing health care costs, and increased mortalities (WHO, 2009a:6).

Furthermore HCWs should prevent and control infection by hand hygiene, nursing patients in separate rooms and using personal protective equipment, ensuring prescribers adhere to antibiotic policies for treatment of patients,

sterilisation of equipment and aseptic techniques; and lastly ensuring environmental care such as cleaning and waste disposal (including sharps) (Schmitz *et al.*, 2014:4; Aziz, 2014:428).

2.7 HEALTHCARE WORKERS' OVERALL HAND HYGIENE COMPLIANCE

2.7.1 Hand hygiene (HH) is the principal tool for cross-infection prevention

Globally, there is poor adherence to guidelines in limited-resource countries. In Brazil there is no available published data (Medeiros, Grinberg, Buchner Ferreira, Bauer Cechinel, Zanandrea, Rohnkohl, Regalin, Spessatto, Scopel Pasini & Ferla, 2015:10).

The Medeiros *et al.* (2015:10) study found that the overall HH compliance increased from 27% to 58% from 4,837 opportunities for HH. Following the multivariate analysis some variables were found to have poor HH compliance: men against women (49% to 38%), nurses against doctors (55% to 48%), among others.

Following the implementation of the International Nosocomial Infection Control Consortium (INICC) approach, adherence to hand hygiene was significantly augmented. Programmes should target the improvement of HH in variables that are established as predictors of poor HH compliance (Medeiros *et al.*, 2015:10).

2.7.2 Adherence to Multidimensional Hand Hygiene

Su, Hu, Rosenthal, Li, Hao, Pan, Tao, Gao and Liu (2015:979) in China, found that hand hygiene was augmented significantly by the INICC multidimensional approach. Specific programmes aimed at improving hand hygiene in variables established as predictors of poor hand hygiene compliance should be implemented.

2.7.3 Factors associated with non-compliance with hand hygiene

Following the study of Uneke, Ndukwe, Oyibo, Nwakpu, Nnabu and Prasopa-Plaizier (2014:24) the outcome of focus group discussion among doctors and nurses at Federal Teaching Hospital Abakaliki in Nigeria, are inadequate supply of water, lack of awareness, too many patients to attend to by too few HCWs, indifferent attitude towards hand hygiene by HCWs, inadequate supply of soap and towel, absence of documentary guidelines on hand hygiene and disinfection practices, absence of continuous education, unreported consequences of non-compliance, lack of research on hand hygiene and disinfection practices, forgetfulness, sinks are far from where place of (point) of care, skin irritation. According to Uneke *et al.* (2014:24) the following are observed risk factors for non-compliance with hand hygiene practice and their possible impact on patient safety, escalation of sepsis, prolonged stay in the hospital by patients, increased morbidity and mortality, increased infection and disease among HCWs, acquisition of multi-drug resistant microorganisms, increased cost of treatment, delayed recovery such as in wound healing, and poor quality care increase the risk of infection to both patients and HCWs (Uneke *et al.*, 2014:24).

The discussion on solutions to overcome non-compliance with hand hygiene among HCWs at Federal Teaching Hospital Abakaliki Nigeria are as follows: Continuous health education, Provision of adequate water, soap and disinfectants, Provision of disposable towels and alcohol, Making of policies on hand hygiene and disinfection, Reduce the number of patients to a doctor by employing more, Promotion of research on the need for hand hygiene, Hospital visitors should be made to practice hand hygiene. Furthermore Creating awareness to doctors, patients, medical students and patients' relatives and visitors, Provision of pocket size disinfectant on HCWs, Imposition of sanctions on erring staff, Frequent re-orientation of clinical staff on the practice of hand hygiene and disinfection practice, Nearness of sink to where health care is

provided, Management should motivate staff to comply, Provision of hand hygiene materials such as hand dryers and disposable towels.

In addition supervision also ensures compliance, integrating hand hygiene training in the curriculum in medical and nursing schools, teaching patients to ask their HCWs if they have washed their hands, use of reminders in strategic locations in the hospital, sustaining and extending the programme to other HCWs (Uneke *et al.*, 2014:24).

Moreover Uneke *et al.* (2014:24) conclude that after intervention, hand hygiene indications and compliance rates among HCWs at the Federal Teaching Hospital Abakaliki Nigeria indications assessed after intervention the overall percentage compliance via direct observations were as follows: Before touching a patient 58.0% (390/672), Before clean or aseptic procedure 84.4% (184/218), After body fluid exposure risk 75.3% (128/170), After touching a patient 73.6% (438/595), After touching patient surroundings 59.0% (184/312), Overall compliance rate 65.3% (1140/1655). The hand hygiene indication with the highest compliance rate was “before clean or aseptic procedure” (84.4%) followed by “after body fluid exposure risk” (75.3%). The hand hygiene indications with the least compliance rate were “before touching a patient” (58.0%), and “after touching patient surroundings” (59.0%). After intervention hand hygiene compliance was based on professional category and hand hygiene indications determined via direct observation technique.

According to Uneke *et al.* (2014: 23) in Nigeria the observers openly and objectively observed practices and gathered data on hand hygiene using the five indications in line with the methodology and instructions specified in the hand hygiene Technical Reference Manual (WHO, 2009e:9). The period of observation was formally announced to the head nurse, consultants and chief residents of the various units and departments.

2.7.4 Undertaken accurate hand washing and hand-rubbing

In Turkey accurate handwashing and hand rubbing is 65.9% (754/1144). From the assessment of intensive care unit and surgical clinics together, hand hygiene compliance rates were 51.26% (199) and 66.85% (591) for doctors and nurses, respectively. Therefore, from the findings researchers believed that pre-informed observations are significant training instruments for hand hygiene compliance (Süzük, Çiğdem, Çalık, Akdoğan & Ünal, 2015:107).

2.7.5 A multi-faceted, multi-modal hand hygiene strategy and findings

These are strategies meant to improve hand hygiene compliance among HCWs. These were developed in (2009) by the World Health Organization and endorsed for use in Ireland (Higgins & Hannan, 2013:32).

The design used involves time-series quasi-experimental to measure compliance. This was with respect to the Five Moments for Hand Hygiene and handwashing technique using the adenosine triphosphate monitoring system to measure handwashing technique, and SureWash Glanta limited in Dublin, Ireland. An automated auditing and training unit, was also used to provide assistance with staff training and education (Higgins & Hannan, 2013:32).

Hand hygiene improved significantly over the study period. The study was undertaken from November 2009 to April 2012. Incorporation of new automated teaching technology was found to be effective in encouraging staff participation in learning, and ultimately enhancing hand hygiene compliance and technique (Higgins & Hannan, 2013:32).

2.7.6 Healthcare associated infections and lack of hand hygiene compliance are serious majors

Healthcare associated infections and lack of hand hygiene issues are global health problems in both developing and developed countries (WHO, 2009a:5). It is highlighted in Gould and Drey's (2013a:760) survey of student nurses' experiences with infection prevention and control whilst on clinical placement in UK that about 500 students from England, Wales, Scotland, and Northern Ireland responded to a survey. More than three quarters of respondents reported that they had seen clinicians failing to perform hand hygiene before patient contact, and more than half of respondents reported deficiencies in other infection prevention practices (such as 'sharps' disposal, changing personal protective equipment between patients, or failure to apply isolation precautions). According to Gould *et al.* (2013a:760), nurses did not provide best exemplary role models as hand hygiene champions. Medical staff was the group that was criticised mostly for poor compliance. The findings gave evidences that ensuring safe infection control practice in hand hygiene issues remains a challenge in the United Kingdom and indeed globally, despite its high priority.

2.7.7 Direct observation of Healthcare workers provides direct information

Direct observation provides direct information. This is about the performance of employees of various ranks, categories and vocations that is whether HCWs are cleaning hands at the indicated times before, during and after patient care; and, if HCWs are using appropriate techniques to decontaminate own hands' in the USA (Squires, Suh, Linklater, Bruce, Gartke, Graham, Karovitch, Read, Roth, Stockton, Tibbo, Woodhall, Worthington, & Grimshaw, 2013:16; Srigley, Lightfoot, Fernie, Gardam & Muller, 2013:101).

2.7.8 Healthcare associated infection (HAI) surveillance

According to Russo, Cheng, Richards, Graves and Hall's (2015:37) study, programmes are of paramount importance to prevent infections in Australia. A robust national HAI surveillance programme is currently lacking in Australia. So

Russo *et al.*'s study examined the current HAI surveillance programmes supported with literature review. Evidences acquired from international programmes indicate that national HAI surveillance decreases HAIs rates yet the present status of HAI surveillance activity in Australian states is disparate. The differences between each respective programme are not fully understood, and the quality of data presently used to establish national HAI rates is uncertain (Russo *et al.*, 2015:37).

Conclusively, the study found that there is a need for the development of a robust evidence-based national HAI programme in Australia to meet the demand for validated reliable national HAI data. Such a programme can be adapted from the work of currently available Australian and international programmes (Russo *et al.*, 2015:37).

A detailed study in Australia and indeed in other parts of the world, interventions to prevent HCAs should reduce deaths and shorten hospital admission days. Monthly infection rates for six types of healthcare-associated infections were examined. Infection categories were: bloodstream infections, central-line associated bloodstream infections, methicillin-resistant and methicillin-sensitive *Staphylococcus aureus*, *Staphylococcus aureus* bacteraemia and surgical site infections. The intervention was associated with reduced infection rates in many cases (Barnett, Page, Paterson, Brain, Martin, Winter, Hall, Campbell & Graves, 2014). According to Cruickshank and Ferguson (2008: xi) Australians by right expect safe, high quality health care along with all other countries' nations globally. Australian healthcare provides an excellent system of care in general. However, some patients do get infections during health care and such infections are a leading cause of preventable and unnecessary serious negligence that leads to harm.

2.7.9 Healthcare associated infection is an integral factor

HCAIs are integral factors in order to establish the clinical outcome among patients admitted in critical care areas in India. The Datta, Rani, Chauhan, Gombar and Chander (2014:30) study, established the epidemiology and risk factors of HCAIs within Intensive Care Units (ICUs) of a tertiary care hospital. This prospective, observational clinical study found that 166 out of 679 patients experienced 198 episodes of device-associated infections. The infections encompassed catheter-associated urinary tract infections, central-line-associated blood stream infections, and ventilator-associated pneumonias. There were 73(10.75%) cases of urinary tract infections amongst ICU patients who had indwelling urinary catheters.

Pseudomonas aeruginosa and *Acinetobacter* species were the organisms most frequently linked to HCAIs. The risk factors ascertained as being significantly linked with device associated infections in the ICU were diabetes, COPD and ICU stays (Datta, Rani, Chauhan, Gombar & Chander, 2014:30).

2.7.10 Predicting hand hygiene among Iranian HCWs

According to McLaws, Maharlouei, Yousefi and Askarian (2012:336) in Iran at the University of Medical Sciences, Shiraz, a study was conducted to identify significant predictors of handwashing associated with hospital elective (clean) and hospital inherent (dirty) contacts. This cross-sectional survey of 1,700 HCWs was based on the Theory of Planned Behaviour. Data were gathered into components according to the theory and tested for predictors of hospital elective and hospital inherent handwashing using multiple logistic regression analysis. All wards studied were in private and government hospitals associated with the University of Medical Sciences, Shiraz, Iran between April and September 2008. Of the 1,200 HCWs surveyed 1,077 (90%), of whom 83% were nurses, returned a completed survey. Hospital elective handwashing practice was positively influenced by community elective practice, hospital inherent practice, perception that handwashing required little effort, and subjective norms (nursing peers) and

negatively influenced by poor attitudes regarding handwashing. Hospital inherent handwashing practice was positively influenced by hospital elective practice, community inherent practice, subjective norms (infection control practitioners), and attitudes and negatively influenced by poor subjective norms. The conclusion arrived at was that Community-based handwashing practices exerted a strong influence on handwashing compliance in the hospital. Given this interdependence between community and hospital handwashing, a campaign to improve awareness of the benefit of community handwashing may improve clinicians' compliance.

2.7.11 Bactericidal of non-alcoholic fermented foods on hand hygiene in the community in Lesotho

In this section, the focus is on the traditional methods of preparing fermented foods and beverages in Zimbabwe and Lesotho which closely links with one of the objectives because the foods have bactericidal properties, namely: to determine the key determinants of hand hygiene promotion. It was observed in a study in Lesotho that *motoho* effectively inhibits strains of enteropathogenic *Escherichia coli*, *Salmonella typhii* and *Shigella boydii* three hours after fermentation (Gadaga *et al.*, 2013:2388). Additionally *ilambazi lokubilisa* sour porridge produced by Ndebele speaking people in Zimbabwe has been shown to be bactericidal to strains of enteric pathogens belonging to the genera *Aeromonas*, *Campylobacter* and *Salmonella*, and bacteriostatic to strains of *Shigella* and *Escherichia coli* (Simango & Rukure, 1992 in Gadaga *et al.*, 2013:2388). Gadaga *et al.*, (2013:2390) study concluded that: 'There is need for further research as these products might be incorporated into hand hygiene practices in the local communities because of their antimicrobial properties.'

2.7.12 Alcoholic beverages production through food fermentation

This section describes the traditional methods of preparing fermented beverages in Zimbabwe and Lesotho. This links with alcohol gel rubs in hand hygiene. In Zimbabwe the sorghum or millet based mixture is slowly heated to near boiling point. The resulting mash is called *masvusvu*. This is cooled, strained and served or allowed to ferment to make other products like alcoholic beverages. Traditional alcoholic beverages in Lesotho are referred to as *joala*. Such beverages are all intoxicating and are meant for consumption by adults during feasts or just as refreshing drinks.

Alcohol gels for HCWs hand rubs can be locally and traditionally produced in Zimbabwe with the guidance and jurisdiction of the World Health Organization based in the country, but there is need for further studies on the microbiological and biochemical characteristics of these products and encourage modernisation [to the cheap products to be easily available and accessible to local communities] (Gadaga, Lehohla & Ntuli, 2013: 2387). In order to improve hand hygiene the quantity and quality of hand washing compliance additional factors should be considered, and health care institutions also need to develop and implement innovative educational and motivational interventions in programmes tailored to HCWs (Contzen, Meili & Mosler, 2015:103).

2.8 HAND HYGIENE COMPLIANCE BY HEALTHCARE WORKERS: MODELS OF HAND HYGIENE, ADHERENCE TO HAND HYGIENE

Hospital clinical governance in Vietnam accepts and indeed countries that champion HCWs hand hygiene programmes that hand hygiene is number one priority. Every clinician's duty of care includes hand hygiene, yet globally, HCWs continue to struggle with hand hygiene compliance (Salmon & McLaws, 2015:1086).

2.8.1 Multifaceted intervention in HCWs hand hygiene

A multifaceted intervention has been shown to encourage higher hand hygiene

compliance and reduce the number of infections. In order to change hand hygiene behaviour the following measures should be implemented, educating HCWs on exactly when and how to clean hands and what to use, introducing alcohol gels at the point of care, on-going monitoring and observation of hand hygiene practices along with feedback to HCWs, modeling of correct hand hygiene compliance behaviour.

In addition there should be leadership in organisational structures, with hand hygiene champions setting an example (in terms of proper hygiene practices). Further, patients involvement, and encouraging HCWs to improve on hygiene compliance rates is important to alleviate HCAs. Finally, there should happen in operations organisational senior management support and commitment to make hand hygiene compliance to be given high priority and to happen at all time. However, the monitoring and surveillance of hand hygiene compliance and the delivery of feedback to HCWs in order to stimulate improvement is also a critical component of multimodal hand hygiene promotion (Su *et al.*, 2015:979; Aziz, 2014:428; WHO, 2009c:8).

2.8.2 Hand hygiene compliance monitoring in Scotland

In this section focus is on hand hygiene compliance monitoring in Scotland. Hand hygiene is a systematic way of thoroughly cleansing hands by using safe soap and safe warm water followed by rinsing and drying, or using an alcohol-based hand rub gel for about 10 to 15 seconds. Observation monitoring was conducted, whereby hand contact by HCWs in their day-to-day work at the point of care was observed. This included touching patients during care delivery, and, touching their surroundings such as beds, or any surfaces around the bed such as tables, bed linen, lockers or curtains. This observation monitoring was performed by designated HCWs (who were specifically trained in monitoring activities), and comprised scoring against whether or not HCWs carried out hand hygiene at defined, observed times (McLaws, 2015: 9).

2.8.3 Models: hand hygiene guidance for healthcare workers in Scotland Australia and England

The WHO's official hand hygiene guidelines for HCWs in Scotland and Australia explain why cleaning hands is important, and they specify when hands should be cleaned, and how one must clean one's hands properly. The guidelines further illustrate how to rub and wash hands. Some steps illustrate how to hand wash and rub alcohol gels separately. Within the guide, Illustration 8 portrays hand rubbing, and shows that the hands are safe afterwards. Steps 8 to 11 in the guide instruct HCWs to complete the washing until their hands are uncontaminated (at the drying stage). The guide also addresses issues, for example, when hand hygiene is an important part of respiratory hygiene, cough etiquette, and further checks on correct respiratory hygiene. The guide ends by discussing when hands should be cleaned, and states the rationale behind the five moments for hand hygiene (Health Protection Scotland, 2017:1 & Hand Hygiene Australia, 2016:1).

The Health Protection Scotland (2017:1) and Hand Hygiene Australia (2016:1) promotion of guidelines both utilise the moments of hand hygiene, Hand Hygiene Improvements among HCWs is currently the single most effective intervention to reduce the risk of hospital-acquired infections in Australian hospitals although the Australian promotion addresses a wider range of health care situations, and contains different hand hygiene posters, whereas the Scottish guidelines for HCWs' compliance with hand hygiene also consider various health care situations to which the five moments for hand hygiene are applied. Hand rubbing and washing methods in both sets of guidelines are identical, as they are derived from the WHO (2009a:1). The Scottish Government gathered detailed evidence on how often HCWs were decontaminating their hands. This governmental monitoring helped NHS Scotland to identify what further actions were needed to ensure that everyone working for NHS Scotland regularly decontaminate their

hands. Scotland's National Hand Hygiene Campaign was launched in January 2007. Two information leaflets were made available from the Scottish National Hand Hygiene Campaign website: one for members of the public, and one for HCWs. Australian initiative began in 2009 (McLaws, 2015:8).

According to Loveday, Wilson, Pratt, Golsorkhi, Tingle, Bak, Browne, Prieto and Wilcox (2014:S1) guidelines in epic three are comprehensive recommendations to prevent HAIs in health care settings based on best current evidences. National based guidelines are too broad and need to be integrated into local practice guidelines and should be audited to focus on patient safety. Henceforth incorporating these guidelines into daily routine HCWs practices patient experiences in healthcare settings are made safer from the risk of getting HAIs.

2.8.4 Promotion of Healthcare Workers' Hand Hygiene in Developed countries

The size and scope of the HAI burden globally appears to be of paramount importance but often greatly misjudged. Methods to evaluate the magnitude and nature of the problem exist and can help to integrate correct monitoring as well as finding suitable solutions. However, these tools must be simplified and adapted to overcome the affordability barrier in settings where there are inadequate resources and data sources. Hand hygiene has been recognised and established to be effective as a preventative measure and health promotion measure against HAIs. It is simple to implement. Awareness of HAIs and infection control through hand hygiene must be one of the key priorities in national health programmes, particularly in developing countries (WHO, 2009a:7).

2.9 BARRIERS OR CHALLENGES TO HEALTHCARE WORKERS' HAND HYGIENE COMPLIANCE

Literature has shown that the adherence of HCWs to acceptable hand hygiene compliance standards has been variable, with mean baseline rates ranging from 5% to 89%, and global average compliance of 38.7% (WHO, 2009b:5). Reasons reported by HCWs for the lack of adherence with recommendations include the following: skin irritation; inaccessible supplies; interference with patient relationships; urgent patient needs; wearing gloves; forgetfulness; ignorance of guidelines; insufficient time; high work load and understaffing; and, lack of scientific information demonstrating the impact of improved hand hygiene on hospital infection rates (WHO, 2009a:74).

2.9.1 Observed factors for poor adherence to hand-hygiene compliance

The factors influencing HCWs' lack of hand hygiene compliance include the following: being a physician rather than a nurse, being a nursing assistant rather than a nurse, being a nursing assistant rather than a nurse, being a man rather than a woman, working in an intensive-care unit and due to its very busy nature leaving no time to carry out hand hygiene, busier working hours during the week (as opposed to quieter hours during the weekend). In addition, wearing gowns or gloves, which can affect HCWs from cleaning hands regularly, unavailability of automated sinks, and undertaking activities with high risk of cross-transmission and thereby forgetting to clean hands (WHO, 2009a: 66; WHO, 2009b: 6).

2.9.2 Self-reported factors for poor adherence with hand hygiene

Self-reported factors of poor adherence to hand hygiene include, among others: Patient needs taking priority, Often too busy, insufficient time, hand-washing agents causing irritation and dryness, and hygiene. In addition there is perceived low risk of acquiring infection from patients, wearing of gloves that perceivably obviate the need for hand hygiene, not thinking about it, forgetfulness. There is also skepticism regarding the value of hand hygiene, hand hygiene disrupts an effective HCWs-patient relationship, and no role models among colleagues or

superiors to follow as best examples in the leadership model in the clinical settings (WHO, 2009b: 6).

2.9.3 Organisational-reported factors for poor adherence with hand hygiene

2.9.3.1 *The Healthcare Workers' side*

The following are reported factors for poor adherence to hand hygiene:

This is in view of lack of funds at health-care facilities, lack of medications, lack of personnel, lack of equipment, lack of diagnostic tools and inadequate built structures (WHO, 2009b:6). Moreover sinks are inconveniently located/shortage of sinks, lack of soap and paper towels, understaffing or overcrowding, lack of knowledge of guidelines, protocols, disagreement with the recommendations, and lack of scientific information and proof of improved hand hygiene on health-care-associated infection rates. According to Berger *et al.* (1979:111) legitimation as a process is best described as a second order objectivation of meaning and that legitimation produces new meanings that serve to integrate the meanings already attached to disparate organisational processes. Whilst legitimation does not only tell individuals why one should perform one action and not another it also tells why things are what they are. Knowledge precedes values in the legitimation process of organisations.

2.9.3.2 *The patient's side*

The following apply:

There is absence of protocol, policies, guidelines, clinical pathways – implementation, insufficient training of HCWs in knowledge and skills. There is also lack of adequate organisation, leading into suboptimal use of skills, task definition, and leadership and planning. Additionally there is poor communication, poor attitudes, documentation, leading to poor hand over for continuity of care for

patient safety with a focus on hand hygiene and alleviation of HCAs (WHO, 2009b: 6).

2.9.3.3 Additional perceived barriers to appropriate hand hygiene

Listed below are some of the barriers associated with hand hygiene namely: Lack of active participation in hand-hygiene promotion at individual or institutional level, and lack of role models promoting hand hygiene. In addition there is lack of institutional priority towards hand hygiene, not enough disciplining of HCWs who do not comply with regulations, and also limited institutional health and safety regulations that includes guidelines and policies.

However, improved compliance has been reported following education, introduction of alcohol gels, observation and feedback, and local promotion activities. In many situations, especially in developing countries, HCWs do not always have access to hand hygiene cleaning resources such as: warm water, soap, paper towels, and alcohol gels, when needed. In such circumstances, safe hand hygiene cannot be achieved at all. Resources should be made available by the responsible authorities, which should take a leading role through effective management and leadership in raising HCWs hand hygiene compliance (WHO, 2009a:99). Events occurring in health care settings in Africa identified as gaps were HCAs, Misdiagnosis with respect to HCAs as comorbidity in association with their underlying conditions (WHO, 2009a:6).

2.10 CONCLUSION

This chapter reviewed relevant literatures in relation to the study title, research problem, purpose, research questions, objectives and hypothesis of this study. Globally, there is substantial room for greatest improvement in HCWs' hand hygiene compliance and standards to alleviate public health infections. Precede-Proceed model and Theory of Planned Behaviour serve as a template guide for

the formulated and developed guidelines for fostering hand hygiene compliance among HCWs in the Mutoko and Mudzi districts public health care institutions in Mashonaland East province in Zimbabwe. In Chapter 3 the theoretical foundations are discussed.

CHAPTER 3

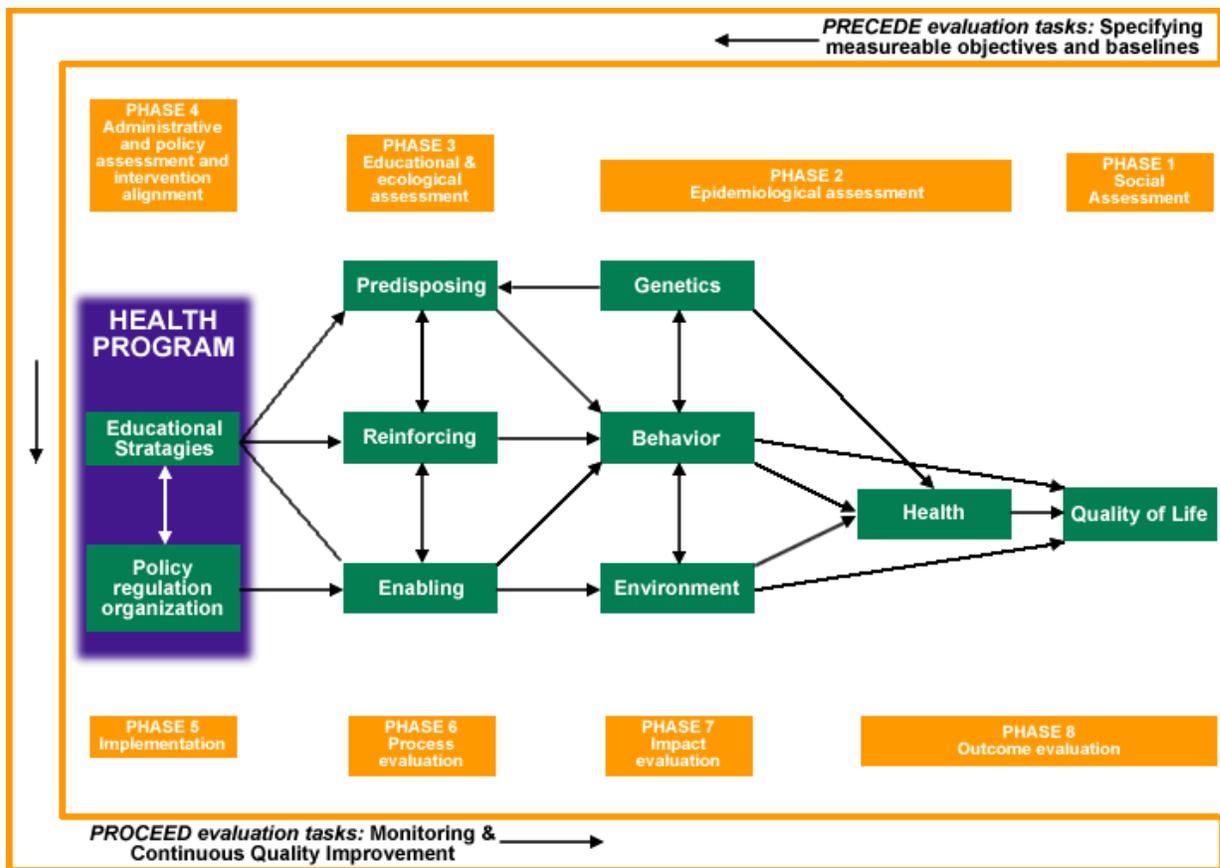
THEORETICAL FOUNDATIONS OF THE STUDY

3.1 INTRODUCTION

This chapter is preoccupied with an explanation of the theoretical foundation. In Chapter 1, this was referred to as the Precede-Proceed Model coupled with the Theory of Planned Behaviour. Presently, the main features of the said model are outlined, showing how its choice has a close relation with the problem under investigation, and how the application of the model helps address the research questions, as framed in Tables 1.1 to 1.4., and Figures 1.4, 3.1 to 3.2. The following are discussed, the Precede-Proceed model coupled with the Theory of Planned Behaviour and the paradigm. Additionally, the components of the model, how the model works singular and in dual operationalisation, phases of the model used, evolution of the model, and, the Theory of Planned Behaviour, as well as organisational change and the educational strategies. This chapter then addresses this model as it is fully applied throughout the study, for the validation and corroboration of results generated guided by the model concepts that lead to the development of guidelines for fostering HCWs hand hygiene compliance to prevent and control HAIs. Precede-Proceed model is ideal as a visual diagrammatic structuring model that can be used for an entire live health promotion programme effort with link to fostering (hand hygiene compliance) towards prevention and control of a particular disease(s) (Crosby & Noar, 2011:S7). According to Phillips, Rolley and Davidson (2012:1) the Precede-Proceed model, Green and Kreuter (2005:10) has been in use across the world's healthcare settings to guide the assessment, planning, implementation, and evaluation of various healthcare improvement strategies. Using a reflective case study approach the applicability of the Precede-Proceed model, Green and Kreuter (2005:10) was examined for two Australian populations.

3.2 COMPONENTS OF THE PRECEDE-PROCEED MODEL ARE DISPLAYED

Researcher has best worked with Precede part of the model for the needs assessments backwards, in phases 1, 2 and 3. Phase 4 was used in developing guidelines, intervention alignment that influence administrative policies in health programmes to integrate educational strategies and organisational policies and regulations. Health programmes concepts were best worked on in integration downwards, upwards and forwards towards best quality of life when infections are alleviated through healthcare workers' hand hygiene compliance. Proceed is best dealt with forwards for implementation and evaluation for best outcome.



(Adapted from Green and Kreuter (2005: 10, 17) in Community Tool Box: (2018:1).

Figure: 3.1 Generic representation of the Precede-Proceed Model

The Precede-Proceed model has two components: 'Precede', and 'Proceed'. The Precede part has four planning phases. According to Green and Kreuter (2005:9), the planning phases consist of a series of planned assessments and diagnoses that generate information, which in turn is used for educational and ecological evaluation, as well as administrative and policy assessments, all of which in turn influence policy regulation focusing on HCAs and HCWs hand hygiene compliance. With respect to HCAs and HCWs' hand hygiene the assessment phases in 'Precede' can be used to evaluate the factors that contribute to hand hygiene compliance.

The Precede stage comprises of four planning phases: social assessment, epidemiological, educational and ecological assessment, administrative policy assessment, and intervention alignment (Green & Kreuter, 2005:10; Crosby & Noar, 2011:S7). Phase 1 of the model (social assessment) relating to HCWs comprises of immunocompromised individuals such as those with HIV or cancer (genetics) (Green & Kreuter, 2005:10). These individuals are at high risk of experiencing profound effects of HCAs. Therefore, Phase 2 of epidemiology requires close HCAs surveillance to establish their associated morbidity, mortality rates so that appropriate interventions measures and administrative policy assessments can be employed to protect patients particularly at risk of contracting HCAs.

The Proceed stage comprises four phases: the implementation phase, driven by the findings from the assessments in the Precede stage. This is followed by three evaluation phases after implementation Phase Five: Phase Six 'process', 'impact', and Phase Eight 'outcome' (Green & Kreuter, 2005:10; Crosby & Noar, 2011: S7). With respect to HCAs and hand hygiene compliance the implementation phase involves using the findings of surveillances to integrate developed guidelines, which counteracts HCAs. The implementation phase needs to be evaluated to see if its intervention is significant to alleviate HCAs. Figure 3.1 shows the influences of health programme policies and inputs.

The generic representation of the Precede-Proceed model for health programme involves assessment, planning, setting the programme, and evaluation. Figure 3.1 shows the influences of health programme policies and inputs with a focus to fostering HCWs behavioural improvement in hand hygiene compliance using the developed guidelines to prevent and control HCAs. As shown by the direction of the arrows, these ultimately influence people's health and quality of life through reduction or prevention of HCAs, thus decreasing morbidity and mortality rates contributing to abundant life. The model shows that the direction taken during the first four phases of the model is reversed in the latter four stages; however, it does not show the feedback processes that are built into the system, or any specific social science theories underlying the model (Green & Kreuter, 2005:10). With respect to HCWs hand hygiene compliance there should be a feedback mechanism which shows their progress in hand hygiene compliance. The representation of the evaluation needs assessment tasks of the model in Figure 3.1 suggest that there are other dimensions and factors that might be identified in the Precede assessment process or evaluated as outputs and outcomes in the Proceed stage (Green & Kreuter, 2005:17).

With respect to policies, regulations and organisation factors the policy makers and healthcare organisation should supply adequate resources for HCWs to be able to carry out their hand hygiene. These guidelines will reinforce individuals to use their available resources in their respective healthcare settings (environmental) to enable HCWs and patients to counteract HCAs incorporating the predisposing component of the model (that includes knowledge and attitudes). The behaviour of HCWs and patients in turn promotes positive health outcomes in terms of infection control and prevention. There is limited availability, accessibility, and affordability of health resources especially in developing countries such as Zimbabwe and this is a critical issue in order to apply effective hand hygiene compliance to counteract HCAs.

3.3 PHASES OF THE PRECEDE-PROCEED MODEL

The Precede-Proceed model has eight phases that are described as follows:

The entry point to Phase One of the Precede is a vision of the quality of life, as well as social and health care-based assessment of factors affecting the quality of life. With respect to the thesis this would involve a meticulous health care-based assessment of factors affecting the quality of life with respect to HCAs, which would significantly help in implementing every possible robust and meticulous measure focused primarily on prevention of the spread of HCAs and better hand hygiene practices. This would consequently result in lower mortality rates and better quality of life.

Phase Two is an epidemiological assessment of genetics, behaviour and environmental factors contributing to people's health, and their consequent quality of life. All these factors and the ones below were explored in this study with a focus on enhancing them in order to achieve fostering better HCWs hand hygiene practices to counteract HCAs.

Phase Three is an educational and ecological assessment of the predisposing, reinforcing and enabling factors (which are linked with genetics, and the behaviour of individuals, groups or communities), and also the environmental factors. With respect to this study, it would involve investigating the predisposing, enabling and reinforcing factors that can help HCWs to improve hand hygiene compliance by enhancement of HCWs behaviours and attitudes in order to comply during patient care. All kinds of factors contribute to HCWs and patients' health and quality of life free from HCAs. Theory of Planned Behaviour within the Precede-Proceed model concerns behaviour of HCWs for fostering hand hygiene compliance implementing 5 Moments of Hand hygiene to reduce or prevent HCAs.

Phase Four comprises administrative and policy assessment, and intervention

alignment. This involves planning a health programme, which takes into consideration educational strategies, and the fact that those strategies interlink with policy, regulation and organisation with respect to HCWs hand hygiene compliance and the alleviation or counteracting of HCAs.

Phase Five is the implementation phase off the Proceed part of the model. Phases Six to Eight form the evaluation component (evaluation, impact evaluation and outcome evaluation, consecutively) (Green & Kreuter, 2005:10). According to Tones and Green (2005:62), further analysis should identify the plethora of factors that influence health behaviour, which in turn are grouped into predisposing factors that influence HCWs' motivation to change (such as knowledge, beliefs, attitudes and values).

Enabling factors that support changes in HCWs' behaviour or work environments include resources availability, skills, and the removal of barriers to achieving hand hygiene compliance. Lastly, reinforcing factors need to be assessed (such as feedback received from HCWs whose behaviour is being targeted). For this study, the factors considered are those that help to foster HCWs' hand hygiene compliance, resulting in the control and prevention of HCAs in the Mutoko and Mudzi districts public health care institutions in Zimbabwe.

Handy (1999:29) explains motivation to work that if we could understand [HCWs hand hygiene compliance] and could then predict, the manner in which individuals were motivated, we could influence what they do by changing the components of that motivation process. In certainty such understanding could lead to great power since it would allow the control of human behaviour [to comply] without the visible and unpopular trappings of control and in this study fosters on HCWs hand hygiene compliance and infection control as well as prevention focusing on HCAs. However, Handy (1999:30) further elaborates that indeed motivation is concerned to find ways by which individual HCWs could put more effort to [own health care settings] as organisations and skills to the service

of employer. Motivation of HCWs spares the essential dignity and independence of the individual.

3.4 EVOLUTION OF THE PRECEDE-PROCEED MODEL

The Precede-Proceed model is the corner stone of health education and health programme promotion planning, implementation as well as evaluation and is now a recognised tool that employs an educational and ecological approach to public health and population health planning (Green & Kreuter, 2005: xxii; Gielen, McDonald, Gary and Bone, in Glanz, Rimer and Viswanath, 2008:408). This model has enabled the researcher to explore the factors for fostering hand hygiene compliance, and to link them with the findings of this study guided by the model coupled with the theory of planned behaviour and with scientific literature by analysing and linking the relevance of the study's findings with respect to literature (Grove, Burns & Gray, 2013: 695).

During the early stages in the evolution of the Precede component, it was referred to as a framework. This was a cautionary term used to discourage analysts from perceiving it as a model or theory. The primary purpose of the Precede framework was not to explain and predict phenomena, but to organise existing multiple theories and variables into a cohesive, comprehensive and systematic view of relations among those variables (Green & Kreuter, 2005:25). This helps HCWs to enhance hand hygiene compliance and reduce the HCAs rates. The Precede-Proceed organises precursors into three categories, within which various concepts and models can be used for planning detailed procedures such as messages, incentives, training and policies (Green & Kreuter, 2005:148). With respect to the study this can involve giving HCWs incentives to motivate them to improve their hand hygiene practices, training them on how to better achieve effective hand hygiene compliance and generating robust guidelines that can guide them to achieve this. Proceed stage with its four phases was added to the Precede component after the extensive application and

validation in practice, and after decades of research, it now qualifies to be called a model (Green & Kreuter, 2005:25).

The purpose of a model is not merely to explain and predict a phenomenon, but to give a logical structure that supports a systematic manner of assessing, planning and evaluating health behaviour change. This model with the theory has aided in enabling the study achieve research questions and objectives. The Precede-Proceed model (Green & Kreuter, 2005:18) can also be used as a platform for crafting best practices and evidence-based practical guidelines for HCWs' hand hygiene compliance in context. The model is used in combination with the organogram of Zimbabwe in conjunction with World Health Organization in partnership to the Government of Zimbabwe in health issues.

However, according to Sundin and Fahy (2008:20) the first contextualisation process that is the repositioning of geographical districts maps with their health care settings, tests and retests explanations in real terms of the worldview by using Precede-Proceed model concepts for the decision making atmospheric processes that are textualised and the second resituation henceforth was the investigated hand hygiene compliances and the experiences as constructs by participants as collected data *vis - a - vis* infection control and prevention to show concepts systematically, thematically, highlighting points made by sources of information and therefore findings for the meanings are embeded in the data. According to Serrant-Green (2007:3) not only just by presenting findings from the natural settings perspectives of individual participants but also by embedding the social contexts of that experience and expectations in the research process is contextualisation. Data were the information from participants, that data were analysed, interpreted and discussed giving meanings for feeding back the information to the districts. The feedback is the true reality as presented guidelines of HCWs hand hygiene and HCAs control and prevention in Mutoko and Mudzi districts in Zimbabwe.

According to Green and Kreuter (2005:197) match the live geo-ecological assessment factors with the worldwide programme concepts that is matching the contemporary realistic worldview of HCWs hand hygiene compliance against HCAs control and prevention in Zimbabwe *vis-a-vis* the ideal worldwide programme scholarly concepts of international highest reputation by using the Precede-Proceed Model coupled with Theory of Planned behaviour in context. In addition, according to Sundin and Fahy (2008:20) contextualisation was the last step in Denzin's interpretive interactionism and that the thick interpretation adds depth to the meaning of the guidelines as theory or model (Denzin, 1989:60).

This links best with development of guidelines for fostering hand hygiene compliance and prevention of HCAs. 'Precede' involves sieving and sorting data, integrating the predisposing, reinforcing, and enabling of constructs in educational, ecological diagnosis and evaluation (Green & Kreuter, 2005:9). These components are important with respect to hand hygiene as they influence the continuous chain of fostering hand hygiene compliance. If this chain is broken, it will be impossible to achieving and fostering hand hygiene compliance, which prevents and controls HCAs. The second part is 'Proceed', which involves policy, regulations and organisational constructs in educational and environmental development (Green & Kreuter, 2005:9). This can be incorporated in HCWs fostering hand hygiene compliance by developing effective, robust policies, regulatory and organisational constructs which they can use as guidelines as presented in chapter 8 to help them to improve their compliance. From this HCWs' hand hygiene and alleviation of HCAs can be promoted with respect to how improvements are accomplished further and sustained for generations.

Organisations are a part of daily living experiences with a focus on healthcare settings in Zimbabwe. The key to successful organisational programmes such as the HCWs hand hygiene compliance and infection control in the Zimbabwean situation promote better understanding of the needs assessments of the

communities and motivations of the people living within the micro-societies cosmos in the contextual question using the Precede- Proceed model and the Theory of Planned Behaviour. Understanding health care settings involves cultures, motivating people in the remote rural communities, leadership, roles of HCWs in healthcare settings, coordinating resources with consultation, responsibility and accountability.

It is this kind of a language that can help in finding new solutions to familiar daily HCWs hand hygiene compliance problems. Organisations need to develop; select, structure, redesign work, resolve political conflicts by utilising guidelines and furthermore plan for the next future generations' quality of life.

3.4.1 Philosophical underpinnings

Philosophical underpinnings about the qualitative-quantitative approaches (mixed methodology), the third paradigm. Philosophical foundations are critical in the investigation of the problem of HCWs hand hygiene compliance and HAIs prevention and control in Mutoko and Mudzi districts in Zimbabwe as focused on in the current study.

According to Parahoo (2014:79) qualitative-quantitative approaches are not two camps in opposition. Combining qualitative-quantitative methodologies facilitate one another. Creswell and Plano-Clark (2011:21) view that a combination of both provides the most complete of analyses of problems to be solved. Further researchers resituate numbers to contexts and words from participants and frame numbers, trends and statistics results with words. Such integration is not problematic in any way because there is enhancement of one method by the other. According to Berger *et al.* (1979:14) a philosopher by whatever methods will inquire into the ontology and epistemology status of conceptions. Epistemology provides philosophical grounding on what kinds of knowing are possible with the study title in context and how it is ensured that the knowledge is

adequate and legitimate (Crotty, 1998:8). Out there objects, held no meaning at all (Crotty, 1998:43). This is supported by Giddens (2001:22) who explains that cultures could not exist without societies and vice versa. Without cultures there would not be human beings as understood today, would have no language, no self-consciousness and ability to think or reason severely impaired. This is keyed in Figure 3.2, linking the title to resituated contextual aspects in the model concepts. Henceforth that is why there is the need to identify, explain, and justify the epistemological viewpoint of this study with the concepts of the Precede-Proceed model. Hall (2012:5) is of the same viewpoint that a realist approach has been suggested as an alternative single paradigm. This approach supports the use of mixed methods. Therefore, it is the type of data sought by researcher that determines the methods used (Parahoo, 2014:79).

Additionally, a new born human must learn the culture of its society and becomes an identified member of that society (Haralambos & Holborn, 2008:2). However, Berger *et al.* (1979:149) explains that on one hand a child is not born a member of society on the other hand is born with a predisposition towards being socialised to become a member of society. In lives of all individuals there is a temporal induction period in the participation in the societal dialectic.

According to Creswell and Plano Clark (2011:38) the philosophical assumptions do provide foundation for the study as worldviews, using and relating these assumptions to mixed methodology procedures. A framework is therefore needed in planning how philosophical assumptions fit into the mixed methodology design (Creswell & Plano Clark, 2011:38). Further, Creswell and Plano Clark (2011:39) indicate four levels for developing a research study as follows: paradigm worldviews to get answers such as ontology, epistemology, methodology, theoretical lens such as in the use of the Precede-Proceed model and or social science theory in this study specifically Theory of Planned Behaviour. Further there is mixed methodological approach influencing methods

of data collection as observational and interviews thereafter data analyses influence guidelines development from evidence-based findings.

Logic is defined as a branch of philosophy that analyses patterns of reasoning, structured method of reasoning for evidences, particular system of reasoning that is reasoned thought or argument (Black, Grove, Hucker & McKeown, 2011:589). In this study it is logical to see patterns unfolding in complex phenomena of HCWs hand hygiene compliance for the purpose of developing guidelines for fostering the compliance. According to Haralambos *et al.* (2013:886) a phenomenon comprises anything that human beings live experience and phenomenology being the nature of social reality. This is code able moment seen or seen like as it is in reality (Boyatzis, 1998:1).

According to Ivankova (2015:239) coding is a central issue in inductive qualitative data analyses because it helps give meanings and then to integrate them in a new way into groups or categories and this is reconstruction of participants' common experiences with the study title. Therefore, coding generates true pictures of phenomena (Craig, 2009:189). However Black, Grove, Hucker and McKeown (2011:762) define a phenomenon as anything perceived as an occurrence or fact and additionally phenomenism is a philosophical stance that all knowledge comes from human senses perceptions as one of the views of epistemology of the phenomenal worldview.

According to Meleis (2012:195), there is a logical representation and clarity in the Precede-Proceed model concepts, and both the model and the Theory of Planned Behaviour demonstrates consistency, simplicity, complexity, and usefulness in the development of guidelines for HCWs hand hygiene compliance: "The hallmarks of the Precede-Proceed model are its flexibility and scalability in addressing a wide range of ecological levels, settings, and populations. The

results of using it are evidence-based and evaluable, and they provide a platform for Evidence-Based Best Practice” (Green & Kreuter, 2005:18). Additionally, Burns and Grove (2009:601) report “comprehension, comparison, analysis, evaluation and conceptual clustering to provide an empirical knowledge base of a phenomenon”.

According to Parahoo (2014:162), in order to assess the value of operational constructs sample definitions in confirmatory research, researchers use the five criteria: clarity, precision, validity, reliability, and consensus; whereas in exploratory research, the report must give a clear detailed account of the study as thick descriptions and beyond, concepts investigated, methods used, and findings from which guidelines evidence based are developed henceforth trustworthiness focusses on consistences of judgements: dependability equivalent to reliability. According to Brink in Morse (1991a:167) on information judgement in qualitative research is of the stance that trustworthiness pertains to credibility of a concept implying accurate judgement decisions according to some standard judgements. In research measurement is frequently associated with numerical or quan instruments. In qual, measurement refers to the series of judgements made by the researcher about collected information in relation to representation of the truth about the subjective reality of a phenomenon to be believed as true.

3.4.1.1 Basic anatomy and physiology of hand hygiene programme

Pawson (2006:26) explains the structures and functions of social science programme such as the hand hygiene focusing on guidelines for fostering hand hygiene compliance as interventions follow functional principles of not only good science but best science as guidelines target to streamline particular processes according to sound practice that it should use methods and methodologies that are suitable and compatible with the title of the thesis. The simple rule is

applicable and having used the organogram (see Figure 7.1), Precede-Proceed model and Theory of Planned Behaviour for understanding real happenings in contexts, what drives the determinants of the HCWs' hand hygiene compliance programmes. How are the programmes implemented because from this study, researchers look for evidence in context (Pawson, 2006:26)? However, Pawson (2013:86) explains that programme theories act as units of analysis of evaluation and are the focal point for further investigation. Moreover interventions always start as theories, and the guidelines are:- for fostering hand hygiene among HCWs to alleviate HCAs henceforth influencing policy makers who then pass that knowledge on to practitioners in the clinical field and then into the brains of programme subjects. According to Pawson (2013:87) interventions always begin as theory-based schools of evaluation on hypotheses. Innovative new changes in practice improve the outcome of quality of life. However, theories in turn do provoke more research questions embedded in the hypotheses.

3.4.1.2 Pathophysiology of health and hand hygiene programme

Pawson (2006:26) asks the question: What gives rise to poor performance and inappropriate behaviour with a focus on HCWs' hand hygiene and HCAs control? An appropriate programme is worth implementing because of the benefits to individuals, community health and the health care organisations (Green & Kreuter, 2005:244). If the programme does not Proceed beyond Precede it therefore becomes nullified, blocked to no thing, untenable, unattainable, unreachable, unavailable, inaccessible and unacceptable or unaffordable to the community; henceforth the programme does not materialise for the benefit of society's many generations to come. Therefore, suffering continues without appropriate human interventions because there is nothing to act up on to improve the situations. To attain the physiology of the health and social science programme Pawson (2006:27) explains further that guidelines as theories are always inserted into existing social science systems that account for present problems or questions. Therefore, improvements in patterns of

behaviour, events, or conditions are then generated bringing about fresh inputs to that system in order for the charging, changing and rebalancing of the system.

In other words, diagnose through research and solve the problem guided by Precede-Proceed coupled with Theory of Planned Behaviour. In this study emphasise assessment, planning, implementation, further evaluation and cycles of events that bring about new changes in context henceforth pertaining to hand hygiene compliance infection control and prevention especially of HCAs in Mutoko and Mudzi districts.

3.4.1.3 Lexicology, hand hygiene compliance, infection classification and control

HCAs could be expressed, named and coded differently in different cultural healthcare contexts that need to be interpreted to be understood. However according to Berger *et al.* (1979:150) people not only live in the same world but they participate in each other's being. Only when one has achieved a degree of internalisation is an individual a member of that society to understand the contexts. The ontogenetic process by which this is brought about is socialisation. This is the comprehensive and consistent induction of an individual into the objective world of a society or a sector of it. Primary socialisation is the first socialisation an individual undergoes in childhood through which one is inducted into a member of society in order to understand the cultural aspects in that society through language and knowledge of numerous names and what they mean in that society in context. Philology is involved Black *et al.* (2011:762). It is difficult to speak about HCAs across cultures when unobjectified in vernacular languages. To learn new language such as expressivity about HCAs, speak it (Boyatzis, 1998:12).

3.4.2 Using the Precede-Proceed model

The Precede-Proceed model was used to guide the study, define and refine the research problem, the purpose, research questions, objectives, the research samples, and data collection instruments. It was used in conjunction with the mixed methods approach for developing guidelines to foster HCWs' hand hygiene behaviour in the Mutoko and Mudzi district communities. The model was used to guide generation of data and recommendations in fulfilment of the study title. The findings are also required by the MRCZ, MOH & CW, as well as the relevant epidemiology units, Health Educational Institutions of highest learning, and other organisations influencing the hand hygiene policies and regulations in the Mutoko and Mudzi districts. Above all the findings are required by Mutoko and Mudzi districts health care settings. However, HCWs hand hygiene compliance programmes in healthcare institutions comprise of planning phases, plus implementation and evaluation stages, both of which are accompanied by continuing research into improving the guidelines for fostering hand hygiene and HCAs, prevention and control. According to Peterson and Bredow in Hall and Roussel (2014:238), both a model and a theory are applied in order to fully explain, clarify or predict a phenomenon. Precede-Proceed model concepts are built in such a way, that inherently accommodates use of social science theory and therefore Theory of Planned Behaviour, is in co-operated. Theoretical foundations have concepts and statements of relationships (Mulekar, Jezek & Fruh in Hall & Roussel, 2014:66).

3.4.2.1 Justification for using a model and a theory in this study

Assessment of societal needs, epidemiological, behavioural, environmental assessment, educational and ecological assessment phases of the Precede help health programme planners in developing a logical model of the problem. The phases of the model guide analyses of causes of health problems at many ecological levels towards quality of life. Ecological assessment at level of predisposing factors, reinforcing factors and enabling factors can influence both individual behaviour and environments (Bartholomew, Markham, Mullen and

Fernandez in Glanz, Rimer & Viswanath, 2015: 361, Green & Kreuter, 2005:17). In this study there is explicit linkage between the logical models of the problem in Precede with the study's problem statement. According to Berger *et al.* (1979:14) sociology of knowledge will have to deal not only with the empirical variety of knowledge in human societies but also processual by which any body of knowledge comes in to be considered as socially construal real.

Matlo (2012:3) explains that the model serves in the context where individual theories, community theories, interpersonal communication, technologies, media campaigns can be used within it. Therefore, the model is practical, educational, and ethical as well as geared for research to help solving the puzzling problems. According to Grove, Burns and Gray (2013:4) some HCWs are developers of research and they carry out studies to generate and refine knowledge gaps [such is like in this study]. Masters' graduates critically appraise and synthesise findings from studies and use them for guidelines or policies in practice.

However, Grove, Burns and Gray (2013:4) emphasise that at doctoral level education makes ready the researcher to have advanced research skills, knowledge and leadership qualities to develop, implement, evaluate and revise evidence informed guidelines, protocols and policies. Further Handy (1999:10) is of the view that management is a skill. Sometimes humans seem to have substituted wizard and witch-doctoring for old fashioned common sense. Humans can be tempted that it can be taught in the same way as computing or cooking. It can only be learnt over and over again, even now in the school of experience.

Similarly, is HCWs hand hygiene compliance in which experience guided and enlightened by understanding is likely to be a gentler experience for everyone and to lead to a shorter learning cycle (Handy, 1999:10)? According to Alligood (2014:8) Masters' prepared apply and test theoretical knowledge. Doctoral students, develop theory, test theory, and contribute originally to knowledge in theory-informed and theory-generating research studies. The undertaking for this

argument: - guidelines for fostering hand hygiene compliance and infection control among HCWs henceforth guidelines are according to (Berger *et al.*, 1979:209; Lee, 2010:52) yet theories in any empirical discipline that must be relevant in a two tier fashion to the data defined as pertinent to hand hygiene and infection control, data must be congruent to the discipline, and data must be open to further empirical studies.

Moreover, the stance for UNISA (2012:63) is that “for doctoral studies a theory proper must also be used” henceforward this is the reason why a model and proper theory were both used. Additionally, according to Haralambos, Holborn, Chapman and Moore (2013:885) qualitative study allows for a richer and deeper understanding of processuals involving changes of social lives such as the HCWs hand hygiene compliance *vis - a - vis* HCAs alleviation whilst quantitative methods are used to study more stable parts of social life henceforward presenting the reality of everyday living referred to as “thickness” to tap into the meanings of society in Mutoko and Mudzi districts in Zimbabwe.

Additionally, whilst quantitative research establishes structural elements, qualitative research the processual is according to Haralambos and Holborn (2008:847); performances that go beyond just the thick descriptions (Sergi & Hallin, 2011:191). According to Haralambos *et al.* (2013:885) exploratory data are usually seen as richer and more vital and of greater depth in understanding processes of change presenting a true picture of a way of everyday living in people’s lives, experiences, attitudes and beliefs in context.

3.5 THE THEORY OF PLANNED BEHAVIOUR

In this study, the Theory of Planned Behaviour was used within the Precede-Proceed model to establish HCWs’ hand hygiene compliance, and thereby develop guidelines for fostering hand hygiene compliance among HCWs in the Mutoko and Mudzi districts in Zimbabwe.

This theory was developed by Ajzen (2005) and represented a progression from the Theory of Reasoned Action. It considers intentions as plans of action in pursuit of behavioural goals. Intentions to do or not to do are affected by attitudes to the behaviour and perceived behavioural control. These intentions are the result of an attitude leading to behaviour; they are composed of a positive or negative evaluation of behaviour, and the beliefs about the outcome of the behaviour (Ajzen, 2005 in Polit & Beck, 2014:138).

According to Glanz, Rimer and Viswanath (2008:68), the Theory of Reasoned Action and the Theory of Planned Behaviour focus on individual motivational factors, which determine one's chances of performing a specific behaviour. Both theories assume that the best predictor of behaviour is behavioural intention, which in turn is determined by attitudes toward behaviour, and socially normative perceptions. Positively valued outcomes will influence a positive attitude towards the behaviour, and negatively valued outcomes will have a negative attitude, in which case, the individual will not comply.

In this study it is the HCWs hand hygiene compliance behaviour to prevent and control HCAs. According to Gielen *et al.* in Glanz, Rimer and Viswanath (2008:408), the main purpose of the Precede-Proceed model is not to predict or explain the relationships among factors thought to be associated with an outcome of interest; rather, it provides a logical structure for systematically applying, best-fitting theories, and concepts in the planning and evaluation of health behaviour change programmes for an outcome of quality of life.

The methodology is underpinned by the mixed methods approach linked to the Precede-Proceed coupled with Theory of Planned Behaviour concepts. According to Green and Kreuter (2005:12), predisposing factors can facilitate or hinder a person's (HCWs and patients) motivation to change; they may include knowledge, attitudes, values, cultural beliefs, readiness to change, and

perceptions. Enabling factors can support HCWs efforts to make the desired behaviour change. They include availability of resources, accessibility rules or laws, skills, and engineering. Reinforcing factors come into action following a behaviour occurrence and can encourage or discourage continuation of the favoured behaviour. Examples include the attitudes and behaviour of HCWs, other personnel, peers, parents, and employers.

3.6 ORGANISATIONAL CHANGE AND EDUCATIONAL STRATEGIES

Organisational regulations are important in influencing HCWs' hand hygiene compliance behaviours. Such regulations need to be incorporated readily into the health care system of any country, province or health care district. According to Butterfoss, Kegler and Francisco in Glanz, Rimer and Viswanath (2008:337), individuals are influenced by the opinions, behaviour, advice and support of friends, co-workers, supervisors and influential others within organisational settings. Moreover, organisational leaders are in a position to either facilitate or resist change. Individual behaviour can be improved by coaching, training, goal setting, and obtaining performance feedback in relation to hand hygiene compliance among HCWs in the health care setting. Further, Green and Kreuter (2005:149) also consider family, peers, teachers, community leaders, health providers, employers and decision makers as factors who reinforce HCWs' behaviour henceforth fostering hand hygiene compliance. According to Robertson, Maruta, Mashamba, Mutsvangwa, Jubenkanda, Chasokela, Gomo and Dhliwayo (2014:4) consider the literacy rate for Zimbabwe to be 94% for women and 96% for men.

In Figure 3.2 below Green and Kreuter (2005:215) in their discussion of the required resources, emphasise that the first step in organisational assessment is to review the resources that are needed to implement a proposed programme's methods and strategies. This involves taking a closer look at the time frames needed for achieving set objectives, as well as the types and numbers of people

required to implement the programme. The most important resource is time, since time itself is irreversible and indivisible. Time affects the availability and cost of all other resources, and timetables must accommodate all the agreed objectives, so that they can be achieved within a certain time frame. According to Porter (2015:2) the Precede-Proceed model is widely taught and used with well over one thousand publications resulting in public health and health promotion improvements thereby setting quality of life standards. Some 950 published applications and the theoretical foundation of the model have been explained Green and Kreuter (2005:180).

However additionally in Figure 3.2, according to Green and Kreuter (2005:137) further elaborate the following: that human staffing needs take priority over other budgets considered in the resourcing analyses, that people, HCWs cost more, and that it is harder to allocate HCWs into positions in link to hand hygiene compliance and HCAs control, compared with other resources. The second step is the assessment, enhancement and process evaluation of available resources. The third step is the assessment, modification and process evaluation of factors influencing implementation for the programme towards a quality of life and in this regard focusing on Zimbabwe in Mutoko and Mudzi districts in Mashonaland East as one of the provinces of the country.

According to Braly, Amuta and McNeill (2012:2) Planning models are excellent platforms for educationists to use as logical frameworks with a sense of organisational ability for creating health interventionists. The Precede–Proceed is a model that challenges health personnel to plan and evaluate health promotion programmes by focusing on the preferred outcome programme planning is larger and is a more comprehensive task compared to the subservient function of theory selection and application. Theory is dynamic rather than static (Crosby & Noar, 2011:S7). In the Precede-Proceed, the outcome of interest is identified first and then factors that have an impact on it are investigated backwards (Crosby & Noar, 2011:S7). Precede-Proceed model focus on deep understanding of a wider

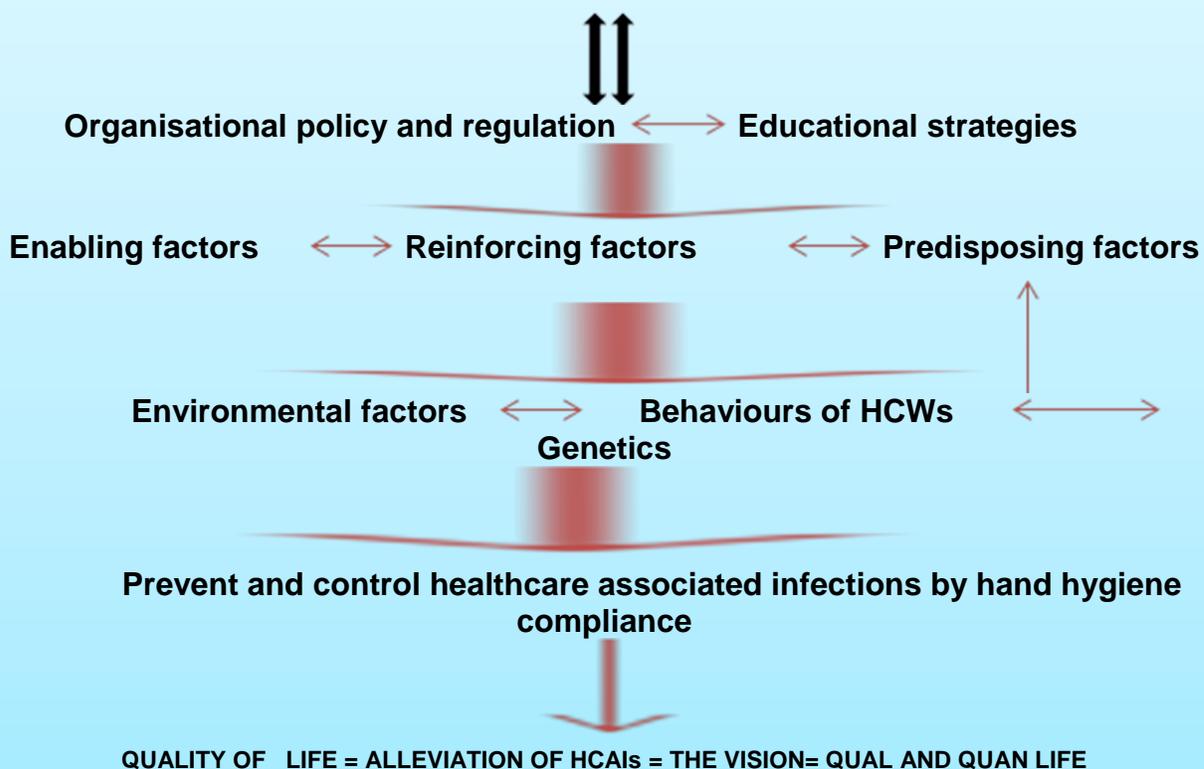
picture of enhancing quality of life (Green & Kreuter, 2005:17). The quality of life has its roots in the clinical practice across the world (Porter, 2015:1). Not only does this apply to quality of life but also quantity of life as objectified abundance longevity vision outcome. Henceforth the vision outcome guided by the model as notation system qualifies as qual, quan showing qualitative strand and quantitative strand and methods, being of equal status as well as priority; QUAN → qual= explain results in explanatory design, QUAL → quan= generalisation of the findings to other contexts, QUAL+QUAN= converge results in life situationally, where both QUAL and QUAN have equal dominant status and priorities.

3.7 APPLICATION OF DATA USING PRECEDE-PROCEED MODEL

According to Greene, Caracelli and Graham (1989:255), on the issue of complementarity of the data, data collection methods used, were supported by pencil and paper tools in documentaries by the researcher and needed to be supplemented by mixed methods as enrichment to deep statistical data. Furthermore, Gray and Costello (1987:12) explain that on one hand quantitative methods can determine the degree to which findings are shared but on the other hand perspectives needs uncovering first in the natural world view before they are shared even up to generalising the findings as illustrated below in Figure 3.2 concerns the data application process using the Precede-Proceed model. Arguably abduction analyses, rather than induction, should be the guiding principle of the scientifically based theory construction. Abduction as a creative inferential process focusses on producing new hypotheses and theories (Timmermans & Tavory, 2012:167). However, Patton (2015:92) is of the stance of paradigm flexibility and methodological appropriateness. Paradigm gives a concrete world view and anchorage with certainty the reality of the world sea of names and that operational as singular paradigm including mixed approach paradigm can be with limitation. The stance involves judging the quality of this study by, the intended purposes, resources available, procedures

followed, and results obtained, in contextual settings, and audiences involved as specified in the study title.

GUIDELINES FOR FOSTERING HAND HYGIENE COMPLIANCE AND INFECTION CONTROL AMONG HEALTHCARE WORKERS AT MUTOKO AND MUDZI DISTRICTS, ZIMBABWE IN SOUTHERN AFRICA



(Researcher devised as adapted from Green & Kreuter 2005: 10).

Figure 3.2 Application of the Precede-Proceed model

3.8 APPLICATION OF THE PRECEDE-PROCEED MODEL AND THE THEORY OF PLANNED BEHAVIOUR FOR VALIDATION OF FINDINGS

The hallmarks of the Precede-Proceed model in Figure 3.1 to 3.2 and 7.0 are its flexibility and scalability in addressing a wide range of social, geographical-ecological problems, settings, and populations. Its results are evidence-based and evaluable, and they provide a platform for evidence-based best practice (Green & Kreuter, 2005:18). The Figures 3.1 to 3.2 and 7.0 therefore were used to enhance the evaluation of health problems by using research questions and objectives specifically in relation to fostering HCWs' hand hygiene compliance in Mutoko and Mudzi districts in Zimbabwe to alleviate HAIs, as it serves as a guide for planning and evaluating hand hygiene programmes, leading to the development of guidelines for fostering HCWs' hand hygiene compliance. This model also embodies a logical structure for applying the Theory of Planned Behaviour. The model helps in promoting coherent and logical mining of data in the study. The Precede-Proceed model emphasises the need for individual and community participation in selecting priority behaviours. The model can also be used in multidisciplinary team's approach in assessing multiple factors contributing to public health problems (Gielen, McDonald, Gary & Bone, in Glanz, Rimer & Viswanath, 2008:430).

Precede-Proceed has been considered a cornerstone for decades, can help guide process of designing, assessing, planning, implementing and evaluating health behaviour change programmes. Whilst Precede-Proceed model appears as a road map and behaviour change theories as the specific directions to a destination, the road map provides all possible avenues whereas the planned behaviour change theories suggest some specific actions to be followed by HCWs (Bartholomew, Markham, Mullen and Fernandez in Glanz, Rimer & Viswanath, 2015:360, Green & Kreuter, 2005:10).

According to Crosby and Noar (2011:S9) a planning model is essentially a road

map for how we go about building the programme in a systematic manner. While it does not contain all the specific details within it such as the specific programme elements, the blueprint does provide a very useful step-by-step guide for constructing and evaluating the programme.

Where theory comes in is as follows: Theory is an essential part of that blueprint, one that is necessary for building a successful programme. Whilst the planning model does not specify the exact theory that should be used in the programme, it does specify basic guidelines that will guide through the process of making these key decisions, including choosing an appropriate theory for the programme. A useful, easy-to-follow and widely applied, planning model is the Precede-Proceed. Precede stands for Predisposing, Reinforcing, and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation. Precede phases correspond with steps 1 through 4 of the models as depicted in Figure 3.1. Proceed, on the other hand, stands for Policy, Regulatory, and Organisational Constructs in Educational and Environmental Development. Developed in 1970s Precede has had influence on the health promotion educational fields towards an outcome- ecological oriented approach to planning.

This means that instead of jumping into applying solutions to health problems Precede-Proceed promotes in-depth understanding of the community, other population or target audience and its needs assessments, plus the determinants of health and quality of life problems and the more distant contextual causes (Batholomew *et al.* in Glanz *et al.*, 2015:360). Using Precede-Proceed model leads to focussed logical planning for intended outcomes and causes (causal model) and therefore provides a logical structure for applying theories and concepts (Batholomew, *et al.* in Glanz *et al.*, 2015:360). This means that the model has inherent unique powered platform provision for applying theories and concepts within it.

3.9 ANALYSES, INTERPRETATIONS AND REPORTING PROGRAMME

PLANNING EVALUATION QUALITY CONTROL CRITERIA

According to Patton (2015:728) the truth is related to research questions being answered accurately and interpreting truthful real meaningful circumstances but Schwandt (2015:310) explains that establishing the nature of meaning is also complex and contested. Further, what carries truth are statements valued beliefs assertions and propositions as used in the Precede-Proceed model concepts that guide this study but how the truth of the same is established is broadly scrutinised and debated. Truth is defended according to Schwandt (2007:300) in Patton (2015:728) that there are ten philosophical orientations to and theories about trustworthiness truth, objectivism, constructivism, realism, critical social theory, contextualism, pragmatism, and hermeneutics-religiously truth veracity integrity. Added are coherence, consensus, and correspondence. Boyatzis (1998:146) explains that despite ontology or epistemology, code, codebook, and assessment of consistent of observations provide reliability, dependability and communication with others in social construction of reality the hermeneutics about the thicknesses of observations. This includes descriptions, discussions and interpretations of accurate meanings of truthfull healthcare events such as hand hygiene compliance and infection prevention and control in specified contexts.

3.10 CONCLUSION

This chapter described and explained the theoretical concreteness of Precede-Proceed model, which has been used to guide the current study, guided by the research problem. This chapter details the model's components and describes how the model works. For this study, the Precede-Proceed model is coupled with the Theory of Planned Behaviour (Green & Kreuter, 2005: 10; Green & Kreuter, 2005 in Community Tool Box, 2018:1; Ajzen, 2005 in Polit & Beck, 2014:138; Batholomew, Markham, Mullen & Fernandez in Glanz, Rimer & Viswanath, 2015:361). The model guides development of the presented guidelines for

fostering HCWs' hand hygiene compliance. Precede-Proceed model links multiple complex disciplines, strategies and multiple-dimensional factors for fostering hand hygiene compliance among HCWs. The process of evaluation cannot occur in isolation, because it is integral in all phases of the Precede-Proceed model, and it guides as the theoretical foundation of the study for continuous quality improvement strategies in hand hygiene, and evaluation of the outcomes of the programme' quality diagnosed from assessments phases (Green & Kreuter, 2005:22). In conclusion, Phillips, Rolley and Davidson (2012:1) hold the view that the Precede-Proceed model is a robust theoretical model that guides realistic led interventions with the highest chances of achieving success. The model's success is echoed by Green and Kreuter (2005:17) in that it has guided planning in numerous health issues in contexts, continentally and globally. Huff, Kline and Peterson (2015:82), and Porter (2015:1) support the evidence. Successful guidelines may well change the conditions that made them work in the first place as morphogenesis, a form of biological change mimic (Pawson, 2006:34). The next Chapter 4 discusses Research design and methodology used in the investigation.

CHAPTER 4

RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

This chapter discusses the research design and methodology, and its appropriateness to the study, sampling, data collection methods, analysing data, validity, trustworthiness and ethical considerations used in each of the strands. For recapitulation the reader is referred to the summary that integrates the research questions, objectives, research problem, design, methods and tools for purpose of this study in Tables 1.1 to 1.4 that serve as templates framing this Chapter 4. Frameworks in the form of tables greatly assist in articulating the study design, methods, and data collection and ultimately enhance and give structure to the presentation of the results section. Therefore, it examined into the procedures that were followed when conducting the study and the instruments that were utilised. By using exactly the same framework this assisted to present the results in Chapter 5 in a concise, coherent, logical sequence with no repetition of research questions, objectives, methods, study designs or justification of the study.

4.2 RESEARCH DESIGN

The discussion in this chapter focuses on an overall plan for enhancing the study's integrity, and the strategies used for gathering and analysing data in a systematic organisation and synthesis of pieces of information obtained in a study (Polit & Beck, 2014:52,378). However, Lincoln and Guba (1985: 187) are of the view that it is not possible to design a naturalistic inquiry in any definitive manner before the study is undertaken. Furthermore, in a mixed methods approach nature study designs must be emergent because meaning is determined by context rather than based only on researcher's construction

(Lincoln & Guba, 1985: 208). Creswell and Plano-Clark (2018:52) explain that designing research study is challenging in both quan and qual. The process is more challenging in mixed approach. In this study, a mixed approach was used to gather data and analyse data in each strand of the multi-phase design. According to Creswell and Plano Clark (2011:70) Strand 1 qual informs Strand 2 quan and it is this quan strand 2 that informs strand 3 mixed approaches. This is a similar form of emergent research design as is applied, illustrated in Table 1.1 to 1.4, and these tables serve as a unit of analysis in the programme evaluation (Creswell & Plano-Clark, 2011:72; Creswell & Plano-Clark, 2018:52; Crotty, 1998:4; Pawson, 2013:86). Seven pillars of realist wisdom are explained embracing the research wheel process (Pawson, 2013:3). In this study each approach is addressed at a time. The purpose of these approaches is to enhance validity, truthfulness of the findings and complementarity (Grove, Burns & Gray, 2013:214). Lacey in Gerrish and Lacey (2010:19) explains that some research designs are QUAN, in that they collect numerical data that is liable to statistical analysis; whereas, other designs are QUAL, and so they use narrative, words, documents, or geographical materials as sources of data, and the material is analysed in order to identify themes, relationships, concepts, and in some cases to develop theories and hypotheses. LoBiondo-Wood & Haber (2010:158) explains that the framework that the researcher creates is the design, whereby the research question, objective, purpose, literature review, theoretical framework, and hypothesis all interrelate with and complement one another, and help with the operationalisation of the design for development into guidelines. According to Polit and Beck (2010:16); Grove, Burns, and Gray (2015:19), a QUAN research design is evidence informed and has a systematic way of gathering information in numbers in order to obtain information about reality of a phenomenon. Creswell and Plano Clark (2011:54), and Graff in Hall and Roussel (2014:50) emphasise that matching the study design with the research title, research problem, purpose, and objectives is an important aspect of a mixed approach. This study was an ethically approved observational survey non-experimental, exploratory, descriptive, and contextual in nature using a mixed

methods approach with reference to the University of South Africa's Health Research Studies and Ethics Committee ethical clearance certificate and approval letter from Medical Research Council of Zimbabwe; annexes 1 and 2 being project numbers 6067662 and reference number MRCZ/B208.

According to Daniel (2016:91) research is to discover the truth, which involves combining reasoning and experiences in context. However, even though qualitative, quantitative and mixed approaches are on separate points of the continuum, they all aim at addressing research problems using different approaches according to the research wheel. By using the mixed methods approach, the justification is based on its flexibility in giving research answers to the set questions and objectives of this study. According to Johnson and Christensen (2008:33), research can be primarily qualitative, quantitative, or a mixed approach and a particular study could fall on a particular point on the research wheel continuum. All three paradigms provide insights to give solutions to the research problem depending on the research title under study. According to Onwuegbuzie (2012:192) a third mixed paradigm that is a (combination of quantitative and qualitative methods) is referred to as the radical middle that is active and not just sitting comfortably in the middle zone of QUAL and QUAN continuum but conscientiously localised, not static, interactive, situational, cultural, contextual, ecological, fluidity, flexible, strategic and generates; tests theory and contributes to knowledge boundaries.

4.3 MIXED METHODS RESEARCH

According to Creswell and Plano Clark (2011:5) definition of mixed methods research is a research design with philosophical assumptions as well as methods of investigations. However mixed methodology has both philosophical theory and methods: - being methodology deals with collecting, analysing, and mixing qual and quan strategies at many steps in the research procedures with the worldview assumptions, utilising the philosophical assumptions up to conclusions drawn

from the study, and on being a method it collects, analyses, and mixes quan and qual data in a single study or multiple strands combined (Creswell & Plano Clark, 2006:18). Additionally, Morse (2012:27) includes a component of qualitative research in quantitative studies as mixed methods design that link to enhance understanding of phenomenon. This means as a qualitative component, the researcher studies in natural settings to make sense of the world as well as to interpret phenomena to make meanings people bring to the context (Denzin & Lincoln, 2005:3). Creswell (2007:37) emphasises research procedures that come from philosophical assumptions to worldviews, through theoretical lens onto the procedures involved. In this study a Precede-Proceed model coupled with Theory of Planned Behaviour exists to approach inquiry of the research problem and helps to answer the research questions to fulfill the objectives.

According to Parahoo (2014:79), the nature of the data determines the type of research methods that are needed to answer the research questions in link with the objectives to find solutions to research problem. For this study, a mixed approach was used. Simons and Lathlean in Gerrish and Lacey (2010:334) identified four types of triangulation the blending of quan and qual research methods, but triangulation has been replaced by mixed approaches (Creswell, 2009, in Grove, Burns, & Gray, 2013:208). LoBiondo-Wood and Haber (2010:123) explain that triangulation has been superseded in both single and multiple studies, to achieve a greater understanding, diversification, and accomplish the set goals of a study. The research design may be dominated either by qualitative (QUAL) and quantitative (QUAN) elements. QUAN and QUAL stages in a study may be conducted in sequence, or simultaneously. Conversion of data occurs, either when data that is originally collected in a QUAN study is then converted into narrative data for QUAL analysis, or when QUAL data is converted into numeric data for statistical analysis (Graff, in Hall & Roussel, 2014:50).

Moreover, Creswell (2009) in Grove, Burns, and Gray (2013:208) explains that a single approach taken to operationalise variables might not adequately justify a claim that it is a valid measure of a theoretical concept. Therefore, mixed methods approach enables utilisation of the strengths of both qual and quan research designs. A mixed approach contains both qual and quan aspects (Marshall & Rossman, 2011, in Grove, Burns, & Gray, 2013:208). Johnson and Christensen (2008:51) specify that in a mixed approach, the researcher could use the following concurrent combinations: QUAN+QUAL, QUAL+ quan, and QUAN+qual (whereby lower-case lettering infers a recessive status and upper-case lettering infers a dominant status). Concurrent qualitative and quantitative mixed data collection methods have been designed to validate one form of data with the other form, to transform the data for the purposes of comparison, or to address different types of questions and objectives (Creswell & Plano Clark, 2011: 69; Driscoll, Appiah-Yeboah, Salib & Rupert, 2007:20; Morse, 1991b:122).

In a single study, the qualitative and quantitative elements may enjoy sequential equal and dominant status (QUAL→QUAN, QUAN→QUAL, QUAL→ quan, or QUAN→ qual). The advantage of this is that the resulting mixture or combination has complementary strengths and non-overlapping weaknesses, and thus the researcher can analyse a phenomenon more comprehensively. Sequential mixed approach data collection strategies involve collecting data in an iterative process, whereby the data collected in one phase contributes to the data collected in the next phase (Creswell & Plano Clark, 2011:66; Morse, 1991b:122). In this study, data were collected in multistrands combination that is both concurrent and sequential. The multistrand combination provides more information about results from the earlier strands of data collection and analyses, and to select participants who could best provide that information to verify and augment the results from the earlier stages (Creswell & Plano Clark, 2011:71; Driscoll, Appiah-Yeboah, Salib & Rupert, 2007:20).

According to Greene, Caracelli and Graham (1989: 257) in their investigation of mixed-method studies they identified two broad levels of methodology: paradigms, and methods, where method refers to data gathering, and handling techniques and paradigm refers to the wider set of methodological principles and philosophical ideas. However, Patton (2015:88) operated with three levels and divided possibilities at all levels into two basic types, one of them regarded as qualitative and the other as quantitative: (design: - naturalistic versus experimental, measurement: - qualitative versus quantitative and analysis: - qualitative versus statistical. By combining these two different possibilities at all three levels the result is two pure strategies and four mixed forms: Mixed form, (i): QUAN → QUAL → QUAL: - experimental design, qualitative measurement, content (qualitative) analysis. Mixed form, (ii): QUAN → QUAL → QUAN: - experimental design, qualitative measurement, and statistical analysis. Mixed form, (iii): QUAL → QUAL → QUAN: - naturalistic inquiry, qualitative measurement, statistical analysis. Mixed form (iv): QUAL → QUAN → QUAN: - naturalistic inquiry, quantitative measurement, statistical analysis.

Tashakkori and Teddlie (1998:37) as classical authors propose different names to indicate changes and identification of the three levels of research: inquiry that will be exploratory and confirmatory and not qualitative and quantitative, that data collection and operations be qualitative in nature regarding the information and quantitative in terms of data, that data analyses and inference be qualitative and statistical. However, to be thorough in the taxonomy Tashakkori and Teddlie (1998:53) added two mixed forms to their classification: Mixed form: QUAN → QUAN → QUAL: confirmatory investigation, quantitative data-operations, qualitative analysis-inference and mixed form: QUAL → QUAN → QUAL, exploratory investigation, quantitative data-operations and qualitative analysis-inference.

4.3.1 Main characteristics of the mixed methods research

Mixed methods in this study is an integration of qualitative and quantitative methods, philosophical views and research design foundation orientation as shown in frameworks, tables 1.1 to 1.4. According to Creswell and Plano Clark (2011:5), the researcher collects and analyses persuasively and with rigour combined QUAL and QUAN data in accordance with the research questions and objectives in mixed approach. The definition combines methods, philosophical position and a research design orientation in that the researcher, collects both QUAL and QUAN data and analyses data answering research questions and objectives, mixes the two forms of data concurrently by merging them henceforth one being informed by the other as a built on approach, prioritises one or all forms of data, these processes are used in a single study or multiple phases of a single study, utilises philosophical worldviews and theoretical foundations, and links the research processes into specific research designs that direct the plan for carrying out the study.

Furthermore, Parahoo (2014:81) explains that researchers may use a mixed approach in order to achieve one or more of the following: enhancement of the validity of measuring tools, development, implementation, and evaluation of interventions, further exploration of or testing the findings, studying different areas of the same topic, exploring complex phenomena from different viewpoints, and to confirm or cross-validate data in the study. In this study the researcher executed mixed methodology approach and data were collected concurrently and sequentially in the multiphase design of the mixed approach with qualitative and quantitative methods.

4.3.1.1 Data collection methods in mixed approach

Blaxter, Hughes and Tight (2010:183) are of the stance that research involves the collection and analyses of data, be it by reading, observing, measuring, questioning, or by a combination of strategies. Data may be numerical or verbal or be a combination of both. Similarly, according to Creswell and Plano Clark

(2011:53) research designs are the plans that are followed by the researcher in data collection, analyses, interpretation, describing and discussing data henceforward reporting. In this study data collection were through observations in the QUAL study one that involved collecting data by direct eye observation of HCWs' hand hygiene compliance and quantitised. Considered as cognitive construction, the symbolic universe is theoretical and starts in processes of subjective reflection, which upon social objectivation lead to formulated links between important themes that have their roots in many institutions. Only after a symbolic universe is objectivated as a first product of theoretical thought does the possibility of systematic reflection about the nature of that universe arise. Symbolic universe proclaims that all reality is humanly meaningful and that the whole cosmos displays the validity of human existence (Berger *et al.*, 1979:122).

Structured interviews were used to gather further information responses to a questionnaire from patients as guided by the Precede-Proceed model concept of reinforcement therefore linking to influencing HCWs hand hygiene compliance behaviours to alleviate and control HCAs for quality of health. For the HCWs themselves it was qual + quan strand two where self- administered questionnaires were hand delivered and returned completely filled in to the reseacher. This is also illustrated in table 1.1 to 1.4. This strand two involved data collection from patients' interviews on their views about promoting HCWs hand hygiene compliance and from HCWs on the challenges they faced that influence their behaviours within the Precede-Proceed model to accomplish hand hygiene in the context. In strand three retrospective records review (that is: - of HCAs associated mortalities) were done. In this strand there was the integration of the qual and quan strands to give answers to guidelines for fostering HCWs hand hygiene compliance *vis-a-vis* the prevention and control of HCAs in remote rural Mutoko and Mudzi districts health care institutions in Zimbabwe. Documentation was also used to record the progress of data collection.

In this study, HCWs' hand hygiene behaviours were observed seeing with scrutiny HCWs hand hygiene and then the occurrences were recorded, writing on a modified hand hygiene observation tool with pen and paper (MHHOT) considerably as a checklist. The observation tool in annexe 13 was used to write on the occurrences from HCWs like as they were exactly seen during their care with patients on the promotion of hand hygiene compliance. Structured interview questionnaires in the annexe 15 were administered to patients. The questionnaire covered on various issues regarding hand hygiene compliance with respect to HCWs and patients, challenges HCWs faced in achieving the best hand hygiene practices to therefore reduce HCAs, feedback response based on the questions from the questionnaire that patients gave for better hand hygiene practices in the grand scheme of better care. It is every HCWs duty to desire in patient centred or focused care. Hence why they are included as a data source so that they could directly input their feedback with regards to how HCWs could improve their care by various means such as hand hygiene and infections control compliances to counteract HCAs or substantially reduce the risk of them ever occurring again. A retrospective review of records on HCAs associated with mortalities was also conducted. These are attached at the Appendix, which was used as a tool to aid in exploring and investigating many major issues/ topics with regards to HCAs and infection control. Statistical tests were also carried out in order to predict HCWs' hand hygiene compliance behaviour and inference.

4.3.1.1.1 Mixed analyses defined

What is mixed research? It is referred to as mixed methods research in which there is mixing or combination of qualitative and quantitative research strategies, methods, approaches, concepts or lexicology in one study (Johnson & Onwuegbuzie, 2004:17 in Onwuegbuzie & Combs, 2011:2). According to Onwuegbuzie and Combs (2011:3) there are 13 criteria that represent decisions that mixed researchers make before, during, or after the conduct of mixed analyses: each of which occur at one of the following three strands of the mixed

process: research conceptualisation, planning and implementation. The terminology mixed analysis is used for analysing data in mixed approach (Onwuegbuzie & Combs, 2011:2). The 13 criteria are the following: -

- **Justification for the mixed analyses**

Parahoo (2014:81) explains that researchers use a mixed approach in order to enhance the validity of measuring tools and trustworthiness of results as well as development, implementation, and evaluation of interventions. The mixed questions and objectives of this study include the exploratory and confirmatory for deductive and inductive research wheel to develop interventionist theory as guidelines. This study developed guidelines to promote compliance to hand hygiene practices among HCWs, centred to alleviate HCAs. Argyrous (2011:7) further argues that the determination of an operational definition is a major source of disagreement in research debates, and that the validity of research centres on this. This study has mixed approach concepts and also the mixed operational work to help analyses in order to achieve the purpose of the study as marked in the title.

- **Foundational philosophical approach to mixed analyses**

Creswell and Plano Clark (2011:5) defines mixed research as a methodology with philosophical assumptions as well as methods of inquiry in which researcher collects, analyses and mixes both quan and qual data in a single study or a multiphase programme of study. Furthermore, Creswell and Plano Clark (2018:34) indicate four levels for developing a research study as follows: paradigm worldviews, theoretical lens such as in the use of the Precede-Proceed model and or social science theory in this study Theory of Planned Behaviour, methodological approach, and methods of data collection thereafter mixed data analyses.

- **Number of data types analysed**

Morse (2012:27) calls for mixed approach to have emerged as the solution during the paradigm wars to include qual research in quan studies as mixed method design that link together to enhance understanding of phenomenon.

- **Number of data analysis types that will be used**

Blaxter, Hughes and Tight (2010:183); Lacey in Gerrish and Lacey (2010:19) explain that some research designs collect data utilising numbers that are liable to statistical analyses; whereas, other designs use narrative, words in the analyses of information focussing on guidelines for fostering HCWs hand hygiene compliance and infection control and prevention. This study used mixed analyses.

- **Time sequence of the mixed analyses**

This involves analyses in multiphases or overall combination according to Johnson and Christensen (2008:51; Plano Clark, 2011:66; Morse, 1991b:122). In this study, data were analysed both done concurrently and sequentially.

- **Level of interaction between quantitative and qualitative analyses**

Parahoo (2014:81) explores complex phenomena from different viewpoints and to confirm or cross-validate data in the study. Even though Lincoln and Guba (1985:333) explains that data analyses is not just a question of reducing it but it being induction therefore arguably abduction analyses, rather than induction, should be the guiding principle of the scientifically based theory construction. Abduction as a creative inferential process focusses at producing new

hypotheses and theories to the best explanation in this study (Timmermans & Tavory, 2012:167).

- **Priority of analytical components**

Mixed analyses are given emphasis as qual or quan analyses components. The qual quan can be of equal weighting or dominant and recessive priority qual or quan or *vice-versa* whilst believing that inclusion of qual or quan increases understanding of the phenomena under study (Onwuegbuzie & Combs, 2011:5).

- **Number of analytical phases**

According to Greene (2007:155) mixed analyses involve several analyses phases such as the following as identified that is, data transformation, data correlation and comparison, analysis for inquiry conclusions and statistical inferences, and using aspects of the research wheel of one methodological aspect within the data analysis from another aspect.

- **Link to other design components**

Morse (2012:27) explains that qualitative research in quantitative studies as mixed approach design links together as well as to other designs to enhance understanding of phenomenon under study that is hand hygiene compliance and infection control plus prevention in Mutoko and Mudzi districts in Zimbabwe. According to Onwuegbuzie (2012:192) mixed approach as the radical middle is not only in the middle of a continuum but also conscientiously localised, dynamic, interactive, situational, cultural in context, ecological, fluidity, flexible, strategic and henceforth tests; generates theory and contributes to knowledge boundaries and this applies to this study.

- **Phase of the research process when all analysis decisions are made**

Creswell and Plano Clark (2011:63) terms each level of the multiphase design, a strand and to qualify as a mixed approach there should be a minimum of, one qual strand and one quan strand or vice – versa and then this is followed by overall interpretation of the mixed analyses to complete the research wheel procedures.

- **Type of generalisation**

Researcher generalised from sample information to representative population from the context.

- **Combined quantitative and qualitative Analysis**

Mixed methodology addresses techniques, methods, approaches, concepts or language into one study or set of related studies (Johnson & Onwuegbuzie, 2004:17 in Onwuegbuzie & Combs, 2011:2). This was centred to the title, problem, research questions and objectives towards guidelines to help solve the problem.

- **Cross-over nature of analysis**

Parahoo (2014:81) explains this as to confirm or cross-validate findings. In this study the findings were corroborated and validated using the Precede-Proceed model leading to the development of guidelines for fostering hand hygiene compliance for HCWs to absolutely follow when it is reasonable to do so. However, Aamodt in Morse (1991a:49) and Stern in Morse (1991a:156) explain that transformation of data is from one level of analysis to another.

Analysing data in a mixed methodology is the most complicated step because the researcher must be skilful at analysing both the quantitative and qualitative data that have been collected, as well as integrating and interpreting the results that stem from both the quantitative and qualitative strands in a coherent and meaningful way (Onwuegbuzie & Combs, 2011:3).

4.3.1.1.2 Data analyses

The analyses strands might not interact until the data interpretation stage yielding a basic parallel mixed analysis, although more complex forms of parallel mixed analyses can be used, in which interaction takes place in a limited way before the data interpretation phase (Onwuegbuzie & Combs, 2011:3).

Mixed approach data analyses rely on a firm knowledge of the strategies used to analyse qualitative and quantitative data (Graff, in Hall & Roussel, 2014:59). According to Johnson and Christensen (2008:97), after the researcher has finished studying the data, the researcher must then analyse the data to answer the research questions and objectives. A mixed approach involves putting QUAL and QUAN data into one data set and analysing the combined data set in a research wheel (Johnson & Christensen, 2008:97). According to Johnson and Christensen (2008:19), new knowledge is generated using the exploratory or inductive method, and this provisional knowledge is tested or justified using the confirmatory or deductive method. The foundation for this is that the exploratory scientific method focuses on theory discovery, generation, and theory construction; and the confirmatory scientific method focuses on theory that raises questions, hypothesis testing, justification or verification.

This study analysed the qualitative data using these parameters as a research wheel process. However, Graff in Hall and Roussel (2014:45); Bryman and Bell (2015:652) explain that quantitative researchers focus on numeric data analyses; qualitative researchers focus on narrative data analyses; and, mixed approach researchers combine both qual and quan elements. This study used both a

multistrand data analyses. According to Babbie (2010:467), descriptive statistics is a medium for describing data in more manageable forms. On the other hand, inferential statistics move beyond descriptive statistics, assisting researchers into drawing conclusions from the data about a representative sample drawn from the population for intended results. This helps for inference to the population to enable generalisation of the findings of the study. For this study, an experienced statistician was consulted. The mixed approach analysis is guided towards analysing data in a way that yields at least one of five types of generalisations, external statistical generalisations, internal statistical generalisations, analytical generalisations, case-to-case transfer, and naturalistic generalisation (Onwuegbuzie & Combs, 2011:3).

Morse (1991a:24) raises a question during a dialogue on bracketing (the etic aspect: can one do phenomenology without the self? Others' answers are a no but Tripp- Reimer in Morse (1991a:24) opinion is that one could do that if one takes a non-Western position because all Western Science is self- centred even when doing qualitative or quantitative. A thin difference is explained in timing that qualitative analysis has very little difference from quantitative from this view in that as soon as one starts looking for codes, categories and themes in qualitative research one has already objectified the subjects and that is not different than looking for statistical means for inference. You take two similar experiences and you average them and that is your description or interpretation. Bergum in the same dialogue Morse (1991a:24) questions whether personal experience helps or hinders one's being in the setting and Knafl replies that has real hard time getting to grips on it, on one hand is bracketing and on the other hand one is using the self. According to Boyle in Morse (1991a:23) questions how does one discriminate and know when to use self and when to bracket? The answer according to Bergum in Morse (1991a:23) is that it is the thoughtfulness and the awarenesss that one enters the setting with a sense of questioning so there is a self questioning about the nature of one's own involvement and Stern in Morse (1991a:23) responds that all these methods are very important to nursing as we

do not separate ourselves from whom we are working with. Munhall asks then what the difference is. Is it the level of intimacy or the one- to- one that then makes one to think that phenomenology is more intimate? On further dialogue Hutchinson in Morse (1991a:23) answers that according to what she thinks there is always an identification that is more fundamental and more ego-focused. Can one be more focused on empathy in phenomenology, where it can? Lipson in Morse (1991a:23) agrees that to be right.

4.3.2 Advantages of a mixed methodology design

Combination of qualitative and quantitative methods inclusive of their philosophical assumptions includes complementarity strengths to avoid limitations of overlapping weaknesses of using one method only (Johnston & Christensen, 2017:482). The integration is done within the complex nature and uses best suitable methods, instruments appropriate to address research problem plus questions and not be disadvantaged by rigid adherence to a single method, progressively built on topic is incremental with one strand informing the other strand(s), enhanced validity supported by many complementary data to give more confidence about inferences and credibility. Above all pragmatist reality considers that it is the research question that drives the inquiry, designs and methods (Polit & Beck, 2014:340). According to May in Morse (1991a:24) someone said that “bracketing means rendering the known biases problematic, but that assumes considerable self-knowledge”. Anderson in Morse (1991a:24) further interrogates “how then do you go about preparing yourself for the interview?” One student told her that “she actually mediates before, that cleanses her mind, put everything aside so that she is more receptive and open to what is going on”.

4.3.3 Strands

Strand one explores the extent and nature of compliance of hand hygiene standards by HCWs in rural health care settings in Zimbabwe. Hand hygiene opportunities were observed for compliance and non-compliance during data collection. Strand two focused on key determinants of hand hygiene promotion as perceived by patients among the different categories of HCWs and also determined key factors of hand hygiene promotions by different categories of HCWs in order to improve compliance to hand hygiene. The key determinant factors were established from the interviewed patients for their perspectives on HCWs hand hygiene compliance, and from the challenges HCWs face in order to accomplish hand hygiene compliance in healthcare institutions and analyses of their existing practices, relevant to HCWs hand hygiene, and compare with international standards in Mutoko and Mudzi districts. Strand three investigated in retrospect HCAs related mortalities linked with strands one and two.

The three strands inform each other, and the findings concluded from them contribute to a clear separate Chapter 6 on discussion of the findings, which extracts and synthesises material from the preceding chapters and serves to frame Chapter 9: Summary, Conclusion and Recommendations. This contributes towards the development of guidelines for fostering hand hygiene compliance to alleviate HCAs in Mutoko and Mudzi districts in Zimbabwe. Guidelines were developed by intervention alignment from evidence-based findings of the collected analysed data derived as influenced by appropriate mixed methodology that involves combining qualitative-quantitative mixed methods and theoretical lens underpinned by the philosophy of epistemology guided by the model and naturalistic ontological assumptions in specified Mutoko and Mudzi districts healthcare settings. The findings were collated, corroborated and validated using Precede- Proceed model concepts, organogram and World Health Organization as a leader in all health aspects.

This chapter also describes the multi-phase research design including the types of mixed approaches and mixed analyses relevant to this study. Exploratory -

descriptive and comparative descriptive research designs were used across the three strands. Convergent design brings together the complementary effects of quantitative methods with large samples, trends for generalisation to the population with those of qualitative methods with small samples for indepth details used with qualitative findings for corroboration and validation with statistical results. This design is also used for showing quantitative results with qualitative findings, complementarity of qualitative and quantitative results to develop indepth understanding and comparing multiple strands the study. It also involves data transforming and validation (Creswell & Plano Clark, 2011:76).

The information were analysed and the objectives of the study of the phenomena were guided by the Precede-Proceed Model (Green & Kreuter, 2005: 10, Green & Kreuter, 2005, in Community Tool Box, 2018:1). This model was coupled with the Theory of Planned Behaviour by linking its concepts to solve the research problem (Ajzen, 2005 in Polit & Beck, 2014:138). Statistical consultation data presentation and analyses were also included and according to Grove, Burns and Gray (2013:538) to enable computing of inferential statistics in order to draw conclusions and make inferences that could lead to generalisability.

4.4 NON-EXPERIMENTAL RESEARCH DESIGN

This study used a non-experimental research design as applied. This was done in order to gain a deeper understanding of the phenomenon for a thicker description and interpretation in context.

In quantitative non-experimental research, researchers collect data without introducing treatments or manipulation of any kind (Polit & Beck, 2014:47; Grove, Burns and Gray (2013:225). Kerlinger (1986:348) in Johnson and Christensen (2008:356) defined non-experimental research as a systematic investigation in which the researcher has no direct control, either because their manifestation has already occurred, or because they are inherently not manipulated. According

to Polit and Beck (2014:159) prognosis questions are raised or it would be unethical to manipulate variables and becomes not natural. Therefore, according to Kerlinger (1986:348) in Johnson and Christensen (2008: 357), manipulation of variables as well as randomisation to groups as occurs in experimental research studies do not happen. Non-experimental research also enabled the researcher to make inferences regarding relationships among variables.

If data are collected backwards in time, then it is a retrospective study (Johnson & Christensen, 2008:384). This study included a retrospective review of mortality records, with a focus on developing guidelines for fostering hand hygiene compliance among HCWs to control and prevent HAIs in Mutoko and Mudzi districts in Zimbabwe.

According to Johnson and Christensen (2008:384), descriptive research provides an accurate picture of the status of a situation in context or phenomenon. The findings of the study were validated and corroborated with Precede-Proceed model (Green & Kreuter, 2005: 10; Green & Kreuter, 2005 in Community Tool Box, 2018:1).

4.4.1 Survey designs

The survey falls into two firstly, to mean non-experimental design, classified as a descriptive or correlational study (Grove Burns & Gray, 2013:224). Surveys are used to collect detailed descriptions of existing variables such as opinions, attitudes, or facts, to justify and assess current phenomenon (LoBiondo-Wood & Haber, 2008:198). Secondly a survey in a narrower sense is a data collection technique, whereby the researcher uses questionnaires or personal interviews to collect data (Grove Burns & Gray, 2013:224). As Babbie (2010:121) explains in any research design researchers must specify as clearly as possible what they want to find out, and then determine the best way to do it.

4.4.2 Exploratory research

According to LoBiondo-Wood and Haber (2010:198), when little is known about a phenomenon, survey-based, descriptive, explorative, or comparative studies are undertaken. In this study, exploratory research was used to investigate hand hygiene compliance among HCWs as a phenomenon, and other factors related to it in link with alleviation or prevention of HCAs at the Mutoko and Mudzi districts health care institutions in Zimbabwe where there is no robust surveillance programme in place to monitor HCAs. Since there is no robust surveillance programme in place it is difficult to ascertain precisely the mortality or morbidity rates linked to HCAs so that they can be counteracted effectively therefore the researcher had to familiarise with concepts of HCWs hand hygiene compliance and HCAs prevention and control to facilitate start of interpretation and that is this interpretive character of description rather than detail that makes it thick (Schwandt, 2015:306).

4.4.3 Descriptive research design

Descriptive research design facilitates full description and explanation of the phenomena. In descriptive research studies, researchers discover new meanings, describe what exists, determine the frequency with which something occurs, and categorise information (Grove, Burns and Gray, 2013:26). That means code, categorise, conceptualise and operationalise for construct accuracy. In this study, both hand hygiene compliance and non-compliance rates of the HCWs were determined. Patients' views of HCWs hand hygiene compliance, and the challenges faced by HCWs in accomplishing hand hygiene compliance were described, and the data were categorised. Data contained in retrospective records of HCAs-based mortalities were also gathered and described and further explained. According to Grove, Burns and Gray (2013:26), descriptive studies are usually conducted when little is known about a phenomenon in situ, and these provide the basis for the conduct of correlational studies, quasi-experimental, and experimental studies. In this study Cronbach's

coefficient alpha determined the internal consistency of the construct (Cozby, 2009:374; Polit & Beck, 2014:378).

According to Denzin (1989:33), thick description traces the beginning and development of the happenings in the settings. In thick description the happenings are textual and can be interpreted. Thin description simply reports facts superficially, and, are independent of intentions or the circumstances that surround the occurrence.

According to Lincoln and Guba (1985:42), and Schwandt (2015:308) trustworthiness has the following components:

Credibility is the researchers' worth of being believed as a true picture of occurrences from the mixed aspect: persistent and consistent observations, experiences in real life, go beyond thick descriptions by the researcher to facilitate transferability, auditability, dependability and confirmability: - Interpretation of the study findings takes the form of thick performances beyond just thick descriptions, the processual nature and this means that the information from participants presents voices, meanings, actions and feelings and in that way the participants are heard in contexts to improve life experiences (Creswell, 2007:194). In this study the happenings can then be interpreted and discussed. Transferability occurs when interpreting of findings from thick performances beyond the thick descriptions as the processual nature does facilitate the transfer that is conveyance from one context to another context, the findings being depended on as capable of worthy of believability and confirmed by others as evidence based. Henceforth the evidence contributes to originality as authentic which in this study was concerned with the extent to which the participants' own genuine contributions were enhanced by the researcher as a result of having participated in the investigatory processes (Schwandt, 2015:12). Henceforth: - following the equivalent scientific procedures of the research wheel for auditability trail of the study.

4.4.4 Methodological research design

In methodological research there is the identification of an intangible construct or concept, and the process of making it tangible with a paper and pencil instrument, or an observation protocol. The literature review provides the foundation for item formulation (LoBiondo-Wood & Haber, 2010: 2008). Moreover, other types of quantitative research complement the business of research by providing a means of viewing and interpreting a phenomenon, and a deeper understanding of health science and practice (LoBiondo-Wood & Haber, 2010:207). An operational definition specifies a range of categories or values for a variable into which individual cases fall. Such categories and values are meant to capture the possible range of variation that could arise in the process of measurement (Argyrous, 2011:10).

4.5 CONTEXTUAL DESIGN

According to Denzin (1989:60), contextualisation starts with important themes and structures that are exposed in bracketing and construction. Its efforts are to interpret those constructs to give them meaningful thought by relocating them back in the natural social world. Contextualisation relocates the phenomena in social backgrounds of participants under study. It isolates meaning for them in their own language, presents it in their terms and emotions. It reveals how the phenomenon is understood by ordinary people. It does this by thick descriptions of occurrences in their own world habitats as belonging to them.

Context means the environment where events occur (LoBiondo-Wood & Haber, 2010:576). In this study, context represents the settings where observations, interviews of patients, experiences of challenges faced by HCWs and the retrospective review of related mortalities in view of HCAs from documentary records were carried out for data collection, with a focus on the phenomena under study. Entry into the settings was gained through permissions, and ethical

considerations were always upheld to protect research participants from harm. It is for this reason that the researcher carried out the investigation to draw meanings of situations from Mutoko and Mudzi contexts in Zimbabwe.

4.6 ORGANISATION OF THE STUDY IN STRANDS GUIDED BY THE PRECEDE-PROCEED MODEL COUPLED WITH THEORY OF PLANNED BEHAVIOUR IN THE HEALTH CARE INSTITUTIONS

The data collection stage included choosing the data collection methods, developing and testing the data collection instrument and the characteristics of the data collection instrument, applying the data collection process, and adhering with the ethical considerations related to the data collection. Records of mortalities were retrospectively reviewed, and the data were documented and described. After all data had been gathered, data analyses were carried out. Both internal and external validity checks were performed by a highly qualified statistician and the researcher to enhance the integrity, trustworthiness and credibility of the study.

4.6.1 Healthcare workers' observed hand hygiene compliance

Ninety-five HCWs' and 570 hand hygiene opportunities were meticulously observed by the researcher and the researcher's team in the hospital wards, and the primary health care settings. This was done by observing in the natural healthcare settings hand washing, hand rubs, drying and the application of the moments of hand hygiene. After each observation session these were tallied and then overally counted using Modified Hand Hygiene Observation Tool (MHHOT) and calculated using a formula (Fuller, McAteer, Slade, Cookson, Michie, Savage & Stone, 2009:16; McAteer, Stone, Fuller, Charlett, Cookson, Slade & Michie, 2008:224). The Hand Hygiene Observation Tool was modified by the researcher in line the best hand hygiene practices and substantially reducing or

eradicating HCAs. As it was modified by the researcher there was no need of restriction on any permission because of the free access of the material.

4.6.2 Interviewed patients

574 Patients' feedback from hospital wards, maternity wards out patients departments, with respect to HCWs' hand hygiene compliance was then collected. They are primarily the ones in direct contact with HCWs on a daily basis. So, they are the best group of people to offer reliable information and know if HCWs are complying well with effective hand hygiene practices as they receive care from them in context. Healthcare should always be patient centred. Therefore, interviewing patients helped to ensure that they receive optimal care.

4.6.3 Self- administered questionnaires

Hand hygiene compliance questionnaires were administered to 189 HCWs to collect data on the challenges they faced in accomplishing hand hygiene compliance. This included their recommendations for improving compliance in their healthcare settings.

4.6.4 Mortality records

Data were collected through a retrospective review of HCAs with link to their associated mortalities from records kept by the registrars of births and deaths in the Mutoko and Mudzi districts.

4.6.5 Statistical consultation methods for analysing data

Statistical tests were carried out to predict and inference fostering HCWs' hand hygiene compliance behaviours to alleviate HCAs in the Mutoko and Mudzi districts.

4.6.5.1 Statistical methods

Statistical consultation was conducted by the statistician to address and analyse data for each of the research questions corresponding to the the set objectives. Qualitative data fit in from the perspective that the researcher used an interview addressing questions from questionnaire tool for the patients. (Patient Data: Patients' perception of HCWs' hand hygiene compliance questionnaire). The data obtained from the questions were both qualitative and quantitative. This interview and questionnaire qualitatively assessed patients' perception on compliance, assessing the attitudes regarding whether the HCWs took the necessary practices of hand hygiene compliances in the different moments of hand hygiene. This data was then drawn together as quantitatively analysed. This study is a mixed approach.

Quantitative data fits in from the perspective of how often or not HCWs implemented certain hand hygiene practices and assessing other factors that hindered them from achieving optimal hand hygiene practices. These data were collected using the self- administered questionnaires that assessed whether the HCWs had enough resources, the challenges they faced in order to foster hand hygiene effectively and optimally. The information obtained from this was then qual, quan analysed.

4.6.5.1.1 Pearson χ^2 test statistic for test of independence

Throughout this project, the Pearson χ^2 test statistic for test of independence was used whenever it was applicable. In general, if the sample size is large, the Pearson χ^2 test statistic for test of independence is appropriate for examining the association between variables X and Y (whereby X and Y are categorical variables). The Pearson χ^2 test statistic for two-way tables examines the differences between the observed and expected frequencies, and is computed thus according to Agresti (2013:75):

$$Q = \sum_i \sum_j \frac{(n_{ij} - e_{ij})^2}{e_{ij}},$$

Whereby n_{ij} is the observed frequency in table cell (i, j) , and e_{ij} is the expected frequency for table cell (i, j) . The expected frequency is computed under the null hypothesis that the row and column variables are independent:

$$e_{ij} = \frac{n_{i.} n_{.j}}{n},$$

Where $n_{i.}$ is the row total for the i^{th} row, $n_{.j}$ is the column total for the j^{th} column, and n is the total frequency count. When the row and column variables are independent, Q has an asymptotic χ^2 distribution with $(R - 1)(C - 1)$ degrees of freedom, whereby R and C denote the number of levels for the row variable and the column variable in the two-way table, respectively.

According to the alternative hypothesis in section 1.4.4, knowing the level of Variable X can help to predict the level of Variable Y , and vice versa. For large values of Q ($p\text{-value} < 0.05$), the test rejects the null hypothesis in favor of the alternative hypothesis of general association.

However, if the sample size is large, the χ^2 test statistic for testing independence is appropriate for examining the relationship between variables X and Y . However, when the sample size is small (cell counts being less than 5), alternative methods that use exact small-sample distributions rather than large-sample approximations are needed. Therefore, in addition to the χ^2 test, a two-sided Fisher's exact test was also used for testing independence (Hollander, Wolfe & Chicken 2014:511; Agresti 2013:90).

4.6.5.1.2 Logistic regression

In addition to using the χ^2 test of independence, logistic regression Agresti (2013:119) was also used to answer the research question linking to objective of exploring factors that can foster hand hygiene compliance among HCWs and patients for infection prevention and control of HCAs (HCWs DATA). The outcome variables are binary (Yes, No), and the covariates are the HCWs' job title (5 levels) and gender (2 levels). For each outcome variable, a logistic regression was used to model the probability of having an outcome variable namely responses being "Yes"), with the covariates as the explanatory variables.

For a binary response variable and a vector of explanatory variables x , let $\pi(x)$ = P (response = "Yes"|X =x) = 1 - P (response = "No"|X = x). The logistic regression for $\pi(x)$ = P (response = "Yes") at values X = x is Agresti (2013:119) and as elaborated by the consultant statistician:

$$\pi(\mathbf{x}) = \frac{\exp(\alpha + \beta\mathbf{x}^T)}{1 + \exp(\alpha + \beta\mathbf{x}^T)}.$$

Equivalently, the log odds, called the *logit*, have the linear relationship. The procedure shown below is taken from Agresti (2013:119,163) as was also used in analysing by the consultant statistician during the statistical consultation of this thesis as a research project.

$$\begin{aligned}
\text{logit}[\pi(\mathbf{x})] &= \log \frac{\pi(\mathbf{x})}{1 - \pi(\mathbf{x})} \\
&= \alpha + \beta_1 \text{ gender} + \beta_2 \text{ title1} + \beta_3 \text{ title2} + \beta_4 \text{ title3} + \beta_5 \text{ title4} \\
&\quad + \beta_6 \text{ title1} \times \text{gender} + \beta_7 \text{ title2} \times \text{gender} + \beta_8 \text{ title3} \times \text{gender} \\
&\quad + \beta_9 \text{ title4} \times \text{gender},
\end{aligned}$$

where gender, title1, title2, and title3 are indicator variables with

$$\begin{aligned}
\text{gender} &= \begin{cases} 1 & \text{if gender = male;} \\ 0 & \text{otherwise.} \end{cases} \\
\text{title1} &= \begin{cases} 1 & \text{if title = Doctor or clinician;} \\ 0 & \text{otherwise.} \end{cases} \\
\text{title2} &= \begin{cases} 1 & \text{if title = Nurse;} \\ 0 & \text{otherwise.} \end{cases} \\
\text{title3} &= \begin{cases} 1 & \text{if title = General hand;} \\ 0 & \text{otherwise.} \end{cases} \\
\text{title4} &= \begin{cases} 1 & \text{if title = Environmental health technician;} \\ 0 & \text{otherwise.} \end{cases}
\end{aligned}$$

The gender \times title interaction effects are also considered through title1 \times gender, title2 \times gender, title3 \times gender, title4 \times gender.

Firth's penalized maximum likelihood estimation to reduce bias in the parameter estimates.

The type 3 analysis of effects based on the Wald χ^2 test is used to determine if an effect is statistically significant. The null and alternative hypotheses for each effect are:

$$\begin{aligned}
&\text{For gender effect, } H_0 : \beta_1 = 0, \\
&\quad H_a : \beta_1 \neq 0; \\
&\text{For title effect, } H_0 : \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0, \\
&\quad H_a : \text{at least one of them does not equal to 0;} \\
&\text{For gender and title interaction effect, } \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0, \\
&\quad H_a : \text{at least one of them does not equal to 0;}
\end{aligned}$$

The null hypothesis is rejected if the p-value of the Wald χ^2 test is less than the chosen level of significance, which for this study is 0.05.

4.6.5.1.3 Analysis of variance (ANOVA)

This method was used to check for a relationship between “compliance” and “title” in accordance with study Objective 1: to observe and describe hand hygiene compliance among HCWs during patient care. A one-way analysis of variance (ANOVA) was used for the data set, MHHOT (Ostertagová & Ostertag, 2013: 256; Larson, 2008: 115). A one-way ANOVA considers one factor with two

or more levels. The goal of the analysis is to test for differences among or between the group means of the levels, and to quantify these differences.

The form of the one-way ANOVA is as follows:

$$\text{Compliance} = \beta_0 + \beta_1 \text{ title1} + \beta_2 \text{ title2} + e,$$

Whereby e denotes the error term, and title1 and title 2 are indicator variables.

$$\text{title 1} = \begin{cases} 1 & \text{if the job title = Doctor or clinician;} \\ 0 & \text{otherwise} \end{cases}$$

$$\text{title 2} = \begin{cases} 1 & \text{if the job title = Nurse;} \\ 0 & \text{otherwise} \end{cases}$$

The overall F test was used to test the hypothesis that the means among different groups (job titles) are equal, with the assumption that the sampled populations are normally distributed. The null and alternative hypotheses for testing the job title effects are:

$$H_0: \beta_1 = \beta_2 = 0,$$

H_a : at least one of them is not equal to zero.

If the result for the F test is statistically significant, then pairwise comparisons can be performed to see where the differences occur. The multiple comparison adjustment for the p-values using Tukey's method was conducted (Hollander, Wolfe & Chicken, 2014:59).

4.7 ASSUMPTIONS OF ANOVA TO DEVELOP THE CONFIRMATORY EXPLANATION FOR THE DATA

The following three assumptions of ANOVA need to be tested:

- Independence of observations.
- Normality: are the distributions of the residuals normal?
- Homoscedasticity: the equality of variances of data in groups.

Normality was examined using the following:

4.7.1 Skewness

The sample skewness is the tendency of the deviations to be larger in one direction than in the other. Skewness is a measure of symmetry. Observations that are normally distributed should have skewness near zero (as normal distribution is symmetric):

A negative skew indicates that the tail on the left side of the probability density function is longer than the right side, and the bulk of the values lie to the right of the mean (skewed to the left). A positive skew indicates that the tail on the right side is longer than the left side, and the bulk of the values lie to the left of the mean (skewed to the right).

4.7.2 Kurtosis

The sample kurtosis is the extent to which its distribution is peaked, and the heaviness of its tail (relative to a normal distribution):

Observations that are normally distributed should have a kurtosis near zero. A high kurtosis distribution has a sharper peak, and longer, fatter tails; while a low kurtosis distribution has a more rounded peak, and shorter, thinner tails.

4. 7.3 The Shapiro-Wilk test of normality

The Shapiro-Wilk test procedure is a goodness-of-fit test for the null hypothesis that the values of the analysis variable are a random sample from the normal distribution. A p-value of less than 0.05 in the Shapiro-Wilk test leads to the rejection of the null hypothesis of normality. Levene's test for homogeneity of variances is also used to investigate if the variance is the same in each group.

4.8 GENERALISED LINEAR MODELS

In this study, Compliance is the number of counts of item compliance (count data). Generalised linear models (GLMs) were used to model the count for a single discrete response variable Agresti (2013:113), namely the independent Poisson GLM with log link, which was used to investigate the relationship between job title and the outcome variable (compliance). Type III likelihood ratio statistics were used to test if the job title effect on compliance was statistically significant at the 0.05 significance level.

4.9 RESEARCH GEOGRAPHICAL SETTINGS: STAFFING LEVELS IN 2011

Table 4.1 and 4.2 respectively show the staffing levels within the Mudzi and Mutoko healthcare settings.

Table 4.1 RESEARCH PUBLIC HEALTH CARE INSTITUTIONS IN MUDZI DISTRICT

District	Facility	No. of Doctors	No. of Clinical Officers	No. of Nurses	No. of Nurse Aides	No. of EHTs	No. of General Hands	Total for Each Health Facility
Mudzi District	(a)	0	0	2	1	1	1	5
	(b)	0	0	2	1	1	1	5
	(c)	0	0	2	1	1	1	5
	(d)	0	0	2	1	1	1	5
	(e)	0	0	2	1	1	1	5
	(f)	0	0	2	1	1	1	5
	(g)	0	0	2	1	1	1	5
	(h)	0	0	2	1	1	1	5
	(i)	0	0	2	1	1	1	5
	(j)	3	1	65	6	4	18	97
	(k)	0	0	2	1	1	1	5
	(l)	0	0	2	1	1	1	5
	(m)	0	0	2	1	1	1	5
	(n)	0	0	2	1	1	1	5
	(o)	0	0	2	1	1	1	5
	(p)	0	0	2	1	1	1	5
	(q)	0	0	2	1	1	1	5
	(r)	0	0	2	1	1	1	5
	(s)	0	0	2	1	1	1	5
	(t)	0	0	2	1	1	1	5
	(u)	0	0	2	1	1	1	5
	(v)	0	0	2	1	1	1	5
Grand Total		3	1	107	27	25	39	202

Table 4.2 RESEARCH PUBLIC HEALTH CARE INSTITUTIONS IN MUTOKO DISTRICT

Mutoko District	Health Facility	No. of Doctors	No. of Clinical Officers	No. of Nurses	No. of Nurse Aides	No. of EHTs	No. of General Hands	Total for Each Health Facility
	(A)	4	3	66	22	1	18	114
	(B)	0	0	2	1	1	1	5
	(C)	0	0	2	1	1	1	5
	(D)	0	0	3	1	1	1	6
	(E)	0	0	2	1	1	1	5
	(F)	0	0	2	1	1	1	5
	(G)	0	0	2	1	1	1	5
	(H)	0	0	2	1	1	1	5
	(I)	0	0	3	1	1	1	6
	(J)	0	0	2	1	1	1	5
	(K)	0	0	2	1	1	1	5
	(L)	0	0	2	1	1	1	5
	(M)	0	0	2	1	1	1	5
	(N)	0	0	2	1	1	1	5
	(O)	0	0	2	1	1	1	5
	(P)	0	0	2	2	1	2	7
	(Q)	0	0	2	1	1	1	5
	(R)	0	0	2	1	1	1	5
	(S)	0	0	2	1	1	1	5
	(T)	0	0	1	1	0	2	4
	(U)	3	1	67	8	3	21	103
	(V)	0	0	3	2	0	1	6
	(W)	4	2	68	12	1	22	109
	(X)	0	0	2	1	1	1	5
	(Y)	0	0	10	2	1	2	15
	(Z)	0	0	2	1	1	1	5
Grand Total		11	6	257	68	26	87	455

4.10 SELECTION CRITERIA OF STUDY SITES AS PART OF SAMPLING

All 4 hospitals in the two districts were included in the study. The 44 clinics' names were written on small pieces of paper and placed in a hat. The research assistants were asked to pick out pieces at random until a total of 36 clinics were included in the study. All 4 hospitals were included because they cater for more patients, therefore they enabled more data to be collected and analysed to address comprehensively the questions and objectives of the study. The 4 hospitals have been serving the population's health needs for a very long time with the influence of missionaries from the Global Ministries of the United Methodist Church in the United States of America and the Roman Catholic, the head being in the Vatican City in Italy. The two church related hospitals and their satellite primary health care centres are integrated with the Government of Zimbabwe hospitals under the jurisdiction of the MOH & CW in these Mutoko and Mudzi districts in Mashonaland East Province.

4.10.1 Inclusion criteria

Inclusion criteria covered all HCWs who were on duty during the cross-sectional study time period the thesis was being undertaken and all patients who were admitted at the hospitals and clinics during the time periods the research was undertaken including those who had come for treatment at the clinics as out patients were considered eligible for the study. These patients were a reliable source of information as they were well positioned to give useful feedback regarding the quality of care they directly received from the HCWs on a daily basis. They were well placed to see if HCWs consistently complied with effective hand hygiene compliance hence why they were included. They could thereby make constructive suggestions to the HCWs or the respective managers on how HCWs could improve the care they provide them. Those who were included in the study were willing ill admitted patients. Patients and HCWs were eligible if they were fluent in English or Shona. The structured questionnaires were

translated by English and Shona specialist, a University of Zimbabwe, graduates to ensure consistency and that that they were valid and reliable tools for data collection.

4.10.2 Exclusion Criteria

All HCWs who were not on day duty were excluded. Others who were excluded included severely ill patients, children still dependent on parents, patients unable to give consent to participate in the study, patients suffering from fatigue, and those who did not want to be involved or in the event of an adverse occurrence from the source of data as participants.

4.10.2.1 A target population (universe)

Target population is the entire set of individuals who meet the sampling criteria. The accessible population is the portion of the target population to which the researcher has reasonable access and for which conclusions are drawn based on the study (Grove, Burns & Gray, 2013:351; Mulekar, Jezek & Fruh in Hall & Russell, 2014:67).

4.10.3 The accessible research population

Data are collected from a population or a sample and the sampled population is also called the accessible population (Mulekar, Jezek & Fruh in Hall & Russell, 2014:67). In this study the accessible population becomes open for sampling as portions of the population (universe) comprised of samples in phases, and data were collected as per each sample in order to draw conclusions. According to Grove, Gray and Burns (2015:46) members of a sample are the subjects or participants from which data are collected. This included data collection through a retrospective research design whereby records of mortalities were also reviewed.

4.10.3.1 Sample frame

According to Grove, Burns and Gray (2013:357) each element in the accessible (target) population to have a chance to be included in the sample, the element must have an identification. Therefore, the definition of membership must be through a list the (sampling frame). In this study selection of patients occurred by using the listings in the outpatient or inpatient registers if agreeable and fitting the inclusion and exclusion criteria for the study Probability methods (the only way of obtaining representative sample) need a listing of the population under study (sample frame). Random selection is carried out from probability methods and this depends in several ways from the sample frame. Random selection from probability methods allows for utilisation of statistical techniques which require random selection for estimation of sampling error and inference of sample results to the population (Polit & Beck, 2014:181). However non-probability methods do not fall into the above rigourously stated samples category. Samples are mostly non-representative of the population. (Polit & Beck, 2014:181; Hunt & Lathlean in Gerrish & Lathlean, 2015:174). In this study patients were randomly sampled. With respect to the HCWs, convenience sampling was used, they are always on duty even though there is no sample frame stipulated in non- probability sampling.

4.10.3.1.1 Sampling plan

Sampling plan is used to obtain a sample and this plan, enhances representativeness, reduce bias and reduce sampling errors. The sampling plan uses probability and or non- probability sampling methods (Grove, Gray & Burns, 2015:255; Polit & Beck, 2014:180).

4.10.4 Sampling

Sampling is the process of selecting elements that represent the characteristics of the population for whom the results are intended (Grove, Gray & Burns, 2015:255; Parahoo, 2014:277; Ivankova, 2015:183). Using mixed methods approach aims to generate a sample that represents the population and that gives meaning on interpretation of data. Purposive sampling addresses research questions and objectives that seek a form of transferability and probability sampling addresses samples that seek answers for external validity (Graff, in Hall & Roussel, 2014:55). According to Morse (1991a:139) special sampling strategies are used in qualitative research to make sure that all sides of phenomena are represented. This includes deliberate seeking out negative cases, and seeking informants who had atypical experiences: -bad experiences or in some way a different experience in skill. To avoid distortion toward only one perspective several techniques are used to manage variation that means multiple ways of seeing phenomena (Greene, 2007:20).

There are two types of sampling: - probability, and non-probability. According to Rubin and Babbie (2011:360) in probability sampling all elements of that population have an equal chance of being chosen to be included in the sample? According to Creswell and Plano Clark (2011:174) nonprobability sampling deals with choosing individuals who are available and can be studied as a sample because they are available, and it is important to take note that the sample may not be representative of the population and that the results may not be generalised to the population due to the unrepresentativeness. Sampling affects the generalising of findings (Grove, Burns & Gray, 2013:351). Convenience sampling affects representativeness of the population (Graff in Hall & Roussel, 2014:54). According to Morse (1991a:129) informants with atypical experiences are sought so that the whole range of experiences and the breath of the concept or phenomena may be understood. In this study both probability and non-probability sampling methods were employed in a mixed approach in order to get answers to the research objectives towards an outcome.

A sample is a subset of the population selected for a particular study, and sampling is the process of selecting a group of individuals upon whom to conduct a study. Many strategies are available for selecting a convenience sample. In convenience sampling, subjects are included in the study because they are in the right place at the right time (Grove, Burns & Gray, 2013:363). A sample to be representative must have characteristics resembling those of the population under study (Polit & Beck, 2014:178). For this study, observations of HCWs' 95 and 570 HCWs hand hygiene opportunities were carried out. A total of 189 HCWs were conveniently sampled in the health care institutions, and 189 HCWs completed the questionnaire and handed them in.

Using an acute respiratory infection (ARI) prevalence of 12.1% among HCWs in Zimbabwe, a sample size was calculated as follows:
$$n = \frac{z^2 p(1-p)}{\Delta^2}$$

Where $z = 1.96$, Δ (the precision) = 0.05, and $p = 12.1\%$

$$n = \frac{1.96^2 (0.121)(0.879)}{0.05^2}$$
$$= 163.43$$

Sample size = 164

A minimum sample size of 164 HCWs was therefore needed. An additional 25 HCWs were added to account for others who refused to participate in the study. The total number of HCWs who participated as one group was therefore 189.

4.10.4.1 The sample and sampling method

4.10.4.1.1 HCWs (n=95)

These were conveniently sampled. The HCWs were observed cross sectionally. The observed 95 HCWs' hand hygiene opportunities were 570 in the health care settings were quantified and documented using an observation tool (a checklist) to tally hand hygiene compliance and non-compliance rates among HCWs. This was strand one. According to Morse (1991a:129) instead of selecting HCWs using criteria based on representative population characteristics such as age,

sex, economic status or educational level the HCWs are observed according to informants' skill and knowledge about the research title.

4.10.4.1.2 Patients (n=574)

Patients were simple random sampled and interviewed by the researcher using face-to-face questionnaires for each respective patient. Each patient was asked specific questions by the researcher and feedback from each patient was noted onto the structured questionnaire. This was strand two.

4.10.4.1.3 HCWs (n=189)

HCWs were convenience sampled whilst on duty that had Open-ended questionnaires administered to them; to investigate the challenges or barriers they faced to achieve hand hygiene compliance in the clinical health care settings in the Mutoko and Mudzi districts. This was also included in strand two.

4.10.4.1.4 Mortality records reviewing

HCAIs associated mortalities in the Mutoko and Mudzi districts, were the subject of a retrospective documentary record review of HCAIs associated mortalities and was simple random sampled and then selecting top 10 causes of death in the Mutoko and Mudzi districts from 2007 through 2011. This was strand three.

4.11 OBSERVATION OF HEALTHCARE WORKERS AND HAND HYGIENE OPPORTUNITIES

According to Hewitt-Taylor (2011:35); Grove, Gray and Burns (2015:258) participants are also selected on purpose because they provide the most comprehensive information for the study that means participants are selected because of information richness to the study. As HCWs' and hand hygiene compliance were being investigated, information regarding their hand hygiene

compliance was collected from the observed participants, and hand hygiene opportunities were observed and documented using pencil and paper observation tools until the desired sample size was reached. Convenience and purposive sampling were appropriate for observing hand hygiene opportunistic samples among the HCWs (Creswell & Plano Clark, 2011:178).

4.12 DATA COLLECTION

In this study, observational survey tool was also used for data collection in the first (the QUAL, QUAN) of the strand into HCWs' hand hygiene to observe and record if compliance or non-compliance occurred in the health care institutions. The QUAL, QUAN data were categorical and therefore were also categorically analysed. According to Mulekar, Jezek and Fruh in Hall and Roussel (2014:71), although qualitative information is not presented numerically, a researcher may assign numerical values to data relevant to a qualitative research study to facilitate analysis of sample characteristics. Even though numbers are assigned, these characteristics still represent categorical data. Quantitative data is represented numerically. Mixed approach data have the characteristics of both QUAL and QUAN. However, data collected could be transformed (that is quantitising and or qualitising) (Onwuegbuzie & Combs, 2011:5). Qualitising is reverse of quantitising to narratives.

Data transformation is converting data from one form to the other (convergent mixed research design (qual to quan or *vice-versa* from quan to qual) (Graff, in Hall & Roussel, 2014:52). According to Grove, Burns and Gray (2013:45), data collection is the appropriate combination of relevant information linked to the study to answer the questions and objectives towards achieving the purpose. Moreover, there are four different levels at which to undertake a process of measurement in the QUAN phase; these are from the lowest to the highest level: nominal, ordinal, interval, and ratio levels. Therefore, according to Argyrous

(2011:12) and Babbie (2010:157), the more available the information about a variable the higher the measurement levels.

All data collection for the three groups of participants took place over a period of two weeks, from the 2nd August 2011 to the 15th of August 2011. During the third week, the fourth group of data, a retrospective review of information of HCAs associated mortalities from records of mortalities at Mutoko and Mudzi districts were collected. HCWs' hand hygiene compliance was observed and documented.

4.13 DATA COLLECTION METHODS

4.13.1 Observation

Data were collected from HCWs and patients in the health care settings. According to LoBiondo-Wood and Haber (2010:271), observation is an important method for collecting information on how people behave; it can take place in natural settings and may have contextual connotations. Lincoln and Guba (1985:188) explain that redundancy is achieved when there is repeatability of information as often as is necessary, the theory stabilised and emerging design in fulfilment to a possible extension but information saturation occurs when the facts become exhaustively repeatable without any further new information forthcoming (LoBiondo-Wood & Haber, 2010:123). Kumar (2014:228) explains that during the information collection phase, the researcher continues until saturation point is reached. In the QUAL study the researcher reached the saturation point in terms of the point where there was no emergence of new patterns. However, HCWs' hand hygiene opportunities were observed and documented using pen and paper on a checklist, in accordance with the study's questions and objectives guided by Precede-Proceed model (Green & Kreuter, 2005: 10; Green & Kreuter, 2005 in Community Tool Box, 2018:1). This was

coupled with Theory of Planned Behaviour (Ajzen, 2005 in Polit & Beck, 2014:138).

The integrated 5 moments for hand hygiene compliance are: before patient contact, before doing an aseptic procedure, after body fluid exposure, after patient contact, and after contact with patient surroundings. With each risk assessment, HCWs are expected to perform hand hygiene procedures by following the six moments of hand hygiene to control HCAs (Sax, Allegranzi, Uckay, Larson, Boyce & Pittet, 2007:9, 13; WHO, 2011:1). Compliance monitoring of HCWs' hand hygiene opportunities were observed using the MHHOT that was organised in categories, and which qualified as a checklist on data transformation during direct observation. According to Polit and Beck (2014:190), the most common approach to making structured observations is to use a category system for classifying observed phenomena. Category systems must be accompanied by explicit operational definitions of the behaviours and characteristics to be observed. Each category must be carefully explained, giving observers clear-cut criteria for assessing the occurrence of a phenomenon.

4.13.2 HCWs as participants and, Healthcare associated infections

Patients who consented were random sampled and interviewed using a questionnaire whilst respecting patients' privacy and implementing the inclusion and exclusion criteria. HCWs were conveniently sampled and an open-ended self-administered questionnaire was administered to collect data concerning the challenges faced by HCWs in accomplishing hand hygiene compliance. Finally, infections focussing on HCAs and their associated mortalities were reviewed including the 2007 to 2011 five-year period of the top ten causes of all deaths in Mutoko and Mudzi districts in Zimbabwe retrospectively from local council offices of the registrar's offices of births and deaths at the Mutoko and Mudzi districts.

4.13.3 Permit

According to Graff in Hall and Roussel (2014:57), researchers need to collect data after being given permission from institutional review boards, organisations, key persons in the organisations, and participants or representatives of participants who provide data about participants. Creswell and Plano Clark (2011:157) defined a gatekeeper as a key person in the organisation who is supportive of the proposed research, and who essentially opens up the organisation for research to be carried out. Nevertheless, Mulekar, Jezek and Fruh in Hall and Roussel (2014:71) explain that the type of data required depends on the research question or objectives, and the design of the study, and that using both types of data collection methods provides greater depth and breadth to the research findings.

Five research assistants assisted during fieldwork as observers and interviewers. They were very experienced and highly skilled some of them with high qualifications in their field. Before being assigned roles their qualifications and skills were analysed for suitability for the research task. The researchers' role included assisting in administering the questionnaires to the patients and HCWs, monitoring that the questionnaires were well structured, well administered, well understood by the patients and HCWs, that data was collected reliably and validly. The research team moved as a team from one healthcare institution to the other following the completion of their task at each respective healthcare institution. The training consisted of: instructions regarding observation of HCWs hand hygiene defined standards according to the six moments of hand hygiene using WHO training material, interviewing techniques and field procedures; a detailed review of the questionnaire content; instructions on how to administer the self- managed HCWs questionnaire on challenges faced; retrospective review data collection for HCAs related mortalities and lastly practice mock interviews among group members as member checking.

The training of the research assistants ensured the standardisation of the data collection process. The research assistants were trained in observing,

documenting, and face-to-face interview techniques, interviewing rules, and ethical considerations in data collection. This was followed by interview rehearsals, role-playing and feedback until the research assistants demonstrated mastery of the whole observation and interviewing process, and proper data collection ethics. The research assistants were adults who were trained, knowledgeable, and fluent in both the Shona and English languages. All observers were close to the point of care while observing; close enough to see but not interfere with patient care activities. The observers respected patients' privacy. Observers did not interfere with health-care activities being carried out during the session. Observers would stop observing or interviewing in times of emergency or if patient needed to terminate the interview.

4.14 DEVELOPMENT AND TESTING OF THE DATA COLLECTION INSTRUMENTS

In this study, the researcher developed and pre-tested the instruments on five HCWs hand hygiene compliance and challenges faced interviewed patients who were excluded from the study, and thereafter the instruments were used to collect data. A data collection instrument is a tool used by a researcher to collect data, such as a questionnaire, test, or observation tool (Polit & Beck, 2010:557). In this study the researcher used a hand hygiene observation checklist as a tool. The checklist was tested when five observations were carried and not included in the study.

The structured interview questionnaire was a reporting form designed to elicit information from responses given by the patients. The questionnaires were designed to determine patients' attitudes so as to establish their fostering influence regarding HCWs' hand hygiene compliance. Grove, Burns and Gray (2013:426) described the following four essential requirements for the design of a questionnaire as follows: identify the information desired; search the literature for items in questionnaires and questions that should be included; construct the

questionnaire, along with a covering letter explaining the purpose of the study; and perform a pilot test of the questionnaire.

For this study, the questionnaire was developed after the following were done:- Identifying the information required, Literature search for necessary items and questions, constructing the questionnaire, questions for patients regarding their perceptions of the promotion of hand hygiene among patients, and of Healthcare Workers' hand hygiene compliance. The Demographic Data Questionnaire among patients was also included.

4.14.1 Healthcare workers' hand hygiene observation tool

The researcher used MHHOT, as adapted (Fuller, McAteer, Slade, Cookson, Michie, Savage & Stone, 2009: 16). This contains columns detailing the moments for observed HCWs (n=95) and hand hygiene opportunities (n=570) and the observation protocol was followed.

Following the observations was the documentation of what was observed. Amongst these columns, the observation tool contains rows with the following observed HCW categories:

Doctor or Clinical officer: soap and water, alcohol gel rub, no hand hygiene, unknown.

Nurse or HCA: soap and water, alcohol gel rub, no hand hygiene, unknown.

Other HCWs were observed either using or not using the following rows: soap and water, alcohol gel rub, no hand hygiene, unknown. This was done in conjunction with observing the 5 moments of hand hygiene before, during and after patient care and did not just focus on the type of agent used to clean the hands (e.g soap, water, alcohol gel rub) but hand hygiene compliance as defined by the researcher in Chapter 1.

4.14.1.1 The 5 moments for hand hygiene

According to McAteer, Slade, Cookson, Michie, Savage and Stone (2008: 225), the MHHOT collects data of the five moments for hand hygiene, associated hand hygiene behaviours and categories of HCWs. In this study, the researcher used the MHHOT, whereby the five moments for hand hygiene are: before patient contact, after patient contact, after contact with patient surroundings, before an aseptic task, and after body fluid exposure risk. The five moments without hand drying will not achieve optimal hand hygiene; therefore hand drying is also included. Hand hygiene behaviours are listed in the MHHOT as, use of water and soap, use of alcohol hand rub, no hand hygiene compliance, or unknown where no hand hygiene behaviour is seen before or after an unobserved moment. Healthcare Workers (HCWs) are categorised as doctors, nurses, and others. 'Before' is defined as the point at which an opportunity begins during a patient contact episode. 'After' is defined as the period immediately after a break in a contact episode. A break in a patient contact episode may include contact with another patient or moving from a contact with a patient or their surroundings to an aseptic task. Hand hygiene moments should not be double-counted. If a HCW was observed moving directly from one hand hygiene moment to another without any intervening contacts, this was included in the same moment.

However, Polit and Beck (2014:190) further elaborate that category systems are the basis for constructing a checklist, which is the instrument that an observer uses for recording observations. The checklist is usually formatted, with a list of behaviours from the category system on the left, and space for tallying the frequency on the right. The task of the observer using an exhaustive category system is to place all observed behaviours into one category for each integral unit of behaviour. For this study, the behaviours and attitudes assessed from the questionnaires about the patients' perception of HCWs hand hygiene compliance were tallied according to their categories before being analysed. Observations were made through visual observations and then recorded using paper and

pencil methods, even though they can also be recorded with the use of sophisticated equipment such as video equipment (Polit & Beck, 2014:189).

4.15 INTERVIEWING OF PATIENTS USING INTERVIEW SCHEDULE

4.15.1 The sample for interviewed patients

A total of 574 patients were random sampled and interviewed face-to-face following an interview schedule. The tool used was a structured questionnaire that has formed the basis of the interview – it had the same specific questions for all the patients which the researcher asked and noted

4.15.2 Data collection

Questionnaires were used to collect data from patients in the health care institutions.

4.15.3 Data collection approach and method

In QUAN strand, the second data were collected from the (n=574) patients. In this study, the structured interview was used to ascertain the patients' responses regarding HCWs' hand hygiene behaviours with a focus to development of guidelines for fostering hand hygiene among HCWs. In this study, the structured interview questionnaires also ascertained the patients' insights regarding HCWs' hand hygiene compliance. The interview data were collected using the Perceived Promotion Hand Hygiene among Patients Questionnaire (PPHHAPQ) interview questionnaire and data were analysed to get some answers for this study.

4.16 HEALTHCARE WORKERS AND THE CHALLENGES THEY FACE

4.16.1 The sample for Healthcare workers who face challenges

Questionnaires were completed and returned all fully filled in by (n=189) HCWs.

4.16.2 Data collection

Open-ended questionnaires were self-administered to collect data concerning the challenges HCWs faced in accomplishing hand hygiene compliance in the two districts.

4.16.3 Data collection approach and method

Data were collected from HCWs who agreed and signed the consent form to participate in the study. They completed the short questionnaires as self-administered and returned them.

4.16.4 Development and testing of the data collection instruments

An Open-ended questionnaire was developed and pre-tested on five HCWs to ensure that they were suitable for data collection from HCWs. Only four open-ended questions were included. The characteristics of the data collection instrument are shown below. Five HCWs were found at each of the four hospitals and one primary healthcare setting that the study was going to be undertaken. These were naturally excluded from the study itself as they were on vacation during the main data collection period.

4.16.5.1 Healthcare Workers Questionnaire comprised of the following aspects

What challenges do you face in accomplishing Hand Hygiene?

What are your recommendations in order to comply?

Please indicate your job title.

Please indicate your gender.

4.17 RETROSPECTIVE REVIEW OF HEALTHCARE ASSOCIATED INFECTIONS ASSOCIATED MORTALITIES

The researcher developed a tally sheet as an instrument to collect mortality data. Testing of the data collection instrument was not necessary because this was a retrospective systematic study of data from the past through the collection of existing data from the mortality records.

A retrospective review of records for HCAs associated mortalities was carried out by the researcher linking to guidelines for fostering hand hygiene compliance in Mutoko and Mudzi districts. This was conducted in the district administrator registrar's office of births and deaths as local government district level office.

4.17.1 The sample

From 2007 to 2011, there were 2245 mortalities in link with HCAs in the Mutoko district, and there were 2133 mortalities in the Mudzi districts.

4.17.2 Data collection

Initially, records of mortalities were not organised in any meaningful way towards assisting with the research in the Registrar's offices of births and deaths.

4.17.3 Data collection approach and method

All the records were sorted out and grouped according to calendar year. The researcher collected data on the mortality records for the past five years, from 2007 to 2011.

4.17.4 Characteristics of the data collection instrument

The researcher used the tally sheet as an instrument for data collection. The mortalities and associated conditions were tallied on the tally sheet and summarised with the top ten most prevalent mortality conditions during each year. The data was collected and recorded systematically, then organised to facilitate computer entry for further analysis. The results were analysed and are presented in Chapter 5. However further details of all the data collecting instruments are found in the Annexure section of this study.

4.17.5 Descriptive statistics

In published investigations, descriptive statistics are usually reported in tables and in the narrative of chapters or sections concerning the results of an investigation. Measures of central tendency (the mode, median, and mean), and measures of dispersion (range, and standard deviation) are usually calculated to describe study variables (Grove, Gray & Burns, 2015:336). However, in this study, descriptive and comparative descriptive statistics were used to describe and compare the samples and the study variables. Descriptive and inferential statistics were also presented together to describe differences and similarities between groups. Inferential statistical procedures that were used include the Chi-square test for the nominal level of categorical data. According to Grove, Gray and Burns (2015:336), from a perspective of descriptive analysis, 'the purpose is not to test for causality, but to describe the differences or similarities between groups in a study'. The results of this study are presented in tables, bar graphs and pie charts, and are also fully described and discussed, in Chapter 5 and 6.

Hand hygiene compliance of HCWs was observed then using a MHHOT, whereon hand hygiene opportunity (HHO) responses were noted whenever the HCWs performed hand hygiene procedures in response to a qualitative observed hand hygiene opportunity. Their hand hygiene compliance rate was then

calculated, documented, presented, and described. Compliance factors identified during the observational strand one informed strand two. In addition strand two informed strand three. The findings were used for developing guidelines for fostering hand hygiene compliance.

4.18 ETHICAL CONSIDERATIONS

According to Polit and Beck (2014:380), ethics is considered as a system of moral values that is concerned with the degree to which research procedures adhere to professional, legal, and moral obligations towards the study participants. Ethical considerations of the study therefore are discussed in detail below.

For this study, Permission was granted by the Medical Research Council of Zimbabwe, the Ministry of Health and Child Welfare, the Provincial Medical Director, and the District Medical Officers of the Mutoko and Mudzi districts. The MRCZ approved the study, and granted overall permission by letter, MRCZ/B/208 after conducting a review of the proposal as an institutional review board (IRB). The Secretary for MOH & CW, the PMD for Mashonaland East, and the DMOs and DNOs of Mutoko and Mudzi districts health care institutions also granted permission to carry out the study. The Department of Health Studies Ethical Committee (Higher Education) of The University of South Africa had also approved the study as project number 6067662. Ethical principles were strictly followed and adhered to to protect human subjects and their full rights as participants. The principle of beneficence gave them freedom from harm, and freedom from exploitation. The principle of respect for human dignity allowed them the right to self-determination, and the right to full disclosure about what the researcher intended to do with the study. The principle of justice included the subjects' right to fair treatment, and the right to privacy and confidentiality (Grove, Burns & Gray, 2013: 163).

In one health care setting, in order to gain access and collect data, there was the requirement that all researchers' original permission documents, and information on what the researcher proposed to do, had to be certified as true copies by Mutoko Police station, and by the Office of the President of Zimbabwe. The documents were stored in files in a safe cabinet under double locks and keys by the researcher. Also, initial permission from PMD Mashonaland East was conditional on the study being authorised, and endorsed with a study number by the MRCZ. According to the UNISA (2012:70), this was the institution's policy on human subjects' basic ethical rights to autonomy, justice, beneficence, and non-maleficence from the researcher's conduct of carrying out research.

Full disclosure meant that the researcher fully described the nature of the study. Therefore, a full explanation of what the researcher intended to do was given to UNISA's ethical clearance committee, MRCZ (for authorisation), and the participants so that they could make an informed decision on whether to participate or not (Polit & Beck, 2008:172). Participants who refused to participate in the study made an informed decision, which was respected. The researcher fully explained the purpose of the study before they participated, and after participation, the researcher clarified any issues arising from information collection. If the participants were willing to participate, the details of the informed consent was then explained, including the participant status, study purpose, type of data being collected, the nature of commitment, participant selection, procedures, potential course, confidentiality pledge, voluntary consent, the right to withdraw, and the researcher's contact information in the event of further questions, comments, or complaints in relation to the research (Grove, Burns & Gray, 2013:163).

The consent form was signed by participants to indicate their informed decision, understanding, and willingness to participate. The patients were assured that the information they gave was confidential, and that no names would appear on questionnaire forms. If patients and HCWs were unhappy with some of the

questions that provoked unpleasant feelings, they had the right to refuse to participate. Patients and HCWs were assured that questionnaires would be number coded, and that their names would not appear on the data and data collected from them would only be available to the researcher, the university, and the responsible authorities in the Ministry of Health and Child Welfare. The data was kept in a double locked safe place and was accessible only to the principal researcher. The benefit-risk ratio was assessed for this study; this was calculated as 'nil to minimal risk', whereby the risks were outweighed by important benefits of hand hygiene compliance and infection control (Grove, Burns & Gray, 2013:191).

4.18.1 Ethical principles followed when dealing with participants

4.18.1.1 Principle of respect for persons

Permission to involve participants was secured through signed consent forms, as required by the Medical Research Council of Zimbabwe and the University of South Africa's ethical clearance committee. Persons had the right to self-determination, and the freedom to either participate or not participate in the research, as well as the freedom to withdraw from participation (Grove, Burns & Gray, 2013:192).

4.18.1.2 Principle of beneficence

This principle requires the researcher to behave in a good manner, maximise the benefits, and do no harm (Polit & Beck, 2010:121).

4.18.1.3 Principle of justice

This principle holds that human researchers must treat people who decline to participate in a study or who withdraw from it in a non-pre-judgemental manner

(Polit & Beck, 2010:124). In this study, participants participated voluntarily with informed decisions and without being subjected to any coercion.

4.18.1.4 *Autonomy and health care institutions*

4.18.1.4.1 Health care settings

MRCZ required a copy of the research results for their records, as well as for the health research database in Zimbabwe. Data analyses of identifiable data collected from the participants required IRB approval from the Medical Research Council of Zimbabwe. However, names of health care settings were protected for the purpose of confidentiality and autonomy of institutions rights.

4.19 VALIDITY OF THE STUDY

Validity is defined as a measure that accurately reflects the concept it is intended to measure (Babbie, 2010:153, Parahoo, 2014:73, Polit & Beck, 2014:340). The following are defined as types of validity: face validity, construct validity, criterion-based validity, and content validity (Babbie, 2010:153). Similarly, Cozby (2009:85) explains that when evaluating research, there are four types of validity (construct, internal, external, and conclusion (also known as statistical conclusion validity), and that validity refers to truth and the accurate representation of information. Argyrous (2011:7) poses a question: what criteria should be used to decide if a particular operational definition is adequate? Argyrous (2011:7) explains that this is known as the problem of construct validity and that, ideally, the researcher is looking for an operation that will vary whenever the underlying variable that the researcher thinks it shadows also varies. However, Argyrous (2011:7) further argues that the determination of an operational definition is a major source of disagreement in research debates, and that the validity of research centres on this. The variables must be operationally defined correctly in the first place, but if the operational criteria used for measuring a variable are

sensitive to the way a variable changes between cases, the measurements will generate misleading results. In this study, both definitions of conceptual and operational terms are clearly stated for the benefit of the reader and for replication of the study if needed. In addition, Kumar (2011:56) explains that the understanding of concepts varies from person to person, and so operational definitions inform readers on what exactly researcher means by the terms used and defined in the study.

Coward (1990) in Grove, Burns, and Gray (2013: 208) details how validity can be enhanced: construct validity is enhanced when results are stable across multiple measures of a concept; statistical conclusion validity is enhanced when the results are stable across many data sets and methods of analyses; internal validity is enhanced when results are stable against many potential threats; and, external validity is supported when results are stable across many settings, populations, and times. According to Grove, Gray, and Burns (2015:243), mixed approaches enable researchers to exploit the strengths of QUAL and QUAN research designs. LoBiondo-Wood and Haber (2010:294) insist that a research study needs accuracy, which in turn deals with validity in order to determine content validity. However, in this study, the following validities for determining accuracies were:- determining content validity, criterion-related validity, and construct validity; and, based on the determination of construct validity, and factor analysis. According to LoBiondo-Wood and Haber (2010:288), when issues of content validity occur, the researcher must ensure that the measuring instrument and the items it contains are representative of the contents that the researcher intends to measure (as conceptually and operationally defined), and that the items that reflect the concept and its dimensions are developed. The items are submitted to a panel of judges who are experts on this concept. In this study the items were submitted to the MRCZ for the institutional review board (IRB). Content validity provides the framework and basis for developing items that adequately represent the content. Validity-trustworthiness is a production of knowledge (Shadish, 1995:421). The knowledge extends knowledge boundaries.

4.19.1 Reliability of the patients' interview schedule

The reliability of a measure denotes the consistency of measurement obtained in the use of an instrument, and reliability testing is a measure of the amount of random error in the measurement technique. Reliability testing focuses on three aspects: stability, equivalence, and internal consistency or homogeneity (Grove, Burns & Gray, 2013: 707). The structured interview questionnaire was pretested (Polit & Beck, 2014:388) on five patients who were excluded from participating in the actual study, and as a result there was no change in wording.

4.19.2 Validity and trustworthiness of the hand hygiene observation tool

The hand hygiene observation tool was pre-tested on five HCWs who were excluded from the main study. The results were compared, with a focus on equivalence among observers in documenting hand hygiene opportunities; the results were found to be similar, and this led to the acceptance of inter-rated reliability (Polit & Beck, 2014:383).

This study focussed on the development of practical guidelines for fostering hand hygiene compliance among HCWs and infection control in the Mutoko and Mudzi districts, therefore improving the quality of patients' and HCWs' lives in terms of health and safety in context. Green and Kreuter (2005:22) explain how the Precede-Proceed model guides the planning process in such a way that HCWs are well placed in such strategic positions to use the model and foster evidence-based "best practices" to make them aware contextually in different settings where such guidelines are used. The researcher ensured the validity and trustworthiness of instruments used as follows:

4.19.2.1 Standardised methods and clarity of questions

The researcher was assisted by five trained observers who were skilled and trained in data collection. They were trained to directly observe the hand hygiene opportunities of the HCWs in the health care institutions. These observers were trained with examples using WHO illustration diagrams and films on how to observe hand hygiene opportunities until they could successfully recognise all possible opportunities. They also underwent practice mock observations and interviews. The inter-rated reliability test measured the agreement of the ratings in HCWs' hand hygiene opportunities being observed.

4.19.2.2 Pre-testing of instruments in similar settings to the study

The research objectives were properly formulated in a clear manner, so that the research instruments could be used to collect, collate, and simplify data entry in an effort to address the research questions and objectives (Grove, Burns & Gray, 2013:533).

The researcher ensured the validity, reliability and trustworthiness of this study as follows:

4.19.2.2.1 Undertaking a thorough literature review

4.19.2.2.2 Bringing together different ideas

Different ideas were integrated. This was guided by the Precede-Proceed model (Green & Kreuter, 2005: 10, Green & Kreuter, 2005 in Community Tool Box, 2018:1) coupled with the Theory of Planned Behaviour (Ajzen, 2005 in Polit & Beck, 2014:138). Conceptual and operational terms were adequately defined, and study instruments were developed to measure the contents that the researcher intended to measure in order to formulate guidelines. Berger *et al.* (1979:37) explain that the natural attitude is the attitude of common-sense consciousness because it refers to a world that is common to many people and

not only to minority few. However, common sense is something moving from the realism of theoretical formulations into practical use of everyday life thoughts, actions, openness and accountability. Furthermore, Berger *et al.* (1979:27) expand that the theoretical formulations of reality whether it is scientific, philosophical or mythological do not exhaust what is real for the members of a society. What concerns knowledge must first of all be what people know as real in their every day non or pre-theoretical lives, putting it differently common-sense knowledge rather than ideas must be the central focus for the sociology of knowledge. Berger *et al.* (1979:27) explain that it is this knowledge that makes the nitty- gritty of meanings without which no society could be in existence. The problem of ideas constitutes a part only of the larger problem of the sociology of knowledge and not the central focus. According to Handy (1999:9) common sense and intuitive leadership should be backed up by a better understanding of how human societies work especially with a focus on HCWs hand hygiene compliance and infection control and prevention. However, Schutz (1973:6) explains that the thought objects constructed by the social scientist are founded upon the thought objects constructed by the common sense thought of man living his everyday life experiences among his fellow countrymen. Thus, the constructs used by the social scientist are constructs of the second degree namely, experiences of the participants in reality of life situations. The researcher observes behaviours of participants and tries to explain in accordance with the procedural regulations of his scientific discipline with a focus on hand hygiene compliance and infection prevention and control.

4.19.2.2.3 Internal consistency of the construct

The variables were measured by Cronbach's coefficient alpha that determined the internal consistency. For HCWs, challenges 1 to 5, $\alpha = 0.0384$.

- For HCWs, recommendation 1 to recommendation 5, $\alpha = 0.3898$.

- For MHHOT, $\alpha=0.5086$. The variables used were: before patient contact, after patient contact, after surrounding contact, before aseptic contact, and after a body fluid exposure risk.
- For patient, $\alpha=0.3512$, the variables used to calculate alpha were as follows: before being touched, before aseptic procedure, after fluid exposure, after patient contact, after contact with patient's surroundings, reaction, report, remind.

However, in order to anchor the trustworthiness of the mixed methodology approach in this study the viewpoints are shared (Lincoln & Guba, 1985:42; Schwandt, 2015:308).

4.19.2.2.4 The study instruments were constructed

Instruments were constructed according to the study questions and objectives in line with the research title, research problem, and purpose of the study, and with the Precede-Proceed model (Green & Kreuter, 2005:10, Green & Kreuter, 2005 in Community Tool Box, 2018:1). The model was coupled with the Theory of Planned Behaviour (Ajzen, 2005 in Polit & Beck, 2014:138). The reader is referred to annexes 13 to 16 for details of the study instruments. Annexe 13 is according to (McAteer, Stone, Fuller, Charlett, Cookson, Slade & Michie, 2008:225).

4.20 BIAS CONTROL

According to Damani (2012:143); LoBiondo-Wood and Haber (2010:274) and WHO (2009:158), direct observation for hand hygiene compliance is ideal but time consuming and is subject to bias and confounding. For the method proposed by the WHO (2009:158), hand hygiene observations should be open, and the observer should declare presence before commencing. According to Damani (2012:143); the WHO (2009:158), it is very important to train and validate observers for corroboration. According to Morse (1991a:139) theoretical

variation should not take into consideration the quantitative regard for proportions and percentages henceforth theoretical richness has nothing to do with the most or least common experience, and has nothing to do with likelihood instead the researcher is after describing experiences as richly as possible with accuracy for the sake of validity and integrity all cases must fit the explanatory model.

4.20.1 Healthcare workers being observed for hand hygiene opportunities

For HCWs who participated in the study, their hand hygiene opportunities were observed, documented, and quantified for hand hygiene compliance or non-compliance, and the results were organised according to the categories of the HCWs.

4.20.2 Observer bias

Observer bias was limited using inter-rated assessments prior to making the observations and periodically during the study period, in order to assess consistency. This was performed to make sure that the results were valid and reliable as well as credible and trustworthy, and to observe and measure the truth or accuracy of the findings (Grove, Burns & Gray, 2013:533). Cronbach's coefficient alpha also determined the internal consistency of this study. Additionally according to Morse (1991a:139) managing variation descriptively is achieved by using thick description to explain HCWs hand hygiene compliance. Moreover according to Lincoln and Guba (1985:219) explain about persistent consistency of observations, member checking, negative case analysis to establish credibility, thick descriptions to facilitate transferability, auditability, dependability and confirmability. Henceforth this is about achieving external validity as the extent of the drawn conclusions transferability, auditability trail, dependability on and confirmability to other circumstances, times, people and settings in contexts. The researcher in the report carefully describes all possible perspectives or types of observations revealed after reaching saturation.

Explications of explanatory concepts are presented as detailed generic description depending on the level of analysis.

4.20.3 The Hawthorne effect

In this study, the probability that participants could have behaved differently when they knew that their hand hygiene opportunities were being observed was considered (Polit & Beck, 2010:231; Cozby, 2009:114). However, the Hawthorne effect could have affected the HCWs' hand hygiene compliance, thus giving an increased compliance, according to Damani (2012:143). However, if observational surveys are conducted regularly on different days and at different times as a continuum of audit trail basis by HCWs themselves as colleague audits, this bias would be equally distributed among all observations, and HCWs are likely to become accustomed to the fact that they are being observed even in the extensive major research studies (Damani, 2012:143). Additionally, Morse (1991a:138) states that majorly purposive samples are biased by virtue of the selection process, self-selection, and researcher selection. These methods do facilitate a certain type of informant with a certain knowledge or skill to be included in the study but this is the purpose and intent of using those methods. In qualitative research bias is used as a tool to facilitate positively the research. However for the conventional trustworthiness criteria (internal and external validity, reliability and objectivity are inconsistent with naturalistic exploratory investigations and therefore there is alternative criteria called credibility, transferability, dependability, confirmability and additionally authenticity together with equivalent scientific procedures that anchor the trustworthiness of naturalistic approaches (Lincoln & Guba, 1985:42).

4.20.4 Confounding

Monitoring hand hygiene compliance is subject to confounding factors. Such factors include the time when observations are carried out, the type of patients

and health care settings, intensity of care, a high number of opportunities in a short time, and the professions' categories of HCWs included in the study (Damani, 2012:143).

4.21 CONCLUSION

Chapter 4 described the research design and methods used to collect data during the study. This study followed the mixed method approach, observed, the overall compliance with hand hygiene during routine patient care duties in the targeted health care institutions among various categories of HCWs. Structured interview questionnaires were administered to 574 patients. Questionnaires were used to collect data from 189 HCWs to investigate the challenges they faced in accomplishing hand hygiene compliance. Statistical tests were used to determine differences among the groups. A review of records detailing mortalities and associated HCAs was also discussed. There are advantages in using a mixed approach: the QUAL and QUAN elements complement each other; the approach imparts practicality and reality, given the sophistication of the nature of the study; and, there is enhanced validity and worth trusted (Polit & Beck, 2014:340). Furthermore, ethical considerations were discussed. The data analyses plan was laid out and guided by the model that is a simplified description or a graphic representation of reality in context. A model involves organisations, processes and beings often used to hypothesise outcomes of specific organisations, inputs, processes, beings (Naidoo & Wills, 2016:75). In this study Precede- Proceed is the model used coupled with Theory of Planned Behaviour. According to Naidoo and Wills (2016:75) theory is an idea or proposition, often using general principles that are used to explain something of a specific nature. The next chapter, Chapters 5, analysed, presented and described data results guided by the Precede –Proceed model coupled with Theory of Planned Behaviour.

CHAPTER 5

ANALYSIS, PRESENTATION AND DESCRIPTION OF THE RESEARCH FINDINGS

5.1 INTRODUCTION

This chapter presents and analyses data and come up with results of the study. To recapitulate, the problem under investigation is HCWs hand hygiene compliance and HCAs prevention and control in Mutoko and Mudzi districts. The research questions and objectives are described in section 1.4.2 to 1.4.3.4 and are summarised in tables 1.1 to 1.4. The findings are presented under research questions, objectives and themes displayed as, text, tables, graphs and statistical measurements.

The researcher starts with patients' demographics to remind the reader of the enrichment high importance of health care services with patients' participation in own health and a focus on henceforth HCWs' hand hygiene opportunities, on the results of data, findings for compliance are presented first. HCWs observed hand hygiene compliance data informs patients interviewed and the data for HCWs on the challenges they faced. The interviewed patient's data informs the data that are described and discussed from the reviewed infections HCAs mortalities (death certificates) of the Registrar General Office of Births and Deaths at Mutoko and Mudzi districts. The analyses also include statistical consultation, which resulted in identifying some factors that helped to develop guidelines for fostering hand hygiene compliance among HCWs in the Mutoko and Mudzi districts.

The purpose of this study was to develop guidelines for fostering hand hygiene compliance among HCWs in Mutoko and Mudzi districts in Mashonaland East Province in Zimbabwe in the Southern Africa Region. Secondly HCWs hand

hygiene compliances prevent and control HCAs and henceforth alleviate mortalities leading to improvements in quality of life. The data analyses, presentations, descriptions and discussions are guided by the Precede-Proceed model coupled with the Theory of Planned Behaviour using a multi-phase research design in a mixed approach. In accordance with the problem statement, all data analyses are also carried out according to the research questions and objectives of the study in order to give answers with focus on the research problem, and in the process, to develop guidelines.

5.2 DATA MANAGEMENT AND ANALYSES

Data management and analyses were done for all the four groups of participants namely. Data were computed, analysed, presented and described partly using manual calculations, and partly using computer statistical programmes within the ideal contextualised Precede-Proceed model coupled with Theory of Planned Behaviour concepts.

5.2.1 Data were analysed from 95 HCWs observed and 570 hygiene opportunities

The analysed data were presented in graphical form along with descriptions of trends and patterns, and critically interpreted and validated with the Precede-Proceed model and Theory of Planned Behaviour. These results were analysed, interpreted and critically evaluated in accordance with philosophical underpinnings of inductive reasoning, and the Precede-Proceed model coupled with the Theory of Planned Behaviour. Of the total HCWs' hand hygiene opportunities observed, the hand hygiene compliance and non-compliance rates at Mutoko and Mudzi district rural public health care institutions were deduced and critically evaluated. Patterns and designs for improving hand hygiene were analysed among HCWs. These analyses were underpinned by the logic of

discovery and guided by the Precede-Proceed model and Theory of Planned Behaviour.

5.2.2 Data were analysed from questionnaires administered to 574 patients

From the questionnaires administered to 574 patients data were analysed, with deductive reasoning, and the Precede-Proceed model coupled with the Theory of Planned Behaviour. Data were displayed in tables.

5.2.3 Data analyses from HCWs

Data were, analysed, with respect to trends and patterns using thematic analyses. Thematic analyses were conducted by using Precede-Proceed model concepts as operationalised as according to Boyatzis (1998:vii) indicators qualifications that are causally integrated henceforth in the Precede-Proceed coupled with Theory of Planned Behaviour with respect to hand hygiene compliance and non-compliance of HCWs. Additionally, other thematic analyses included the HCWs resource availability whether they were sufficient or not in order to accomplish hand hygiene compliance and alleviate HCAs and also regarding the challenges HCWs faced with organisational policies and regulations. All these were presented in tables, charts and graphs and thematically analysed. The findings were produced using confirmatory or deductive logic reasoning.

5.2.4 Data analyses for HCAs associated mortalities from records

Data were analysed using SAT/ STAT and SPSS and the findings are presented and described. Deductive and inductive logic reasoning was guided by the Precede-Proceed model coupled with the Theory of Planned Behaviour in a mixed methods approach contextually.

5.2.5 STATISTICAL ANALYSES ANSWERED THE RESEARCH QUESTIONS TO FULFILL THE OBJECTIVES

This section involved a statistician analyses for the aspects of the study. This is described below: -

5.2.5.1 *The data:*

The following data (listed by questionnaire/dataset) with reference to Annexes 13 to 16 were used in the statistical consulting project (all possible answers are listed in parentheses, and start with a capitalised word in the coding):

- Gender (Male, Female)
- Title (Doctor or clinician, Nurse, Nurse auxiliary, general hand (porter), Environmental health technician)
- What challenges do you face in accomplishing hand hygiene compliance?
 - * (a) Insufficient clean and safe water (Yes, No)
 - * (b) Water cuts, borehole and pump breakdowns, and no fuel (Yes, No)
 - * (c) Insufficient/No detergents (Soap, Jik (bleach), Alcohol gel, sanitiser) (Yes, No)
 - * (d) Understaffed and very busy work place, causing you to forget to change gloves or wash hands (Yes, No)
 - * (e) No gloves or protective clothing (Yes, No)
- What are your recommendations to improve compliance?
 - * (a) Constant clean, purified and safe tap water (Yes, No)
 - * (b) Hand washing facilities with running water (Yes, No)
 - * (c) Full staffing levels at all institutions (Yes, No)
 - * (d) Diesel or electric water pumps, and borehole for every institution (Yes, No)
 - * (e) Workshops for all HCWs (Yes, No)

5.2.5.1.1 *Data from Modified Hand Hygiene Observation Tool (MHHOT)*

- Job title (Doctor or clinician, Nurse, Other)
- Before patient contact (Soap and water, Alcohol gel rub, No hand hygiene, Unknown)
- After patient contact (Soap and water, Alcohol gel rub, No hand hygiene, Unknown)
- After contact with patient surroundings (Soap and water, Alcohol gel rub, No hand hygiene, Unknown)
- Before an aseptic procedure (Soap and water, Alcohol gel rub, No hand hygiene, Unknown)
- After body fluid exposure risk (Soap and water, Alcohol gel rub, No hand hygiene, Un- known)
- Is there hand drying after observed hand hygiene? (Yes, No)

Two variables, compliance and noncompliance, were created:

HCWs compliance for each observation question was (before patient contact, after patient contact, after contact with patients' surroundings before an aseptic procedure, and after body fluid exposure risk). If the response was "soap and water", or "alcohol gel rub", then the score equaled 1; if not, the score equaled 0. For "Hand drying after observed hand hygiene", if the response was "yes", then the score equaled 1; otherwise the score was 0. The six scores were added to produce a summary score for "compliance plus noncompliance = hand hygiene opportunities observed and documented". The result for "Noncompliance plus Compliance" ranged from 0 to 6. * Noncompliance: noncompliance = 6 - compliance.

5.2.5.1.2 Patient Data: Patients' perception of HCWs' hand hygiene compliance

- Patients' perceptions on compliance:
 - * Before being touched (Sad face, happy face, confused face, none of the above)
 - * Before health care worker does a clean or aseptic procedure on the patient (Sad face, Happy face, Confused face, None of the above)

- * After body fluid exposure risk and glove removal, and before the patient is touched (Sad face, Happy face, Confused face, None of the above)
- * After the HCW is in contact with another patient, before touching the patient (Sad face, Happy face, Confused face, None of the above)
- * After the HCW is in contact with patient surroundings, and before touching the patient (Sad face, Happy face, Confused face, None of the above)

5.2.5.1.3 Percent demographics

Patients were asked the following questions:

- * Reaction: What will you do to make sure the HCWs wash hands or rub alcohol gel on their hands before touching you? (Nothing; Will urge to wash hands; Will tell HCW to wash hands first, and will remind them to wash hands)
- * Report: Will you report HCWs to the relevant manager in-charge if they fail to wash their hands or rub alcohol gel on their hands? (Yes, No, Uncertain, Do not know)
- * Remind: Will you remind HCWs if they fail to wash hands or rub alcohol gel on their hands? (Yes, No, Uncertain, Do not know)
- * Gender (Male, Female)
- * Age group (20 or younger, 21-24, 25-29, 30-39, 40-49, 40-49, 50-59, 60-69, 70-79, 80+)
- * Social class (Upper, Middle, Lower)
- * In what area do you usually live in? (Rural community village, Urban, Resettlement, Farm, Growth point/small remote)
- * React: this is a variable calculated from the Reaction data (when Reaction = Nothing, then React = No; otherwise, React = Yes). All data analyses were conducted Statistical Analysis System (SAS) software was used for information retrieval, data management and statistical analysis (including analysis of variance, and linear regression).

5.2.5.1.4 Patients' demographics

Table 5.1 details the patients' gender: 202 (35.2%) were male, and 372 (64.8%) were female; the total number of patients interviewed was 574 (100%).

Table: 5. 1 PATIENTS 574 BY GENDER

Respondent's (Patients) Gender		
	Frequency	Per cent
Male	202	35.2
Female	372	64.8
Total	574	100.0

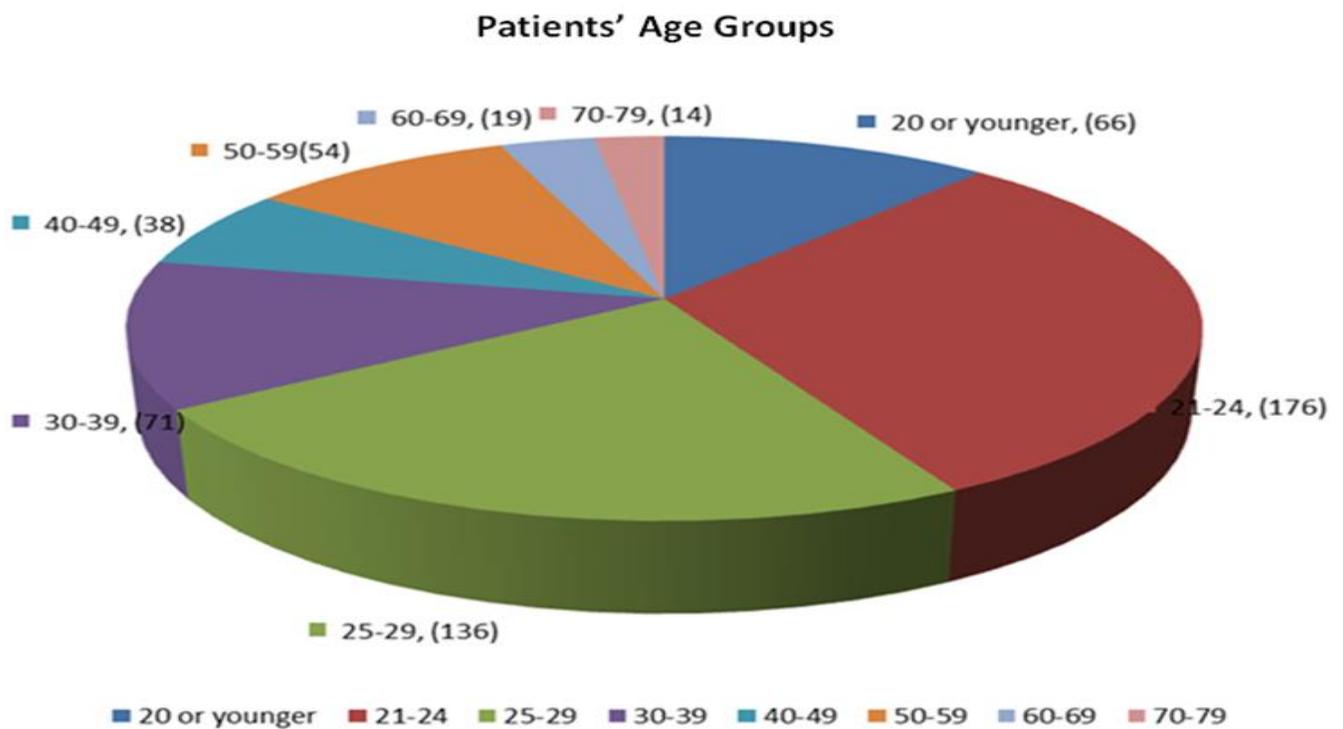


FIGURE: 5.1 AGE GROUPS OF THE PATIENTS

The pie chart (Figure 5.1) shows the proportions of the patients' age groups. All the 574 patients were aged, from under 20, to between 70 and 79. The modal age group consisted of patients aged between 21 and 24 and accounted for 176(30.7%) of all the patients. The median age group consisted of patients aged between 25 and 29 and accounted for 136(23.7%) of all the patients. The age range as illustrated in Figure 5.2 histogram of the patients are positively skewed,

in that mostly young people in this study 449(78.22%), of all patients are aged below 40 are going healthcare institutions to seek health care services from the HCWs in the Mutoko and Mudzi districts. The smallest age group is aged between 70 and 79 (of all patients, 14(2.4%); this is followed by those aged 60 to 69 of all the patients, 19(3.3%). The skew showing a greater number of service users is as shown in (Figure 5.2) as follows: 66(11.5%); 176(30.7%); 136(23.7%); 71(12.4%); 38 (6.6%); 54 (9.4%); 19 (3.3%) and 14(2.4%).

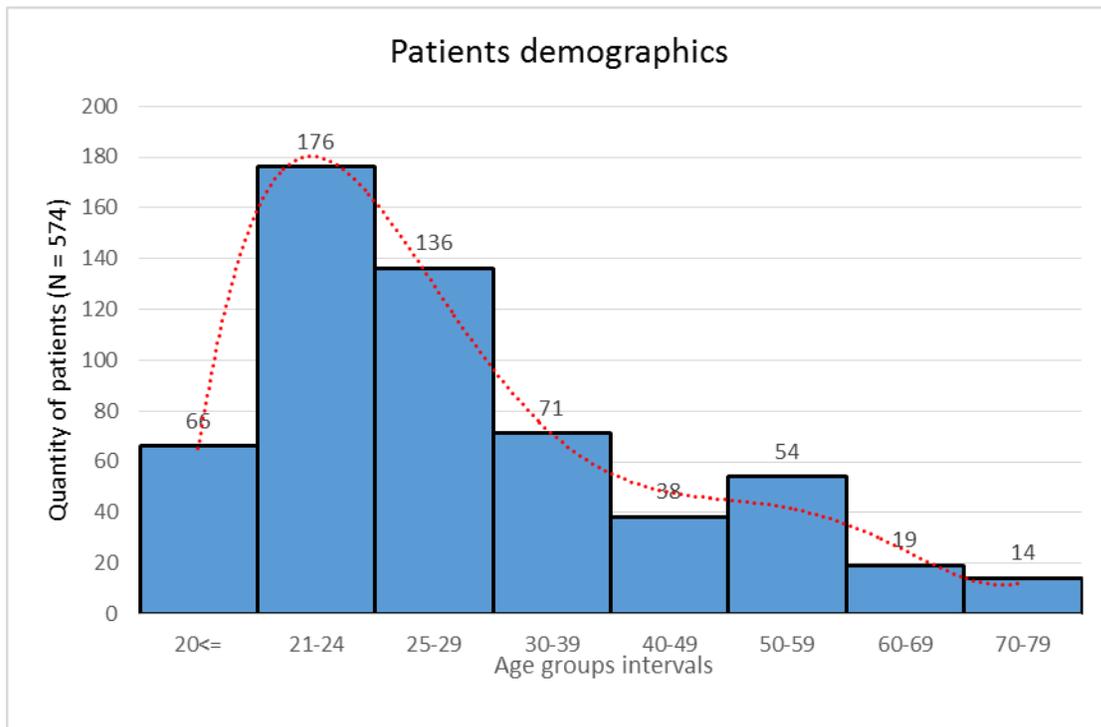


FIGURE: 5.2 PATIENTS DEMOGRAPHICS AND SKEWNESS OF DATA DISTRIBUTION

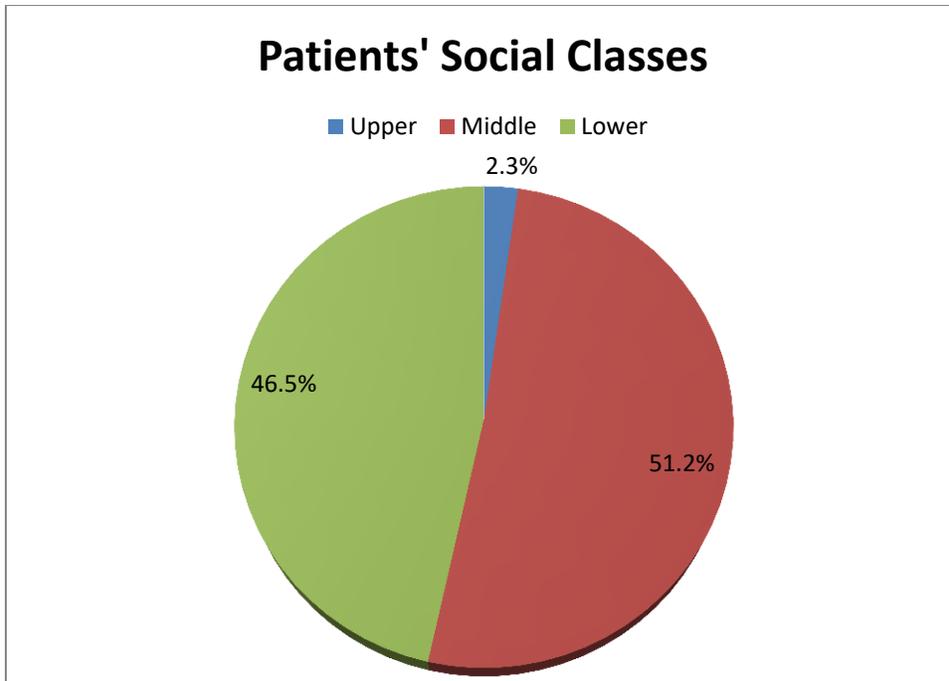


FIGURE: 5. 3 SAMPLES OF 574, PATIENTS' SOCIAL CLASSES

Figure 5.3: presents the patient's social classes: the majority, were middle class 294(51.2%), whilst 267(46.5%) belonged to the lower social class and only a small number were upper class to 13(2.3%). Figure 5.4 is a pie chart showing patient's usual places of residences at a glance.

Table 5.2 presents figures on the patients' domiciliary places: 273(47.6%) of patients live in rural communities or small remote villages; 90(15.7%) of the patients live in urban areas; 24(4.2%) of patients live in resettlement areas; 166(28.9%) of patients live on farms and, 21(3.6%) of patients live in growth points. The total was 100% (574).

Table: 5.2 PATIENTS, 574 DOMICILIARY PLACE

Where do you live most of the time?	Frequency	Per cent
Rural community / small remote village	273	47.6
Urban	90	15.7
Resettlement	24	4.2
Farms	166	28.9
Growth Point	21	3.6
Total	574	100.0

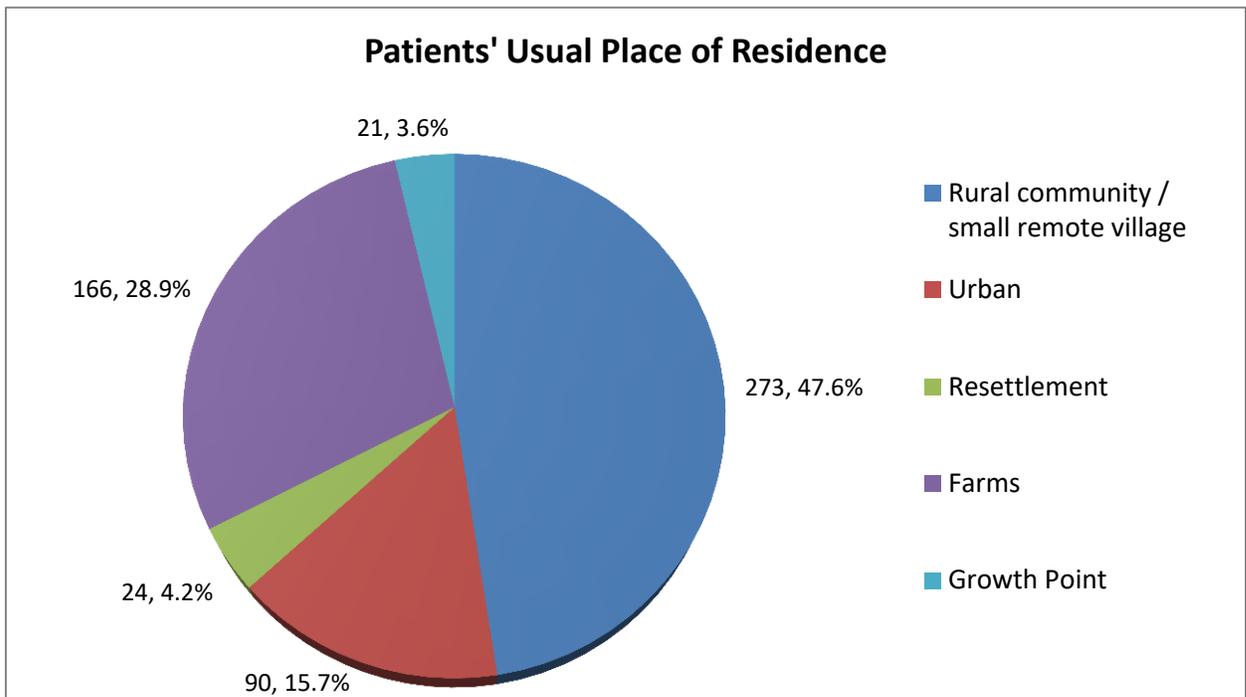


FIGURE: 5.4 PIE CHART OF THE PATIENTS' USUAL PLACE OF RESIDENCE DEMOGRAPHY

Figure 5.4 is a pie chart that shows the patients' usual places of residence. Nearly half of patients' usual homes are in remote rural community villages 273(47.6%). Other patients lived on farms, growth points, resettlements, agricultural land, and in urban areas.

Table 5.1 presents patients' usual domiciliary places: 273(47.6%) of patients' homes are rural situated in communities or small remote villages, 90(15.7%) of patients came from urban areas 24(4.2%) of patients are from resettlement areas; 166 (28.9%) of patients are from farms; and, 21(3.7%) of patients' usual homes are in growth points. The total was 574(100%).

5.3 RESULTS OBSERVED HEALTHCARE WORKERS' HAND HYGIENE

The standards for hand hygiene among HCWs comprised implementing the technique of thorough washing of hands for 40 to 60 seconds at the point of care: wetting hands under a running tap water; applying soap; and, washing all parts of hands, rinsing and drying properly; or applying alcohol gel on hands and rubbing all parts of hands thoroughly for 20 to 30 seconds until they are dry. Hand hygiene was observed according to two main categories - compliance or non-compliance. Either the HCWs adhered to hand hygiene compliance or they did not. So if the HCWs missed any step of hand hygiene that was categorised as non-compliance likewise those who complied with all the steps of hand hygiene were categorised into the compliant category.

5.3.1 Observed 95 Healthcare Workers' hand hygiene practices

As detailed in Table 5.3, soap and water were mainly used by HCWs to wash their hands before any contact with patients. This was performed by 40(42.1%) of the nurses, 8(8.4%) of the doctors or clinicians, and 16(16.84%) of the other HCWs. Only 2(2.1%) of the HCWs observed in the study used an unknown substance to wash their hands before contact with patients. HCWs who did not wash their hands before touching the patients were 26(27.4%).

Table: 5.3 HEALTHCARE WORKERS' 95, HAND HYGIENE BEFORE PATIENT CONTACT

Before patient contact * Respondent's Job Title Cross tabulation				
Before patient contact	Respondent's Job Title			
	Doctor or Clinician n(%)	Nurse n(%)	Other n(%)	Total n(%)
Soap and water	8 (8.4)	40 (42.1)	16 (16.84)	64 (67.4)
Alcohol gel rub	0 (0.0)	2 (2.1)	1 (1.05)	3 (3.15)
No hand hygiene	3 (3.15)	7 (7.4)	16 (16.84)	26 (27.4)
Unknown	0 (0.0)	2 (2.1)	0 (0.0)	2 (2.1)
Total	11 (11.6)	51 (53.7)	33 (34.7)	95 (100.0)

According to Table 5.4, 73(76.9%) of the observed HCWs used soap and water. Only 3(3.2%) of HCWs who were found using alcohol gel, and only 1(1.05%) used an unknown substance use to wash hands after any contact with the patient. 18 (18.95%) of HCWs did not clean their hands after touching immediate surroundings and after touching patients. The HCWs were not asked with with regard to the unknown substance as this was an observational naturalistic study of them working daily in their natural healthcare setting. Since there was no intervention during the observation in the naturalistic observation therefore there was no need to ask what the unknown substance was that the HCWs used because the researcher had also bracketed. Therefore wherever soap and water or alcohol gel rub were used in conjunction with the above stated HCWs hand hygiene standards this meant that there was compliance of hand hygiene by HCWs.

Table: 5.4 HEALTHCARE WORKERS' HAND HYGIENE AFTER PATIENT CONTACT 95

After patient contact * Respondent's Job Title Cross tabulation				
After patient contact	Respondent's Job Title			
	Doctor or Clinician n(%)	Nurse n(%)	Other n(%)	Total n(%)
Soap and water	10(10.5)	41(43.2)	22(23.2)	73(76.9)
Alcohol gel rub	0(0.0)	2(2.1)	1(1.05)	3(3.2)
No hand hygiene	1(1.05)	8(8.4)	9(9.5)	18(18.95)
Unknown	0(0.0)	0(0.0)	1(1.05)	1(1.05)
Total	11(11.6)	51(53.7)	33(34.7)	95(100.0)

Table 5.5 presents the numbers of HCWs (by profession) who used soap and water, alcohol gel, an unknown substance, or who did not use anything else to clean their hands before an aseptic procedure to protect their patients against infections (including patients' own infectious microorganisms entering their own bodies). It was found that 58(61.1%) of the HCWs did not practice any hand hygiene at all, and 31 (32.6%) used soap and water, whilst no one used alcohol gel, and only 6(6.35%) used an unknown substance before carrying out an

aseptic procedure. The use of the unknown substance calls for further studies to be carried out after intervention with the guidelines and resources like the pocket sized alcohol hand gels supplied for HCWs to use the unknown substance could be conclusively known from which further intervention can be undertaken.

Table: 5.5 HEALTHCARE WORKERS' HAND HYGIENE BEFORE DOING AN ASEPTIC PROCEDURE

Before an aseptic procedure * Respondent's Job Title Cross tabulation				
Before an aseptic procedure	Respondent's Job Title			
	Doctor or Clinician n(%)	Nurse n(%)	Other n(%)	Total n(%)
Soap and water	7(7.4)	14(14.7)	10(10.5)	31(32.6)
No hand hygiene	4(4.2)	32(33.7)	22(23.2)	58(61.1)
Unknown	0(0.0)	5(5.3)	1(1.05)	6(6.35)
Total	11(11.6)	51(53.7)	33(34.7)	95(100.0)

Table 5.6 below presents the number of HCWs by profession who used soap and water, alcohol gel, an unknown substance, or who did not use anything to clean their hands after an aseptic procedure. It was found that 91(95.8%) used soap and water to clean their hands after an aseptic procedure, while only 1(1.05%) of the nurses was observed not cleaning hands, and 3(3.2%) of HCWs were observed using an unknown substance to clean their hands after carrying out an aseptic procedure. It was also observed that no one used alcohol gel to clean their hands. All doctors and clinical officers of HCWs 11(11.6%) cleaned their hands after body fluid exposure risk, and all other HCWs (excluding nurses) also cleaned their hands after body fluid exposure risk.

Table: 5.6 HEALTHCARE WORKERS' HAND HYGIENE AFTER BODY FLUID EXPOSURE RISK

After body fluid exposure * Respondent's Job Title Cross tabulation				
After body fluid exposure	Respondent's Job Title			
	Doctor or Clinician n(%)	Nurse n(%)	Other n(%)	Total n(%)
Soap and water	11(11.6)	48(50.5)	32(33.7)	91(95.8)
No hand hygiene	0(0.0)	1(1.05)	0(0.0)	1(1.05)
Unknown	0(0.0)	2(2.1)	1(1.05)	3(3.2)
Total	11(11.6)	51(53.7)	33(34.7)	95(100.0)

Table 5.7 shows that 64(67.4%) of HCWs (in detail, 4(4.2%) of doctors and clinicians, 29(30.5%) of nurses, and 31(32.6%) of other HCWs) did not practice any hand hygiene at all after touching patient surroundings; whilst 22 (23.15%) of HCWs used soap and water, 7(7.4%) used an unknown substance, and only 2(2.1%) used alcohol gel to clean their hands after touching any patients' surroundings such as lockers, curtains, beds and bed linen.

Table: 5.7 HEALTHCARE WORKERS' HAND HYGIENE AFTER CONTACT WITH PATIENT SURROUNDINGS

After contact with patient surroundings * Respondent's Job Title Cross tabulation				
After contact with patient surroundings	Respondent's Job Title			
	Doctor or Clinician n(%)	Nurse n(%)	Other n(%)	Total n(%)
Soap and water	6(6.3)	15(15.8)	1(1.05)	22(23.15)
Alcohol gel rub	0(0.0)	2(2.1)	0(0.0)	2(2.1)
No hand hygiene	4(4.2)	29(30.5)	31(32.6)	64(67.4)
Unknown	1(1.05)	5(5.3)	1(1.05)	7(7.4)
Total	11(11.6)	51(53.7)	33(34.7)	95(100.0)

Figures 5.5 and 5.6 illustrate Hand Hygiene Opportunities observed among HCWs. The total number of opportunities for the HCWs' compliance was 570 (100%). The incidents with respect to compliance are presented in Figure 5.5 as 70(12.3%) before patient contact; 77(13.5%) after patient contact; 31(5.4%) after surroundings contact (that is, after touching patient surroundings); 37(6.5%) before aseptic contact; and, 94(16.5%) after body fluid exposure. During the hand drying moment, all HCWs who exhibited hand hygiene compliance also

dried their hands. Figure 5.5 and 5.6 show the HCWs' levels of compliance in terms of the World Health Organization's 5 moments of hand hygiene standards, as well as the sixth moment that of hand drying as additional, because if hands are left wet, microorganisms can more easily spread from one surface to another, and hand hygiene fails. In general, the level of compliance (percentage of compliance from the total opportunities of HCWs hand hygiene at each moment) increased from the first to the last moment of hand drying, with almost everyone drying their hands. Among those who did not comply, their level of compliance tended to decrease from one moment to the next for the first four moments as shown in the figure 5.5 and 5.6 below. From the observations made, hand hygiene opportunities for compliance and non-compliance were documented, from which the compliance rate was then calculated. The compliance rate was calculated by dividing the compliance rate from the total hand hygiene opportunities at each respective moment as below (Fuller, McAteer, Slade, Cookson, Michie, Savage & Stone, 2009:3). That is:-

The compliance rate at each respective moment was calculated as follows:

$$\text{Compliance at each moment (\%)} = \frac{\text{Number of soap + AHR behaviours}}{\text{Number of soap + Number of AHR + Number of no actions}} \times 100$$

Where AHR means alcohol hand rubs.

For compliance opportunities 70(73.6%) complied before patient contact; 77(81.0%) complied after patient contact; the compliance rate after surroundings contact (after touching patient surroundings) was 31(32.6%); the rate of compliance before aseptic contact was 37(38.9%); and the rate after body fluid exposure risk was 94(98.9%) non-compliance 1(1.1%); 94 HCWs (98.9%) dried their hands, and 1(1.1%) did not. It was revealed that the general trend of the levels of linear compliance increased up to the last moment of hand hygiene (drying). The level of linear non-compliance generally decreased.

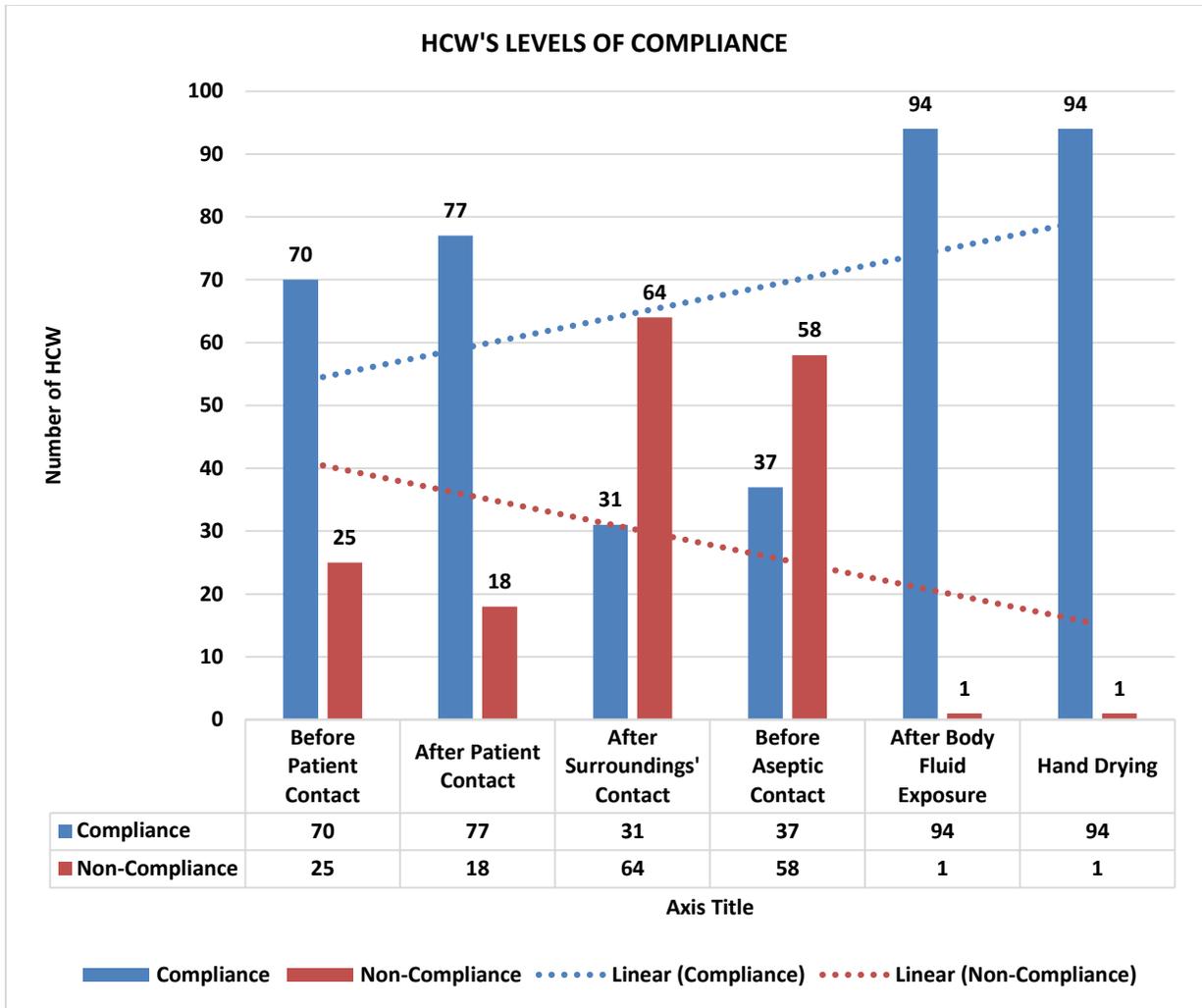


FIGURE: 5.5 HEALTHCARE WORKERS' HAND HYGIENE OVERALL LEVELS OF COMPLIANCE AND NON-COMPLIANCE

Among the observed 95 HCWs observed and moments 570 hand hygiene opportunities, the total calculated compliance rate was 403(70.7%). Figure 5.5 shows that non-compliance before patient contact was 25(4.4%), after patient contact was 18 (3.1%), after surroundings contact was 64(11.2%), and before aseptic procedure contact was 58(10.2%). After body fluid exposure risk, the non-compliance rate was 1 (0.2%), and one HCW did not dry hands 1(0.2%). The total level of non-compliance was 167(29.3%).

The overall compliance rate was calculated as follows:

$$\text{Overall compliance (\%)} = \frac{\text{Number of soap + AHR behaviours}}{\text{Number of soap + Number of AHR + Number of no actions}} \times 100$$

Where AHR means alcohol hand rubs (Fuller, McAteer, Slade, Cookson, Michie, Savage & Stone, 2009:3).

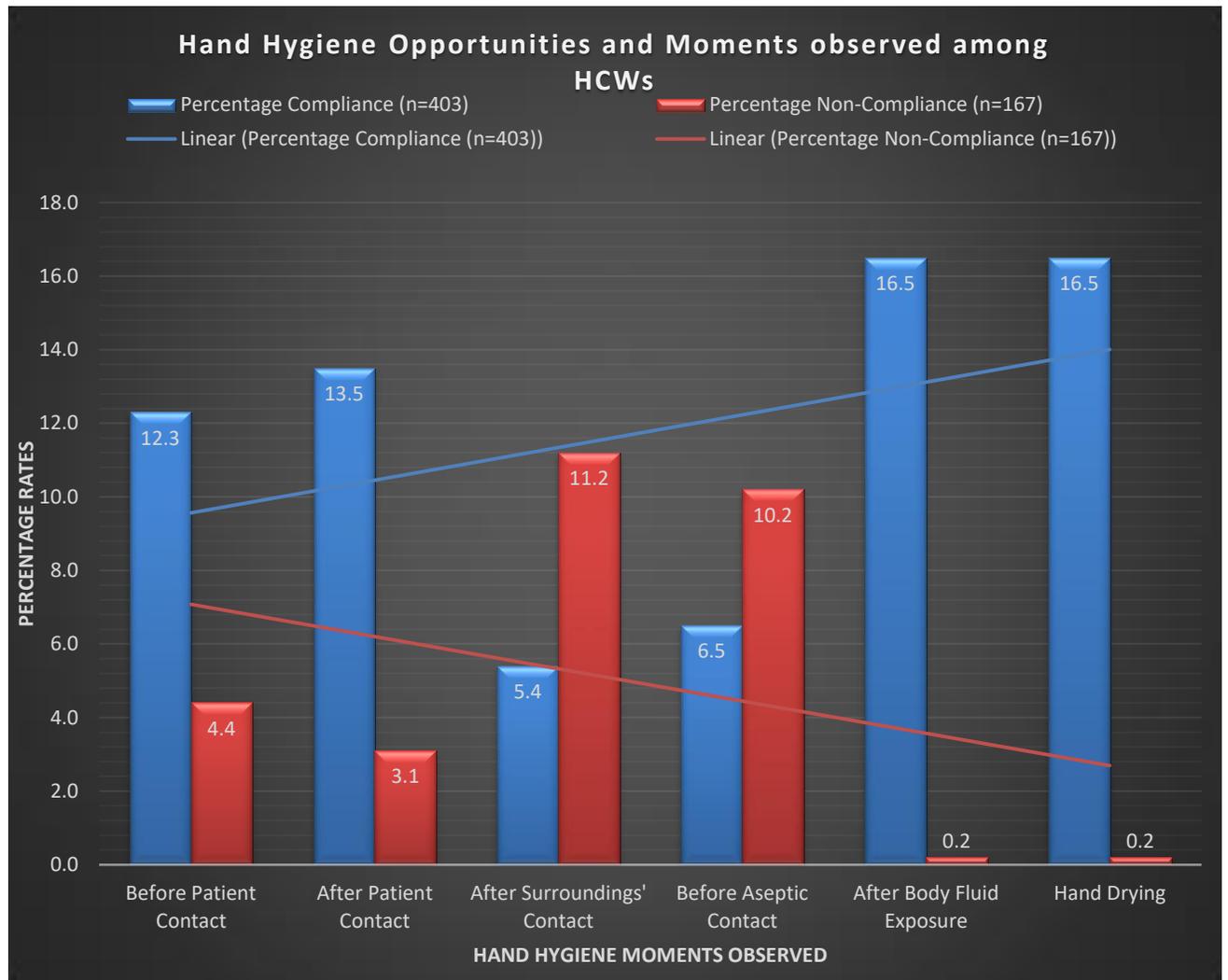


FIGURE: 5.6 HAND HYGIENE OPPORTUNITIES OBSERVED WITH RESPECT TO HAND HYGIENE MOMENTS

The overall percentage rate of compliance was calculated by dividing 403 by 570, then multiplying by 100%, to give 403(70.7%). The total opportunities evidence based observed of hand hygiene were 570, out of those 403 opportunities evidence observed was the number whereby HCWs complied with hand hygiene. The non-compliance rate was 167 divided by 570, multiplied by 100%, which equalled 167(29.3%). This is shown in Figure 5.7 added below as percentage rates of opportunities versus hand hygiene moments observed as follows: -

Overall percentage rate of compliance: $12.3 + 13.5 + 5.4 + 6.5 + 16.5 + 16.5 = 70.7\%$

Overall percentage rate of non-compliance: $4.4 + 3.1 + 11.2 + 10.2 + 0.2 + 0.2 = 29.3\%$

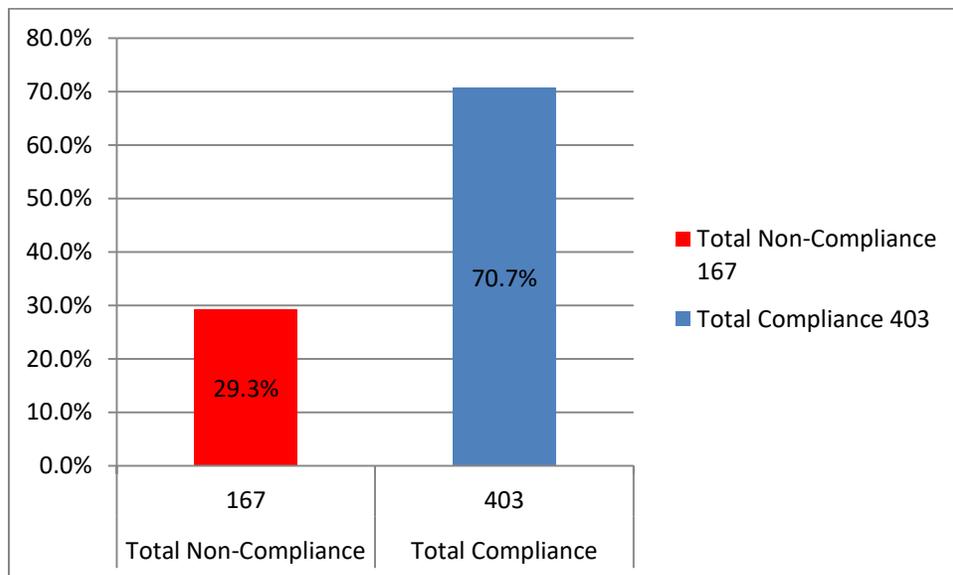


FIGURE: 5.7 OVERALL COMPLIANCE RATES

The compliance and non-compliance rates above were obtained by totalling non-compliance and compliance rates respectively from the hand hygiene opportunities with respect to each moment of hand hygiene observed.

5.3.2 Statistical tests consultation results of data analyses on observed HCWs hand hygiene compliance observations

5.3.2.1 Data analyses Results

There were 95 subjects in the data set: 11 doctors or clinicians, 51 nurses, and 33 other professionals, there were no missing values. Table 5.8 shows the two-way frequency tables of Job title and the five categories of hand hygiene observation. The results of the χ^2 test of independence and the Fisher exact test are also displayed in Table 5.8. Numbers in parentheses are degrees of freedom associated with the χ^2 test.

Recall that the null and alternative hypotheses are as follows:

H₀: Variable X and variable Y are independent.

H_a: Variable X and variable Y are not independent.

In this case, variable X is a Job title, and variable Y is one of the (5 + 1) categories or moments of hand hygiene observation. For large values of Q (p-value < 0.05), the test rejects the null hypothesis in favour of the alternative hypothesis of general association. Therefore, the alternative hypothesis states that knowing the level of Variable X can help to predict the level of Variable Y, and vice versa.

5.3.2.1.1 Based on the test results of χ^2 and Fisher's exact test

Shown in (Table 5.8), the conclusions are as follows:

- “Before patient contact” and “Job title” are not independent (p-value for χ^2 test = 0.0328, p-value for Fisher's exact test = 0.0151, so the null hypothesis is rejected.). Therefore, the job title can be used to predict the level of compliance before patient contact, and vice versa.

- “After contact with patient surroundings” and “Job title” are not independent (p-value for χ^2 test = 0.0026, p-value for Fisher’s exact test < 0.0001, so the null hypothesis is rejected). Therefore, the job title can be used to predict the level of compliance after contact with patient surroundings, and vice versa.

- “Before an aseptic procedure” and “Job title” are independent (p-value for χ^2 test = 0.1233, p-value for Fisher’s exact test = 0.1739, so the null hypothesis is not rejected). Therefore, the job title can be used to predict the level of compliance before an aspect procedure, and vice versa.

- “After body fluid exposure” and “Job title” are independent (p-value for χ^2 test = 0.8535, p-value for Fisher’s exact test = 1.000, so the null hypothesis is not rejected). Therefore, the job title can be used to predict the level of compliance after body fluid exposure risk, and vice versa.

All participants except one dried their hands after carrying out hand hygiene (hand drying after observed hand hygiene except one: 94= Yes, 1=No).

Table: 5.8 TWO-WAY FREQUENCY TABLES OF JOB TITLE BY THE HAND HYGIENE OBSERVATIONS BEFORE PATIENT CONTACT, AFTER PATIENT CONTACT, AFTER CONTACT WITH PATIENT SURROUNDINGS

Before patient contact						
Response	Doctor or clinician	Nurse	Other	χ^2 test statistic	p-value(χ^2)	p-value-Fisher
Soap and water	8	40	16	13.7339 (6)	0.0328	0.0151
Alcohol gel rub	0	2	1			
No hand hygiene	3	7	16			
Unknown	0	2	0			
After patient contact						
Soap and water	10	41	22	5.1910(6)	0.5196	0.5222
Alcohol gel rub	0	2	1			
No hand hygiene	1	8	9			
Unknown	0	0	1			
After contact with patient surroundings						
Soap and water	6	15	1	20.2006(6)	0.0026	< .0001
Alcohol gel rub	0	2	0			
No hand hygiene	4	29	31			
Unknown	1	5	1			

Table: 5.9 TWO-WAY FREQUENCY TABLES OF JOB TITLE BY THE HAND HYGIENE OBSERVATIONS BEFORE AN ASEPTIC PROCEDURE AND AFTER BODY FLUID EXPOSURE RISK

Before an aseptic procedure						
Soap and water	7	14	10	7.2486(4)	0.1233	0.1739
Alcohol gel rub	0	0	0			
No hand hygiene	4	32	22			
Unknown	0	5	1			
After body fluid exposure risk						
Soap and water	11	48	32	1.3460(4)	0.8535	1.000
Alcohol gel rub	0	0	0			
No hand hygiene	0	1	0			
Unknown	0	2	1			

5.3.2.2 Relationship between counts of compliance and job title

Table 5.10 shows the two-way frequency tables of job title by count of compliance. The results of the χ^2 test of independence and Fisher's exact test indicate that there is a relationship between job title and count of compliance ($\chi^2 = 24.8270$, $DF = 10$, $p\text{-value} = 0.0057$, $p\text{-value for Fisher's exact test} = 0.0021$).

To investigate how job title affects the count of compliance of hand hygiene, one-way ANOVA equation was used. The F test for testing the job title effect (refer back to the ANOVA equation in section 5.2.5 for the null and alternative hypotheses) indicates that the mean counts among different groups (doctor or clinician, nurse, other) are statistically significantly different ($F = 7.20$, $DF1 = 2$, $DF2 = 92$, $p\text{ value} = 0.0011$). With the parameter estimates plugged in, the equation $\text{Compliance} = \beta_0 + \beta_1 \text{ title 1} + \beta_2 \text{ title 2} + \epsilon$, becomes:

$$\text{Compliance} = 3.4545 + 1.3636 \text{ title 1} + 0.6435 \text{ title 2} + \epsilon$$

Whereby, ϵ denotes the error term, and title 1 and title 2 are indicator variables.

title 1 = {1 if the job title = Doctor or clinician; 0 otherwise

title 2 = {1 if the job title = Nurse; 0 otherwise

5.3.2.2.1 The least squares means computed

The least squares means computed for the job title effect are 4.8182, 4.0980, and 3.4545, for “doctor or clinician”, “nurse”, and “other”, respectively. The multiple comparison adjustment for the p-values using Tukey’s method indicates the following:

- The mean numbers of counts of compliance between “doctor or clinician” (4.8182) and “nurse” (4.0980) are not statistically significantly different at the 0.05 level of significance (p value = 0.1234).
- The mean numbers of counts of compliance between “doctor and clinician” (4.8182) and “other” (3.4545) are statistically significantly different at the 0.05 level of significance (p value = 0.0016).
- The mean counts of of compliance between “nurse” (4.0980) and “other” (3.4545) are statistically significantly different at the 0.05 level of significance (p value = 0.0268).

Table: 5.10 TWO-WAY FREQUENCY TABLES OF JOB TITLE BY COUNT OF COMPLIANCE

Job title	1	2	3	4	5	6	Total
Doctor or clinician	0	0	0	4	5	2	11
Nurse	2	1	12	20	7	9	51
Other	0	5	13	10	5	0	33
Total	2	6	25	34	17	11	95

Overall, the results from the two-way contingency (Table 5.10) and the ANOVA tests, help to demonstrate the relationship between job title and the counts of compliance. A relationship was found between the counts of compliance and job title (Table 5.10): the results of the Kruskal-Wallis test (non-parametric version of the one-way ANOVA) indicate that there is a relationship between the counts of compliance and job title (Chi-square = 14.6256, DF = 2, p value = 0.0007).

The three assumptions of ANOVA were tested:

- Independence of observations.
- Normality: the distributions of the residuals are normal.
- Homoscedasticity: equality of variances of data in groups.

Figure 5.8 shows the histogram of residuals. The skewness and kurtosis are 0.1106 and 0.2069, respectively. The results of the Shapiro-Wilk test of normality indicate that the normality assumption may be violated (p-value = 0.0032). However, as both the skewness and kurtosis are small, the violation may not be serious enough to invalidate the ANOVA test results. Levene's test for homogeneity of variance suggests that the group variances are equal (p-value = 0.0955). As an alternative to the one-way ANOVA test, independent Poisson generalised linear models (GLMs) with log link can be used to investigate the relationship between job title and the outcome variable, and compliance. The test result of the Type III likelihood ratio statistic suggests that the job title's effect on compliance is not statistically significant at the 0.05 significance level ($\chi^2 = 4.38$, DF = 2, p-value = 0.1119).

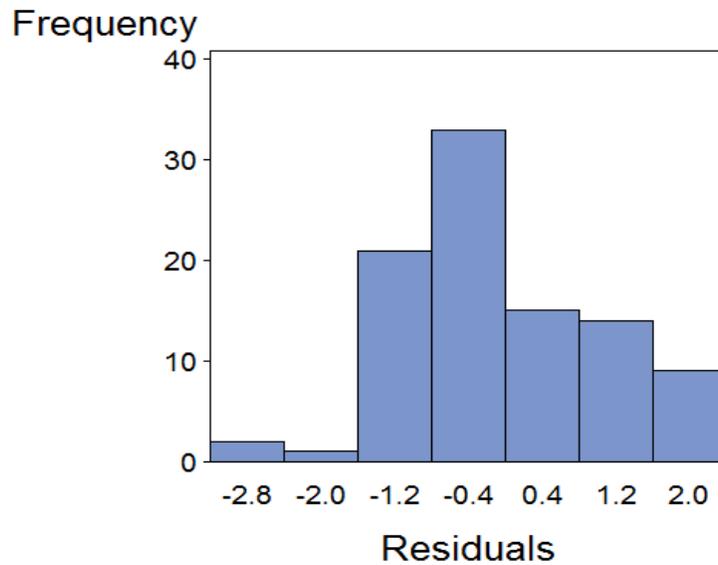


FIGURE: 5 .8 HISTOGRAM OF RESIDUALS

5.3.3 Findings are the following

For (n=95) Healthcare Workers' observed and (n=570) hand hygiene opportunities the following were found:-

5.3.3.1 before any contact with patients

The HCWs used soap and water whereas alcohol gels are a scarce resource.

5.3.3.2 after touching the patient

The HCWs used soap and water and 18(18.9%) of HCWs did not clean their hands after touching patients and their surroundings.

5.3.3.3 before doing an aseptic procedure

58(61.1%) of the HCWs did not practice any hand hygiene at all before carrying out aseptic procedures on patients. This was the second-worst HCWs hand hygiene non-compliance.

5.3.3.4 after body fluid exposure risk

91(95.8%) of HCWs used soap and water to clean their hands. Only one nurse did not clean hands nor dry them. 3(3.2%) of HCWs were observed using an unidentified substance to clean their hands. No one used alcohol gel to clean their hands. The findings confirmed that alcohol gels were not there, not easily accessible. Many HCWs did not know about it, how to use it, or its efficacy.

5.3.3.5 after touching patient surroundings

Of the 6 moments, this was the worst in terms of HCW hand hygiene non-compliance. Most of the HCWs did not perform hand hygiene after touching patient surroundings.

5.3.3.6 Healthcare Workers' hand hygiene: overall levels of compliance

The percentage rate of compliance was calculated as follows: 403 divided by 570, multiplied by 100% = 403(70.7%). Non-compliance rate = divided by 570, multiplied by 100% = 167(29.3%). Hand drying is a critical moment for fostering hand hygiene compliance. Hand drying: 94(98.9%) of HCWs dried their hands. One general trend is that the levels of compliance increased towards the last moment of hand hygiene. The level of non-compliance decreased from the third moment to the last moment.

5.4 DEMOGRAPHIC FINDINGS PATIENTS AND HEALTHCARE WORKERS

Therefore, the findings show that there were 170(29.6%) more female patients than male patients in the study. There were nearly twice as many female patients as male patients. Patients were described by their age groups. Age is an important marker of maturity and developmental stages, which are relevant to hand hygiene compliance and the robust control and prevention of HCAs.

The findings show that among the surveyed HCWs, there were more nurses and nursing auxiliaries than doctors, porters and environmental health technicians. Therefore the HCWs sample was dominated by females, and therefore the Mutoko and Mudzi district health care settings appear to be female-dominated workplaces.

5.5 RESULTS FOR THE INTERVIEWED PATIENTS

5.5.1 Patient data

5.5.1.1 Patients' perception of HCWs' hand hygiene compliance

Statistical tests results are in the tables below.

5.5.1.1.1 Table 5.11

This table displays the results of the two-way contingency tables of patient perceptions (Before being touched) by patient demographics (reaction, report, reminds, gender, age group, social class, usual home, reacts). Numbers in parentheses are degrees of freedom. Patient perception: 1 = sad, 2 = happy, 3 = confused, 4 = none). The χ^2 test of independence and Fisher's exact test were used to investigate the relationship between patient perceptions (Before being touched) by patient demographics and responses (reaction, report, reminds, gender, age group, social class, usual home, reacts). The χ^2 test results are

also shown in Table 5.11 for patient perception (Before being touched). If the p-values for both χ^2 and Fisher's exact test are greater than 0.05, the null hypothesis (that is X and Y are independent) is not rejected (both X and Y are categorical variables). Thus, knowing the level of X does not help to predict the level of Y, and vice versa. If p-values for both the χ^2 and Fisher's exact test are less than 0.05, the null hypothesis (H_0 : X and Y are independent) is rejected.

The conclusions are as follows:

- Patient perception (before being touched) and the report are not independent. Knowing the patient's perception before being touched by HCWs helps to predict this HCWs willingness to report, and vice versa.
- Patient perception (before being touched) and to remind HCWs to comply with hand hygiene are not independent. Knowing the patient's perception before being touched by HCWs helps to predict HCWs willingness to make a reminder, and vice versa.
- Patient perception (before being touched) and age group are not independent. Knowing the patient's perception before being touched by HCWs is an indication of HCWs age group, and vice versa.
- Patient perception (before being touched) and usual home are not independent. Knowing patient perception (before being touched) by HCWs helps the prediction of this person's usual home, and vice versa.

5.5.1.1.2 Table 5.12

This table contains the two-way frequency tables of patient perception (Before HCWs does a clean or aseptic procedure) by patient demographics (reaction,

report, remind, gender, age group, social class, usual home, reacts). The χ^2 test of independence and Fisher's exact test were used to ascertain the relationship between patient perception (before a health care worker does a clean or aseptic procedure on the patient) by patient demographics (reaction, report, remind, gender, age group, social class, usual home, react). The test results are also shown in Table 5.12. If p values for both the χ^2 test and Fisher's exact test are greater than 0.05, the null hypothesis is not rejected (that is X and Y are independent), and thus knowing the level of X does not help to predict the level of Y, and vice versa. If p values for both χ^2 and Fisher's exact test are less than 0.05, the null hypothesis is rejected (that is X and Y are independent), and thus knowing the level of X does help predict the level of Y, and vice versa. The conclusions were as follows:

- Patient perception (before a health care worker does a clean or aseptic procedure) and reaction are not independent. Knowing the patient's perception before a health care worker performs a clean or aseptic procedure on the patient does help to predict whether or not the patient will react, and vice versa.
- Patient perception (before a health care worker does a clean or aseptic procedure) and report are not independent. Knowing the patient's perception before a health care worker performs a clean or aseptic procedure on the patient does help predict whether or not the patient will report, and vice versa.
- Patient perception (before a health care worker does a clean or aseptic procedure) and remind are not independent. Knowing the patient's perception before a health care worker performs a clean or aseptic procedure on the patient does help predict whether or not the patient will make a reminder, and vice versa.

- Patient perception (before a health care worker does a clean or aseptic procedure) and social class are not independent. The patient's perception before a health care worker performs a clean or aseptic procedure on the patient does appear to reflect his or her social class, and vice versa.
- Patient perception (before a health care worker does a clean or aseptic procedure) and react are not independent. Knowing the patient's perception before a health care worker performs a clean or aseptic procedure on the patient can help predict the patient's tendency to react, and vice versa.

5.5.1.1.3 Table 5.13 and 5.14

This displays the two-way contingency tables of patient perception (after body fluid exposure risk, glove removal, and before being touched) by patient demographics (reaction, report, reminds). The χ^2 test of independence and the Fisher's exact test were used to investigate the relationship between patient perceptions by patient demographics. The test results are also shown in Table 5.14 (gender, age group, social class, usual home, reacts). If the p values for both the χ^2 test and Fisher's exact test are greater than 0.05, the null hypothesis is not rejected (that is. X and Y are independent), and thus knowing the level of X does not help predict the level of Y, and vice versa. If the p values for both the χ^2 test and Fisher's exact test are less than 0.05, the null hypothesis is rejected, and thus knowing the level of X does help predict the level of Y, and vice versa. The conclusions were:

- Patient perception (after body fluid exposure risk, glove removal, and before being touched) and reaction are not independent. Knowing a patient's perception (after body fluid exposure risk, glove removal, and before being touched) of a subject can help predict the person's tendency to react, and vice versa.

- Patient perception (after body fluid exposure risk, glove removal, and before being touched) and report are not independent. Knowing a patient's perception (after body fluid exposure risk, glove removal and before being touched) of a subject can help predict whether or not the patient will report, and vice versa.
- Patient perception (after body fluid exposure risk, glove removal, and before being touched) and reminding are not independent. Knowing a patient's perception (after body fluid exposure risk, glove removal and before being touched) of a subject does help predict the person's tendency to remind, and vice versa.
- Patient perception (after body fluid exposure risk, glove removal, and before being touched) and gender are not independent. A patient's perception (after body fluid exposure risk, glove removal and before being touched) of a subject does appear to be an indicator of the person's gender, and vice versa.
- Patient perception (after body fluid exposure risk, glove removal, and before being touched) and social class are not independent. A patient's perception (after body fluid exposure risk, glove removal and before being touched) of a subject does appear to reflect the person's social class, and vice versa.
- Patient perception (after body fluid exposure risk, glove removal, and before being touched) and usual home are not independent. A patient's perception (after body fluid exposure risk, glove removal, and before being touched) of a subject does appear to be an indicator of the person's usual home, and vice versa.
- Patient perception (after body fluid exposure risk, glove removal, and before being touched) and react are not independent. A patient's perception (after body fluid exposure risk, glove removal, and before being touched) of a subject does help predict the person's tendency to react, and vice versa.

5.5.1.1.4 Table 5.15 and 5.16

Displays the two-way frequency tables of patient perception (after contact with a patient, and before touching another patient) by patient demographics (reaction, report, remind). Numbers in parentheses are degrees of freedom. Patient perception: 1 = sad, 2 = happy, 3 = confused, 4 = none). The χ^2 test of independence and the Fisher's exact test are used to investigate the relationship between patient perception (After another patient contact and before touching you) by patient demographics (reaction, report, remind, gender, age group, social class, usual home, react). The test results are also shown in Table 5.16 for gender, age group, social class, usual home and react. If p-values for both χ^2 and Fisher's exact test are greater than 0.05, the null hypothesis (X and Y are independent) is not rejected. Knowing the level of X does not help the prediction of the level of Y, and vice versa. If p-values for both χ^2 and Fisher's exact test are less than 0.05, the null hypothesis (X and Y are independent) is rejected. Knowing the level of X does help the prediction of the level of Y, and vice versa. The conclusions are as follows:

- Patient perception (after a HCW contacts another patient, before touching the patient in question) and reaction are not independent. Knowing a patient's perception (after a HCW contacts another patient, before touching the patient in question) of a subject does help predict the person's tendency to react, and vice versa.
- Patient perception (after a HCW contacts another patient, before touching the patient in question) and remind are not independent. Knowing the patient's perception (after a HCW contacts another patient, before touching the patient in question) of a subject does help predict the person's tendency for remind, and vice versa.

- Patient perception (after a HCW contacts another patient, before touching the patient in question) and social class are not independent. Knowing the patient's perception (after a HCW contacts another patient, before touching the patient in question) of a subject does help predict the person's social class, and vice versa.
- Patient perception (after a HCW contacts another patient, before touching the patient in question) and usual home are not independent. Knowing the patient's perception (after a HCW contacts another patient, before touching the patient in question) of a subject does help prediction the person's usual home, and vice versa.
- Patient perception (after a HCW contacts another patient, before touching the patient in question) and react are not independent. Knowing the patient's perception (after a HCW is in contact with another patient, before touching the patient in question) does help predict the person's tendency to react, and vice versa.

5.5.1.1.5 Table 5.17

This table displays the two-way frequency tables of patient perception (after the HCWs have been in contact with patient surroundings and before touching the patient) by patient demographics (reactions, report, remind). Numbers in parentheses are degrees of freedom. Patient perception: 1 = sad, 2 = happy, 3 = confused, 4 = none). The χ^2 test of independence and the Fisher's exact test were used to investigate the relationship between patient perception (after the HCW has been in contact with patient surroundings and before touching the patient) by patient demographics (reaction, report, reminds). The test results are also shown in Table 5.18 for gender, age group, social class, usual home and react. If p-values for both χ^2 and Fisher's exact test are greater than 0.05, the null hypothesis (X and Y are independent) is not rejected. Knowing the level of X does not help the prediction of the level of Y, and vice versa. If p-values for both

χ^2 and Fisher's exact test are less than 0.05, the null hypothesis (X and Y are independent) is rejected. Knowing the level of X does help the prediction of the level of Y, and vice versa.

The conclusions from specialist statistical analysis are as follows:

- Patient perception (after the HCW has been in contact with patient surroundings and before touching the patient) and report are not independent. Knowing the patient's perception (after the HCW has been in contact with patient surroundings, and before touching the patient) does help predict the person's tendency to report, and vice versa.

- Patient perception (after the HCW has been in contact with patient surroundings and before touching the patient) and remind are not independent. Knowing the patient's perception (after the HCW has been in contact with patient surroundings, and before touching the patient) does help predict the person's tendency to remind, and vice versa.

- Patient perception (after the HCW has been in contact with patient surroundings and before touching the patient) and social class are not independent. Knowing the patient's perception (after the HCW has been in contact with patient surroundings and before touching the patient) does help predict the person's social class, and vice versa.

- Patient perception (after the HCW has been in contact with patient surroundings and before touching the patient) and usual home are not independent. Knowing the patient's perception (after the HCW has been in contact with patient surroundings and before touching the patient) does help predict the person's usual home, and vice versa.

Table: 5.11 TWO-WAY FREQUENCY TABLES OF PATIENT PERCEPTION (BEFORE BEING TOUCHED BY HCWs)

		Before being touched	2	3	4	(χ^2)	p-value (χ^2)	p-value (Fisher)
Reaction	Nothing	52	2	7	1	16.0556(9)	0.0657	0.0866
	Will urge to wash hands	302	12	25	4			
	Will tell HCWs to wash hands	17	4	2	0			
	Will remind them to wash hands	117	7	20	2			
Report	Yes	228	15	27	2	19.2010(6)	0.0038	0.0299
	No	256	10	23	5			
	Uncertain	4	0	4	0			
Remind	Yes	252	15	27	0	22.0141(6)	0.0012	< 0.0001
	No	231	8	25	6			
	Uncertain	5	2	2	1			
Gender	Male	171	12	17	2	2.2636(3)	0.5195	0.5213
	Female	317	13	37	5			
Age group	≤ 20	52	4	10	0	12.9140(6)	0.0444	0.0445
	20-60	407	17	44	7			
	≥ 60	29	4	0	0			
Social class	Upper	13	0	0	0	6.5073(6)	0.3688	0.4638
	Middle	247	17	28	2			
	Low	228	8	26	5			
Usual home	Rural community	245	8	18	2	21.9600(12)	0.0380	0.0256
	Urban	74	2	13	1			
	Resettlement	20	0	4	0			
	Farms	134	13	15	4			
	Growth point	15	2	4	0			
React	Yes	434	23	47	6	0.5026(3)	0.9183	0.8299
	No	54	2	7	1			

Table: 5.12 TWO-WAY FREQUENCY TABLES OF PATIENT PERCEPTION, BEFORE HEALTH CARE WORKER

Before health care worker does a clean or aseptic procedure on you								
		1	2	3	4	(χ^2)	p-value (χ^2)	p-value (Fisher)
Reaction	Nothing	46	1	15	0	39.0551(9)	< 0.0001	< 0.0001
	Will urge to wash hands	308	12	21	2			
	Will tell HCWs to wash hands	21	0	2	0			
Report	Will remind them to wash hands	133	10	3	0	18.5046(6)	0.0051	0.0090
	Yes	239	16	17	0			
	No	263	5	24	2			
Remind	Uncertain	6	2	0	0	13.0051(6)	0.0430	0.0376
	Yes	262	14	18	0			
	No	240	8	20	2			
Gender	Uncertain	6	1	3	0	12.1678(3)	0.0068	0.0057
	Male	180	14	8	0			
Age group	Female	328	9	33	2	19.6613(6)	0.0032	0.0034
	≤ 20	51	4	11	0			
	20-60	428	15	30	2			
Social class	≥ 60	29	4	0	0	12.4336(6)	0.0530	0.0469
	Upper	11	2	0	0			
	Middle	265	6	23	0			
Usual home	Low	232	15	18	2	19.1160(12)	0.0858	0.2152
	Rural community	244	14	15	0			
	Urban	80	3	5	2			
	Resettlement	20	0	4	0			
	Farms	145	6	15	0			
React	Growth point	19	0	2	0	29.5845(3)	< .0001	< 0.0001
	Yes	460	22	26	2			
	No	48	1	15	0			

Table: 5.13 TWO-WAY FREQUENCY TABLES OF PATIENT PERCEPTION (AFTER BODY FLUID EXPOSURE RISK, GLOVE REMOVAL, AND BEFORE THE PATIENT IS TOUCHED)

After body fluid exposure risk, glove removal and before you are touched								
		1	2	3	4	(χ^2)	p-value (χ^2)	p-value (Fisher)
Reaction	Nothing	48	6	8	0	18.5036(9)	0.0298	0.0179
	Will urge to wash hands	313	14	14	2			
	Will tell HCWs to wash hands	20	0	3	0			
	Will remind them to wash hands	122	7	15	2			
Report	Yes	245	10	13	4	20.2827(6)	0.0025	0.0048
	No	254	15	25	0			
	Uncertain	4	2	2	0			
Remind	Yes	252	17	21	4	21.4085(6)	0.0015	0.0027
	No	246	8	16	0			
	Uncertain	5	2	3	0			

Table: 5.14 TWO-WAY FREQUENCY TABLES OF PATIENT PERCEPTION (AFTER BODY FLUID EXPOSURE RISK, GLOVE REMOVAL, AND BEFORE THE PATIENT IS TOUCHED) BY PATIENT DEMOGRAPHICS (GENDER, AGE GROUP, SOCIAL CLASS, USUAL HOME, REACT)

Gender	Male	177	13	8	4	13.4013(3)	0.0038	0.0040
	Female	326	14	32	0			
Age group	≤ 20	54	3	7	2	9.4213(6)	0.1512	0.2109
	20-60	418	24	31	2			
	≥ 60	31	0	2	0			
Social class	Upper	11	0	0	2	43.9802(6)	< .0001	0.0226
	Middle	258	15	21	0			
	Low	234	12	19	2			
Usual home	Rural community	238	12	21	2	34.7099(12)	0.0005	0.0170
	Urban	84	3	3	0			
	Resettlement	15	2	5	2			
	Farms	148	9	9	0			
	Growth point	18	1	2	0			
React	Yes	454	21	31	4	10.0519(3)	0.0181	0.0202
	No	49	6	9	0			

Table: 5.15 TWO-WAY FREQUENCY TABLES OF PATIENT PERCEPTION (AFTER THE HCW HAS BEEN IN CONTACT WITH ANOTHER PATIENT, BEFORE TOUCHING THE PATIENT IN QUESTION) BY PATIENT DEMOGRAPHICS (REACTION, REPORT, REMIND)

After another patient contact and before touching you								
		1	2	3	4	(χ^2)	p-value (χ^2)	p-value (Fisher)
Reaction	Nothing	54	4	0	4	34.8820(9)	< 0.0001	0.0019
	Will urge to wash hands	316	11	13	3			
	Will tell HCWs to wash hands	19	0	4	0			
	Will remind them to wash hands	139	2	5	0			
Report	Yes	246	13	11	2	7.5130(6)	0.2760	0.2511
	No	274	4	11	5			
	Uncertain	8	0	0	0			
Remind	Yes	266	14	9	5	15.4972(6)	0.0167	0.0299
	No	254	3	11	2			
	Uncertain	8	0	2	0			

Table: 5.16 TWO-WAY FREQUENCY TABLES OF PATIENT PERCEPTION (AFTER THE HCW HAS BEEN IN CONTACT WITH ANOTHER PATIENT, BEFORE TOUCHING THE PATIENT IN QUESTION) BY PATIENT DEMOGRAPHICS GENDER, AGE GROUP, SOCIAL CLASS, USUAL HOME AND REACT)

Gender	Male	186	9	4	3	5.3199(3)	0.1498	0.1308
	Female	342	8	18	4			
Age group	≤ 20	61	2	3	0	4.0151(6)	0.6746	0.7598
	20-60	436	13	19	7			
	≥ 60	31	2	0	0			
Social class	Upper	7	6	0	0	94.2826(6)	< .0001	< 0.0001
	Middle	280	6	6	2			
	Low	241	5	16	5			
Usual home	Rural community	252	6	11	4	11.1905(12)	0.5127	0.5555
	Urban	87	1	2	0			
	Resettlement	22	2	0	0			
	Farms	147	7	9	3			
	Growth point	20	1	0	0			
React	Yes	472	13	22	3	20.4953(3)	0.0001	< 0.0001
	No	56	4	0	4			

Table: 5.17 TWO-WAY FREQUENCY TABLES OF PATIENT PERCEPTION (AFTER THE HCW HAS BEEN IN CONTACT WITH PATIENT SURROUNDINGS, BEFORE TOUCHING THE PATIENT) BY PATIENT DEMOGRAPHICS (REACTION, REPORT, REMIND)

After contact with patient surroundings and before touching you								
		1	2	3	4	(χ^2)	p-value (χ^2)	p-value (Fisher)
Reaction	Nothing	56	2	2	2	16.8956(9)	0.0504	0.0682
	Will urge to wash hands	298	14	26	5			
	Will tell HCWs to wash hands	17	0	4	2			
	Will remind them to wash hands	135	2	7	2			
Report	Yes	238	8	18	8	33.2832(6)	< .0001	0.0021
	No	264	10	19	1			
	Uncertain	4	0	2	2			
Remind	Yes	262	8	17	7	21.4830(6)	0.0015	0.0387
	No	237	10	21	2			
	Uncertain	7	0	1	2			

Table: 5.18 TWO-WAY FREQUENCY TABLES OF PATIENT PERCEPTION (AFTER THE HCW HAS BEEN IN CONTACT WITH PATIENT SURROUNDINGS, BEFORE TOUCHING THE PATIENT) BY PATIENT DEMOGRAPHICS (GENDER, AGE GROUP, SOCIAL CLASS, USUAL HOME AND REACT)

Gender	Male	177	8	10	7	6.1477(3)	0.1046	0.1051
	Female	329	10	29	4			
Age group	≤ 20	59	4	3	0	5.9461(6)	0.4293	0.6454
	20-60	416	14	34	11			
	≥ 60	31	0	2	0			
Social class	Upper	9	4	0	0	36.9926(6)	< .0001	0.0054
	Middle	260	6	24	4			
	Low	237	8	15	7			
Usual home	Rural community	250	6	11	6	2.0265(3)	0.5669	0.4678
	Urban	83	1	6	0			
	Resettlement	22	2	0	0			
	Farms	137	8	18	3			
	Growth point	14	1	4	2			
React	Yes	448	16	37	9	2.0265(3)	0.5669	0.4678
	No	58	2	2	2			

5.6 PERCEIVED PROMOTION HAND HYGIENE AMONG 574 PATIENTS

Table 5.19 presents the perceived hand hygiene promotion attitudes of the patients in a health care setting. Patients were asked to tick one of the faces (sad face, happy face, confused face, or none of the above) which best matched their attitudes towards HCWs who did not keep their hands clean on the following WHO 5 moments of hand hygiene are as follows: before being touched; before HCWs do a clean or aseptic procedure on a patient; after body fluid exposure risk, glove removal and before the patient is touched; after the HCW has been in contact with another patient contact and before touching the patient in question; and, after the HCW has touched a patient's surroundings before touching the patient. 506 (88.2%) of the patients selected a sad face on the WHO moment of hand hygiene (After contact with patient surroundings and before touching you),

whilst 39(6.8%) selected confused faces; only 18(3.1%) selected happy faces, whilst 11(1.9%) selected neither happy faces nor sad faces on the same moment of hand hygiene during patient care under the HCWs. Total was 574(100%). Before being touched, Sad Face 488(85.0%), Confused Face 54(9.4%), Happy Face 25(4.4%), none of the above 7(1.2%). Total 574(100.0%) Before HCWs does a clean or aseptic procedure on your Sad Face 508(88.5%), Happy Face 23(4.0%), and Confused Face 41 (7.1%). None: 2(0.4%). Total: 574(100.0).

Table: 5.19 PERCEIVED PROMOTION HAND HYGIENE ATTITUDE LEVELS AMONG THE 574 PATIENTS

Perceived promotion hand hygiene attitude levels among patients	Before being touched	Before HCW does a clean or aseptic procedure on you	After body fluid exposure risk, glove removal and before you are touched	After another patient contact and before touching you	After contact with patient surroundings and before touching you
	n(%)	n(%)	n(%)	n(%)	n(%)
Sad Face	488(85.0)	508(88.5)	503(87.6)	528(92.0)	506(88.2)
Happy Face	25(4.4)	23(4.0)	27(4.7)	17(3.0)	18(3.1)
Confused Face	54(9.4)	41(7.1)	40(7.0)	22(3.8)	39(6.8)
None of the above	7(1.2)	2(0.4)	4(0.7)	7(1.2)	11(1.9)
Total	574(100.0)	574(100.0)	574(100.0)	574(100.0)	574(100.0)

5.6.1 Table 5.20 presents the gender of patients and the actions

Patients would undertake actions to ensure that HCWs wash their hands or rub alcohol gel on their hands before touching them. A total of 343(59.8%) patients reported that they would urge the health workers to wash their hands, whilst 146(25.4%) reported that they would remind them to wash; 23(4.0%) would tell HCWs to wash, and 62(10.8%) would do nothing at all about the HCWs' failure to clean their hands. Additionally, 122(21.3%) male and 221 (38.5%) of female patients, said "they would urge the HCWs to wash their hands before they touch them", while 55(9.6%) of the male patients (compared to 91(5.8%) of the female patients) said 'they would remind HCWs to first decontaminate hands before they touch patients'. Only 2(0.35%) of the male patients and 21(3.7%) of the female patients had the courage to "tell the HCWs to wash their hands first before doing anything with them". However, 23(4%) of the male patients and 39(6.8%) of the

female patients “would do nothing at all about the HCWs not cleaning their hands”.

Table: 5.20 HAND HYGIENE PROMOTION ATTITUDES AMONG 574 PATIENTS (BY GENDER) TO HEALTHCARE WORKERS’ HAND HYGIENE COMPLIANCE WHEN ADMITTED INTO HOSPITAL

Respondent’s gender * What will you do to make sure the HCWs wash hands or rub alcohol gel on their hands before touching you? (Cross tabulation)					
Respondent’s Gender	What will you do to make sure the HCWs wash hands or rub alcohol gel on their hands before touching you?				
	Nothing n(%)	Will urge to wash hands or rub alcohol gel n(%)	Will tell HCWs to wash hands first or rub alcohol gel n(%)	Will remind them to wash hands or rub alcohol gel n(%)	Total n(%)
Male	23(4.0)	122(21.3)	2(0.35)	55(9.6)	202(35.2)
Female	39(6.8)	221(38.5)	21(3.7)	91(15.8)	372(64.8)
Total	62(10.8)	343(59.8)	23(4.0)	146(25.4)	574(100.0)

5.6.2 Table 5.21 presents the responses of the patients

Responses of the patients were as follows when they were asked whether they would report the HCWs to their superiors if they failed to clean their hands. The results show that more than half number of the patients, 294(51.2%), would not report them to the manager in charge, while 272 (47.4%) would gather the courage to inform the responsible authorities of the poor hand hygiene behaviour of HCWs. However, 6 (1.05%) were uncertain whether to report or not, and 20 (35%) of patients said “they did not know what to do in the situation of HCWs’ failed hand hygiene”.

Table: 5.21 PATIENTS 574 INTENT ON REPORTING HCWs TO THE MANAGER AFTER FAILED HAND HYGIENE MOMENT

Will you report the HCW to the manager in charge if they fail to wash their hands or rub alcohol gel on their hands?		
	Frequency	Per cent
Yes	272	47.4
No	294	51.2
Uncertain	6	1.05
Don't know	2	0.35
Total	574	100.0

5.6.3 Table 5.22 presents a total of 272 (47.4%) of patients would report

HCWs could be reported to their superiors; within this group there were more women 157 (27.4%), compared to 115 (20.0%) of men). Within the group of patients who would not report, a greater number of them were women (37.1%, 213), compared to 81 (14.1%) of men. However, there were more men 4 (0.7%) than women 2 (0.35%) who were uncertain of the action they were going to take, and 2 (0.35%) males had indeterminate attitude levels whether to report or not.

Table: 5.22 PATIENTS 574 WILLING TO REPORT TO MANAGER IN CHARGE IN A CALM MANNER AFTER FAILED HAND HYGIENE MOMENT – RESULTS BY GENDER

Will you report the HCWs to the manager in charge if they failed to wash their hands or rub alcohol gel on their hands * Respondent's gender Cross tabulation?			
Will you report the HCWs to the manager in charge if they failed to wash their hands or rub alcohol gel on their hands?	Respondent's gender		
	Male n(%)	Female n(%)	Total n(%)
Yes	115(20.0)	157(27.4)	272(47,4)
No	81(14.1)	213(37.1)	294(51.2)
Uncertain	4(0.7)	2(0.35)	6(1.05)
Don't know	2(0.35)	0(0.0)	2(0.35)
Total	202(35.2)	372(64.8)	574(100.0)

Table 5.23 shows the proportion of patients who would remind HCWs when they fail to clean hands or rub alcohol gel onto hands: 294 (51.22%) of patients said ‘they would remind HCWs’, and 270(47.03%) of patients said “they would not

remind HCWs about hand hygiene compliance”. 8(1.40%) of patients felt uncertain, and the attitude of 2 (0.35%) of patients could not be determined.

Table: 5.23 PATIENTS 574 WILLING TO REMIND HEALTHCARE WORKERS, IF THEY FAILED TO COMPLY WITH HAND HYGIENE PROCEDURES DURING THEIR DUTY OF CARE

Will you remind the HCWs if they fail to wash hands or rub alcohol gel on their hands?		
	Frequency	Per cent
Yes	294	51.22
No	270	47.03
Uncertain	8	1.40
Don't know	2	0.35
Total	574	100.0

Table 5.24 details the willingness of patents to remind HCWs to wash hands or use alcohol gel rub: 127(22.1%) of the men, and 167(29.1%) of the women said they would; 73(12.7%) of men and 197(34.3%) of women said “they would not remind HCWs”; 2(0.35%) of men and 6(1.05%) of women were unsure; and, 0(0%) of men and 2(0.35%) of women said “they did not know”. Of all the responses, 202(35.2%) were by the men, and 372(64.8%) were by the women, and the overall total was 574 (100%). A total of 294(51.2%) of the patients said “they would remind HCWs”; 270(47.0%) said “they would not”; 8(1.4%) felt uncertain; and, 2(0.35%) said “they did not know”.

Table: 5.24 PATIENTS 574 WILLING TO REMIND HEALTHCARE WORKERS ON HAND HYGIENE, AND PATIENTS' GENDER

Will you remind the HCWs if they failed to wash hands or rub alcohol gel on their hands * Respondent's gender Cross tabulation			
Will you report the HCWs to the In-Charge if they fail to wash their hands or rub alcohol gel on their hands	Respondent's gender		
	Male n(%)	Female n(%)	Total n(%)
Yes	127(22.1)	167(29.1)	294(51.2)
No	73(12.7)	197(34.3)	270(47.0)
Uncertain	2(0.35)	6(1.05)	8(1.4)
Don't know	0(0.0)	2(0.35)	2(0.35)
Total	202(35.2)	372(64.8)	574(100.0)

5.7 DEMOGRAPHIC FINDINGS OF THE INTERVIEWED 574 PATIENTS

The following section deals with interviewed (n=574) patients. Patients empower HCWs to comply with hand hygiene. This is in line with Table 1.2. Patients as the public have expectations from HCWs to practice hand hygiene effectively to prevent and control HCAs.

5.7.1 Sample demographics of interviewed patients

5.7.1.1 Patients' responses by gender

5.7.1.1.1 Findings were:

The following findings indications

- *Show that there were 170(29.6%) more female patients than male patients in the study. There were nearly twice as many female patients as male patients.*

5.7.1.2 Patients' Age Groups

5.7.1.2.1 Findings:

- *Individuals were described by their age groups. Age is an important marker of maturity and developmental stages, which are relevant to hand hygiene compliance by HCWs and the robust control and prevention of HCAs. Patients as users of healthcare institutions need safety from HCAs.*

5.7.2 Patients 574, Social Class

5.7.2.1 Patients' social classes

5.7.2.1.1 Findings:

- *Lower social class: 267 (46.5%)*
- *Middle social class: 294 (51.2%)*
- *Upper social class: 13(2.3%). These social classes were measured on an ordinal scale and are ordered categories as indicated, Agresti (2013:2) thus upper, middle and lower socioeconomic classes.*

5.7.3 Patients 574 domiciliary places

5.7.3.1 Patients' usual homes

5.7.3.1.1 Findings:

- *Urban areas: 90(15.7%).*
- *Resettlement agricultural land: 24(4.2%).*
- *Growth Points: 21(3.7%).*

- *Farms: 166(28.9%)*
- *Nearly half of the patient populations live in small remote rural villages 273 (47.6%).*

5.8 FINDINGS OF THE INTERVIEWED PATIENTS

5.8.1 Perceptions of HCWs' hand hygiene among the interviewed patients

5.8.1.1 Patients' perceptions (faces)

5.8.1.1.1 Findings:

- *Before being touched: Interview data indicate that a large majority 488(85%) of patients showed sad faces. The patients felt sad to be cared for by HCWs with unclean hands. This has the greatest influence for fostering HCWs' hand hygiene compliance.*
- *Before HCWs perform a clean or aseptic procedure on the patient: More sad faces than before being touched 508(88.5%).*
- *After body fluid exposure risk: 503(87.6%) of patients showed sad faces.*
- *After HCWs touch patient surroundings, before touching patient: 506(88.2%) of patients showed sad faces.*

5.8.2 Hand hygiene promotion attitude levels among 574 patients (by gender) in relationship to healthcare workers' hand hygiene compliance

5.8.2.1 Findings

A total of 343(59.8%) of patients said “they would urge the HCWs to wash their hands”. Patients who said “they would remind”146 (25.4%), HCWs “to wash hands”. Patients who said “they would tell” 23(4.0%), HCWs “to wash hands”.5.8.2.1.2 Patients 62(10.8%) said “they would take no further action”. The findings show that female patients were more than their male counterparts.

5.8.3 Patients’ intent on reporting HCWs to the manager in charge after a failed hand hygiene moment

5.8.3.1 Findings

Slightly more than half of the number of patients 294 (51.2%), would not report an HCW to the manager. Patients 272(47.4%) said “they would gather the courage to inform the responsible authorities of the bad hand hygiene practice of the HCWs”.Patients 6(1.05%) was uncertain whether to report or not, possibly out of fear of reprisals from the HCWs. Only 2(0.35%) patients did not know what to do in the situation of HCW’s failed hand hygiene. Overall, this seems to suggest a lack of health education promotion among patients.

5.8.4 Patients’ intent on reporting HCWs to the manager

Patients’ intention on reporting after HCWs failed hand hygiene moment, by patients’ gender, the findings are elaborated below:

5.8.4.1 Findings

More female than male patients (27.4% and 20.0% of all patients, respectively) said “they would report HCWs to their superiors if they fail to wash their hands”. Twice as many female than male patients (37.1% and

14.1%, respectively) said “they would not report”. Male patients 4 and 2 female patients respectively were uncertain of the action they were going to take. Male patients 2 did not know whether to report or not. These findings appear to suggest that those who did not know what to do are in need of health promotion education.

5.8.5 Patients’ intent on reminding healthcare workers during failure to perform hand hygiene, by patient’s gender were 574

5.8.5.1 Findings

Patients 294(51.2%) said “they would remind HCWs to wash hands or use alcohol gel rub”.

5.9 RELATIONSHIPSHIP AMONG VARIABLES

5.9.1 Relation of hand hygiene promotion among 574 patients and healthcare workers hand hygiene compliance

Some patients said “they would report HCWs to the manager”, and others said “they would remind the HCWs when they failed to wash their hands or rub alcohol gel on their hands”.

5. 9.1.1 Findings

Support for improved hand hygiene compliance among patients’ family and friends can be a reinforcing factor to foster hand hygiene compliance among HCWs in the Mutoko and Mudzi districts. The evidence is the extensive feedback from the interviewed patients regarding their perspectives with respect to hand hygiene for the sake of improving HCWs hand hygiene compliance practices.

There were patients who said “they would remind the HCWs to wash their hands or rub alcohol gel on their hands”, some said “they would tell HCWs”, and others said “they would gather the courage to inform HCWs” therefore HCWs in the Mutoko and Mudzi districts in Zimbabwe need to be empowered to achieve hand hygiene compliance to the full to alleviate HCAs.

5.10 PRESENTATION OF RESULTS FOR HEALTHCARE WORKERS QUESTIONED

HCWs (n=189) were facing challenges in order to achieve hand hygiene compliance in Mutoko and Mudzi districts in Zimbabwe.

5.10.1 Challenges faced by healthcare workers (HCWs) in the Mutoko and Mudzi districts in Mashonaland East, Zimbabwe

Table 5.25 below details the extent of the challenges faced by all HCWs in accomplishing hand hygiene compliance. The major problem identified by 174 (92.1%) of the HCWs was insufficient clean and safe water to use in the health care institutions”. This was followed by insufficient, or no, detergents like soap, bleach, alcohol gel and sanitiser” cited by 128(67.7%), of HCWs involved in this study. Some institutions were experiencing water cuts by the Zimbabwe National Water Authority (ZINWA) due to unpaid water bills by their responsible authorities”. Another problem was that the boreholes and water pumps were frequently breaking down”, and there was no fuel for which to run engine pumps for the water”. Another challenge (raised by 51(27.0%) of respondents was the absence of gloves or protective clothing”, and 46(24.3%) of the HCWs mentioned understaffing as a challenge during the execution of their duties”. They also identified that at times they were so busy that they forgot to change their gloves or clean their hands”.

In the above-mentioned table, it is shown that insufficient clean and safe water” was reported by 174(92.1%) of respondents, while only 15(7.9%) respondents had access to sufficient, clean and safe water. Water cuts, borehole and water pump breakdowns and no fuel to run the engines was reported by 108(57.1%) of respondents, whilst 81(42.9%) of respondents did not report these problems. Insufficient stocks of detergents, soap, bleach, alcohol gels, and sanitisers were reported by 128(67.7%) of respondents, whereas 61(32.3%) of respondents reported no such shortages. 46(24.3%) of respondents mentioned they were understaffed and busy and that, consequently, they forget to change gloves or wash hands as opposed to 143(75.7%) of respondents who did not indicate such a challenge in their day-to-day duties in the clinical areas. The absence of gloves and protective clothing was reported by 51(27.0%) of respondents, and not reported by 138 (73.0%) of respondents. According to Schwandt (2015:153) qualitative analysis typically embraces the use of inductive and deductive analysis henceforth qualitative data could be quantitised analysed. Additionally, Ivankova (2015:246-247) further reinforce the fact that one form of data can be transformed into another for analyses; qualitative data such as observations, interviews can be quantitised for further analyses.

Table: 5.25 CHALLENGES FACED BY 189 HEALTHCARE WORKERS

What challenges do you face in accomplishing Hand Hygiene Compliance?			
Challenges	Yes n(%)	No n(%)	Total n(%)
(a) Insufficient clean and safe water	174 (92.1)	15 (7.9)	189 (100.0)
(b) water cuts, borehole & pump breakdowns and no fuel	108 (57.1)	81 (42.9)	189(100.0)
(c) Insufficient/No detergents (Soap, bleach, Alcohol gel, sanitiser)	128 (67.7)	61 (32.3)	189(100.0)
(d) Understaffed and very busy that you forget to change gloves or wash hands	46 (24.3)	143 (75.7)	189(100.0)
(e) No gloves or protective clothing	51 (27.0)	138 (73.0)	189(100.0)

Table 5.26 below presents the challenges faced by the HCWs by gender. Traditionally senior managers and doctors are predominantly men. With such male dominance, many men are in a paternalistic position of power they may not pay as much close attention to hand hygiene compliance as women who naturally are considered to be more maternalistic than men. Although there is a lot of women healthcare workers, most of them are nurses and in lesser positions in hospitals or clinics. So with fewer women in the more influential positions such as being senior managers or doctors with how meticulous women generally are in terms of maternalistic hygiene there is a lack of a strong reinforcing factor in implementing or ensuring that hand hygiene compliance is maintained or improved. Specifically, it would be best for women to implement robust effective policies or measures with respect to hand hygiene as they are generally considered to be most maternalistic at it than men.

The challenge of insufficient clean and safe water was mentioned by 174(92.1%) of respondents (of which the majority (70.1%) were females), while only 15(7.9%) of respondents 9 (4.8%) men, and 6(3.2%) women did not perceive this as a major challenge to the 5 moments of hand hygiene. Female respondents 86(45.5%) and male respondents 42(22.2%) all raised the challenge of insufficient or no detergents such as soap, bleach, and alcohol gels in the health institutions, compared with 42(22.2%) and 19(10.0%) women and men, respectively, who felt that it was not a major problem - hence it is evident that some respondents just use plain water, or do not wash their hands at all, thereby putting patients at risk of contracting HCAs. The problem of having no gloves or protective clothing was raised by 23(12.2%) of men and 28(14.8%) of women, whilst 38 (20.1%) of men and 100(52.9%) of women did not see it as a problem. The challenge of understaffing and being so busy, causing HCWs to forget to change gloves or wash hands, was raised by 46(24.3%) of respondents 15(7.9%) men and 31 (16.4%) women.

Table: 5.26 CHALLENGES FACED BY 189 HEALTHCARE WORKERS IN ACCOMPLISHING HAND HYGIENE COMPLIANCE BY GENDER

What challenges do you face in accomplishing Hand Hygiene Compliance?				
Challenges		Male	Female	Total
		n(%)	n(%)	
(a) Insufficient clean and safe water	Yes	52(27.5)	122(64.6)	174(92.1)
	No	9(4.8)	6(3.2)	15(7.9)
(b) water cuts, borehole & pump breakdowns and no fuel	Yes	34(17.9)	74(39.2)	108 (57.1)
	No	27(14.3)	54(28.6)	81(42.9)
(c) Insufficient/No detergents (Soap, bleach, Alcohol gel, sanitiser)	Yes	42(22.2)	86(45.5)	128(67.7)
	No	19(10.0)	42(22.2)	61(32.3)
(d) Understaffed and very busy that you forget to change gloves or wash hands	Yes	15(7.9)	31(16.4)	46(24.3)
	No	46(24.3)	97(51.3)	143(75.7)
(e) No gloves or protective clothing	Yes	23(12.2)	28(14.8)	51(27.0)
	No	38(20.1)	100(52.9)	138(73.0)

Table 5.27 below presents the recommendations put forward by the HCWs as solutions to the challenges they are facing in implementing the 5 moments of hand hygiene. 175 (92.6%) of HCWs saw the constant supply of clean, purified and safe tap water to make workers adhere to the WHO recommended ways of minimising the spread of diseases in health institutions. 137(72.5%) out of 189(100%) HCWs felt that all health institutions should have hand washing facilities with running water to achieve hand hygiene compliance; however, the other 52(27.5%) HCWs disagreed with this assertion. The other three recommendations put forward by the HCWs were supported by a minority and unsupported by a large majority of the respondents. These recommendations include: (i) full staff establishment at all institutions 32(16.9%) of respondents (ii) supply of diesel and or electric water pumps, and drilling of boreholes at each

and every healthcare institution 60(31.7%) of respondents; and, (iii) holding of workshops for all HCWs on the 5 moments of hand hygiene 45(23.8%) of respondents.

Table: 5.27 RECOMMENDATIONS MADE BY 189 HEALTHCARE WORKERS IN ORDER TO RAISE COMPLIANCE

What are your recommendations in order to 'raise compliance'?			
Recommendations	Yes n(%)	No n(%)	Total n(%)
(a) Constant clean, purified and safe tap water	175 (92.6)	14 (7.4)	189(100.0)
(b) Hand washing facilities with running water	137 (72.5)	52 (27.5)	189(100.0)
(c) Full staff establishment at all institutions	32 (16.9)	157 (83.1)	189(100.0)
(d) Diesel or electric water pumps and borehole for every institution	60 (31.7)	129 (68.3)	189(100.0)
(e) Workshops for all HCW	45 (23.8)	144(76.2)	189(100.0)

Table 5.28 below presents the recommendations of the HCWs by gender. 175(92.6%) of respondents recommended the uninterrupted supply of clean, purified and safe water; 117(61.9%) of them of all respondents were female. 14(7.4%) of respondents proposed other solutions, of which 3(1.6%) were males. Of the 137 (72.5%) of respondents who recommended that all healthcare institutions should have hand washing facilities with running water, 94(49.7%) were females, while 18(9.5%) out of the 52(27.5%) respondents who objected were males. Only 10(5.3%) of the 32(16.9%) respondents who indicated that each institution should have a full complement of staff were male, while 105 (55.6%) were female out of the 157 (83.1%) of all respondents who did not agree with this recommendation. A total of 60 HCWs, including 24 males, 36 females (31.7%, 12.7% and 19.0%) of all respondents, respectively, suggested that each institution should have a diesel or electric water pump and a borehole so that there is always a supply of water for them to wash their hands. However, 37 men and 92 women (19.6% and 48.7% of all respondents, respectively) did not see this as a major solution to the water problems faced by many health centres in

the two districts. The holding of workshops for all HCWs was recommended by 45(23.8%) of HCWs, of which 24 were males and 21 were females (12.7% and 11.1%) of all respondents, respectively. The majority of respondents 144 (76.2%) did acknowledge the recommendation but did not see it as contributing much to hand hygiene compared with other recommendations.

Table: 5. 28 HEALTHCARE WORKERS 189, RECOMMENDATIONS (BY GENDER) IN ORDER TO RAISE COMPLIANCE

What are your recommendations in order to comply?				
Recommendations		Male n(%)	Female n(%)	Total n(%)
(a) Constant clean, purified and safe tap water	Yes	58(30.6)	117(61.9)	175(92.6)
	No	3(1.6)	11(5.8)	14(7.4)
(b) Hand washing facilities with running water	Yes	43(22.8)	94(49.7)	137(72.5)
	No	18(9.5)	34(18.0)	52(27.5)
(c) Full staff establishment at all institutions	Yes	10(5.3)	22(11.6)	32(16.9)
	No	52(27.5)	105(55.6)	157(83.1)
(d) Diesel or electric water pumps and borehole for every institution	Yes	24(12.7)	36(19.0)	60(31.7)
	No	37(19.6)	92(48.7)	129(68.3)
(e) Workshops for all HCWs	Yes	24 (12.7)	21(11.1)	45(23.8)
	No	37(19.6)	107(56.6)	144(76.2)

5.11 HCWs' DATA: STATISTICAL CONSULTATION TESTS FOR 189 HCWs' HAND HYGIENE COMPLIANCE QUESTIONNAIRE ON CHALLENGES FACED IN ACCOMPLISHING HAND HYGIENE COMPLIANCE

There were 189 subjects in the HCWs data set. All subjects answered all questions. Due to miscoding, an observation by one subject for 'recommendation

(c) Full staff establishment at all institutions' was excluded from the following data analyses. Independent logistic regression was used to model the relationship between each of the binary responses (challenges (a) to (e), recommendations (a) to (e) and the two covariates (gender and job title (or 'title')). Tables 5.29, 5.30 and Table 5.31 provide, for each of the outcome variables (challenges (a) to (e), recommendations (a) to (e) the results of the type 3 analysis of effects (based on the Wald χ^2 test that was used to determine if an effect (gender, title, gender \times title) is statistically significant at the 0.05 level of significance). When considering both the gender and title effects, according to the analysis results of logistic regression the findings are not statistically significant at the 0.05 level of significance (all p values are greater than 0.05).

5.11.1 In Table 5.32, 'title' is not taken into consideration

The table displays the two-way contingency table for gender, and each of challenges (a) to (e) and recommendations (a) to (e). The χ^2 test of independence and the Fisher's exact test were used to investigate the relationship between the responses of challenges (a) to (e), recommendations (a) to (e), and gender (whilst ignoring the title effect). The test results are also shown in Table 5.32. Recall that if p values for both the χ^2 test and Fisher's exact test are greater than 0.05, the null hypothesis is not rejected (that is X and Y are independent), and so knowing the level of X does not help predict the level of Y, and vice versa. If p-values for both χ^2 and Fisher's exact test are less than 0.05, the null hypothesis (X and Y are independent) (both X and Y are categorical variables) is rejected. Knowing the level of X does help the prediction of the level of Y, and vice versa.

5.11.1.1 The statistical conclusions are as follows:

- Gender and challenge (a) are not independent. Knowing the gender of HCWs helps predict the HCWs response to challenge (a), and vice versa.

- Gender and challenge (e) are not independent. Knowing the gender of the HCWs does help predict the HCWs response to challenge (e), and vice versa.

- Gender and recommendation (e) are not independent. Knowing the gender of HCWs does help predict the HCWs response to recommendation (e), and vice versa.

5.11.1.2 In Tables 5.33 and 5.34

The tables display the two-way contingency table for job title and each of challenges (a) to (e) and recommendations (a) to (e). The χ^2 test of independence and Fisher's exact test were used to investigate the relationship between the responses to challenges (a) to (e) and to recommendations (a) to (e), and job title (or 'title'). The test results are also shown in Table 5.33 and Table 5.34. Recall that, if p-values for both χ^2 and Fisher's exact test are greater than 0.05, the null hypothesis H_0 : (X and Y are independent) is not rejected. Knowing the level of X does not help the prediction of the level of Y, and vice versa. If p- values for both χ^2 and Fisher's exact test are less than 0.05, the null hypothesis H_0 : (X and Y are independent) is rejected. Knowing the level of X does help the prediction of the level of Y, and vice versa.

5.11.1.2.1 Conclusions: -

- Title and challenge (a) are not independent. Knowing the job title of HCWs does help predict the HCWs response to challenge (a), and vice versa.

- Title and challenge (d) are not independent. Knowing the job title of HCWs does help predict the HCWs response to challenge (d), and vice versa.

- Title and recommendation (c) are not independent. Knowing the job title of HCWs does help predict the person’s response to recommendation (c), and vice versa.

- Title and recommendation (e) are not independent. Knowing the job title of HCWs does help predict the HCWs response to recommendation (e), and vice versa.

Table: 5.29 TYPE III ANALYSIS OF EFFECTS OF TITLE, GENDER, AND TITLE x GENDER (INDEPENDENT LOGISTIC REGRESSION IS PERFORMED FOR EACH OUTCOME VARIABLE)

Outcome variable	Effect	DF	Wald χ^2	p-value
Challenge (a) Insufficient clean and safe water	Title	4	5.7397	0.2195
	Gender	1	0.0004	0.9836
	Title x Gender	4	2.7485	0.6007
Challenge (b) Water cuts, borehole & pump breakdowns and no fuel	Title	4	6.7021	0.1525
	Gender	1	0.0296	0.8633
	Title x Gender	4	2.0429	0.7279
Challenge (c) Insufficient/No detergents (Soap, Jik (bleach), Alcohol gel, sanitiser)	Title	4	2.3631	0.6693
	Gender	1	0.1205	0.7284
	Title x Gender	4	1.5756	0.8132

Table: 5.30 TYPE III ANALYSIS OF EFFECTS OF TITLE, GENDER, AND TITLE x GENDER (INDEPENDENT LOGISTIC REGRESSION IS PERFORMED FOR EACH OUTCOME VARIABLE)

Challenge (d) Understaffed and very busy that you forget to change gloves or wash hands	Title	4	4.1356	0.3880
	Gender	1	0.0981	0.7542
	Title x Gender	4	0.6076	0.9622
Challenge (e) No gloves or protective clothing	Title	4	2.4290	0.6574
	Gender	1	0.4202	0.5168
	Title x Gender	4	2.6157	0.6240
Recommendation (a) Constant clean, purified and safe tap water	Title	4	1.3169	0.8585
	Gender	1	1.6962	0.1928
	Title x Gender	4	2.3046	0.6799

Table: 5.31 TYPE III ANALYSIS OF EFFECTS OF TITLE, GENDER, AND TITLE x GENDER (INDEPENDENT LOGISTIC REGRESSION IS PERFORMED FOR EACH OUTCOME VARIABLE)

Recommendation (b) Hand washing facilities with running water	Title	4	1.8493	0.7635
	Gender	1	0.1492	0.6993
	Title x Gender	4	1.2104	0.8764
Recommendation (c) Full staff establishment at all institutions	Title	4	5.0438	0.2828
	Gender	1	0.8733	0.3500
	Title x Gender	4	0.6694	0.9551
Recommendation (d) Diesel or electric water pumps and borehole for every institution	Title	4	1.8805	0.7577
	Gender	1	0.8086	0.3685
	Title x Gender	4	2.7798	0.5953
Recommendation (e) Workshops for all HCWs	Title	4	7.4116	0.1157
	Gender	1	0.1844	0.6676
	Title x Gender	4	3.0829	0.5440

Table: 5.32. TWO- WAY FREQUENCY TABLES OF GENDER, BY RESPONSES TO CHALLENGES: (A) TO (E) AND RECOMMENDATIONS (A) TO (E). NUMBERS IN PARENTHESES ARE DEGREES OF FREEDOM

		Gender		χ^2	p-value χ^2	p-value Fisher
		Male	Female			
Challenge (a) Insufficient clean and safe water	Yes	52	122	5.7296 (1)	0.0167	0.0225
	No	9	6			
Challenge (b) Water cuts, borehole & pump breakdowns and no fuel	Yes	34	74	0.0726 (1)	0.7876	0.8753
	No	27	54			
Challenge (c) Insufficient/No detergents (Soap, bleach, Alcohol gel, sanitiser)	Yes	42	86	0.0524 (1)	0.8190	0.8690
	No	19	42			
Challenge(d)Understaffed and very busy that you forget to change gloves or wash hands	Yes	15	31	0.0031 (1)	0.9556	1.0000
	No	46	97			
Challenge (e) No gloves or protective clothing	Yes	23	28	5.2542 (1)	0.0219	0.0346
	No	38	100			
Recommendation (a) Constant clean, purified and safe tap water	Yes	58	117	0.8138 (1)	0.3670	0.5540
	No	3	11			
Recommendation (b) Hand washing facilities with running water	Yes	43	94	0.1797 (1)	0.6716	0.7284
	No	18	34			
Recommendation (c) Full staff establishment at all institutions	Yes	9	22	0.1975 (1)	0.6568	0.8340
	No	52	105			
Recommendation (d) Diesel or electric water pumps and borehole for every institution	Yes	24	36	2.3999 (1)	0.1213	0.1347
	No	37	92			
Recommendation (e) Workshops for all HCWs	Yes	24	21	11.9822 (1)	0.0005	< 0.0001
	No	37	107			

Table: 5.33 TWO-WAY FREQUENCY TABLES OF JOB TITLE, BY RESPONSES TO CHALLENGES: (A) TO (E) AND RECOMMENDATIONS (A) TO (E). NUMBERS IN PARENTHESES ARE DEGREES OF FREEDOM. JOB TITLES: 1 = DOCTOR OR CLINICIAN, 2 = NURSE, 3 = NURSE AIDE, 4 = GENERAL HAND, 5 = ENVIRONMENTAL HEALTH TECHNICIAN

		Job title					χ^2	p-value (χ^2)	p-value (Fisher)
		1	2	3	4	5			
Challenge (a)	Yes	12	122	27	7	6	13.9643 (4)	0.0074	0.0445
	No	0	9	2	4	0			
Challenge (b)	Yes	9	80	10	5	4	9.3032(4)	0.0540	0.0513
	No	3	51	19	6	2			
Challenge (c)	Yes	9	92	16		3	3.7451(4)	0.4416	0.4463
	No	3	39	13	3	3			
Challenge (d)	Yes	7	30	8	0	1	11.5741 (4)	0.0208	0.0215
	No	5	101	21	11	5			
Challenge (e)	Yes	6	29	10	4	2	6.2298(4)	0.1826	0.1415
	No	6	102	19	7	4			

Table: 5.34 TWO-WAY FREQUENCY TABLES OF JOB TITLE, BY RESPONSES TO RECOMMENDATIONS (A) TO (E). NUMBERS IN PARENTHESES ARE DEGREES OF FREEDOM. JOB TITLES: 1 = DOCTOR OR CLINICIAN, 2 = NURSE, 3 = NURSE AIDE, 4 = GENERAL HAND, 5 = ENVIRONMENTAL HEALTH TECHNICIAN

Recommendation (a)	Yes	12	120	27	11	5	2.7881(4)	0.5939	0.7011
	No	0	11	2	0	1			
Recommendation (b)	Yes	12	94	20	8	3	6.2917(4)	0.1784	0.1156
	No	0	37	9	3	3			
Recommendation (c)	Yes	6	21	4	0	0	13.3063 (4)	0.0099	0.0248
	No	6	109	25	11	6			
Recommendation (d)	Yes	7	45	6	2	0		0.0461	0.0528
	No	5	86	23	9	6			
Recommendation (e)	Yes	9	29	4	0	3	24.8464 (4)	< 0.0001	< 0.0001
	No	3	102	25	11	3			

Table 5.35 details the proportions of the different HCWs groups, in terms of their job titles, in this study: 12(6.3%) of HCWs were doctors or Clinical Officers; 131(69.3%) of HCWs were nurses; 29(15.3%) were nurse aides 11 (5.8%) of HCWs were general hands or porters; and, 6(3.2%) were environmental health technicians.

Table: 5.35 HEALTHCARE WORKERS 189 JOB TITLES

What is your job title?		
Title	Frequency	Per cent
Doctor or Clinician	12	6.3
Nurse	131	69.3
Nurse Aide	29	15.3
General hand (Porter)	11	5.8
Environmental Health Technician	6	3.2
Total	189	100.0

Table 5.36 provides details of the healthcare workers' genders: 61 (32.3%) of them were males and 128 (67.7%) of them were females. The total HCWs was 189(100%).

Table: 5.36 HEALTHCARE WORKERS 189, BY GENDER

HCW's Gender		
Gender	Frequency	Per cent
Male	61	32.3
Female	128	67.7
Total	189	100.0

Table 5.37 presents the numbers of HCWs, by gender and job title. Among the male HCWs (32.2% of all HCWs), 10 were doctors or clinical officers, 31 were nurses, 7 were nurse aides, 8 were general hands or porters, and 5 were environmental health technicians (5.3%, 16.4%, 3.7%, 4.2%, and 2.6%) of all HCWs, respectively. Among the female HCWs (67.8%) of all HCWs, 2 were doctors or clinical officers, 100 were nurses, 22 were nurse aides, 3 were general hands or porters, and 1 was an environmental health technician (1.0%, 52.9%, 11.6%, 1.5%, and 0.5%) of all HCWs, respectively. It is evident that the HCWs

workforce in the Mutoko and Mudzi Districts is dominated by female members of the healthcare staff.

Table: 5.37 HEALTHCARE WORKERS 189, JOB TITLE BY GENDER

Gender	Job Title					
	Doctor or Clinician n(%)	Nurse n(%)	Nurse Aide n(%)	General Hand n(%)	Environmental Health Technician n(%)	Total n(%)
Male	10(5.3)	31(16.4)	7(3.7)	8(4.2)	5(2.6)	61(32.2)
Female	2(1.0)	100(52.9)	22(11.6)	3(1.5)	1(0.5)	128(67.8)
Total	12(6.36)	131(69.3)	29(15.34)	11(5.82)	6(3.2)	189(100.0)

5.12 FINDINGS FOR THE HEALTHCARE WORKERS QUESTIONED

5.12.1 Challenges faced by 189 healthcare workers (HCWs)

5.12.1.1 *Insufficient clean and safe water*

In the institutions this was cited by 174(92.1%) of the HCWs.

5.12.1.2 *An insufficient stock of detergents*

Such as soap, bleach, alcohol gel and sanitiser” was cited by 128(67.7%) of HCWs.

5.12.1.3 *Some institutions were experiencing water cuts*

ZINWA is responsible for water supply and due to unpaid water bills, water cuts were done by by the responsible authorities.

5.12.1.4 Boreholes and water pumps

It was also reported that these were frequently breaking down, or that there was no fuel to run the water pump engines.

5.12.1.5 Not having enough gloves

Several HCWs reported insufficient protective clothing.

5.12.1.6 Understaffing

Understaffing was another cited problem, and some of the HCWs “were so busy that they forgot to change their gloves or decontaminate their hands”.

5.12.2 Challenges faced by 189 HCWs

HCWs were also struggling in accomplishing hand hygiene compliance, by gender.

5.12.2.1 Findings - the 5 critical challenges included:

Insufficient clean and safe running water, insufficient or no detergents in the health institutions, then the problem of having no gloves or protective clothing, understaffing, and HCWs being so busy that they forgot to change their gloves or decontaminate their own hands.

5.12.2.1.1 Percentages of HCWs who said that the following improvements were needed: -

- *“Constant clean, purified and safe tap water: yes, 175(92.6%), no, 14(7.4%)”.*

- *“Hand washing facilities with running water: yes, 137(72.5%), no, 52(27.5%)”.*
- *“Full staff establishment at all institutions: yes, 32(16.9%), no, 157(83.1%)”.*
- *“Diesel or electric water pumps and borehole for every institution: yes, 60 (31.7%), no, 129(68.3%)”.*
- *“Workshops for all HCWs: yes, 45(23.8%), no, 144(76.2%)”.*

5.12.3 Recommendations made by healthcare workers for raising compliance

5.12.3.1 Findings

HCWs 175(92.6%) “recommended a constant supply of clean, purified and safe tap water”.

HCWs 157(83.1%) “did not call for full staffing at all institutions, but the other 32(16.9%) did call for full staffing for all institutions”.

HCWs 144(76.2%) did not recommend holding workshops for all HCWs on the WHO five moments of hand hygiene; 45(23.8%) of HCWs said that “workshops need to be held”.

HCWs 137(72.5%) expressed that “all health care institutions should have hand washing facilities with running water”.

HCWs 129(68.3%) “did not suggest supplying diesel and/or electric water pumps, and drilling of boreholes at each health institution, whilst the other 60(31.7%) of HCWs made this suggestion”.

5.12.4 Healthcare workers 189 (HCWs) recommendations

The HCWs made recommendations in order to raise compliance, by gender. The recommendations are as elaborated in Table 5.28.

5.12.4.1 Findings on recommendations were the following

“There is a need for an uninterrupted supply of clean, purified, and safe water”.

“All health care institutions need hand washing facilities with running water”.

“There is the need for each institution to have a full complement of staff”.

“There is the need for each institution to have a diesel or electric water pumps, and boreholes, so that there is always a water supply for hand washing”.

“The need for holding of workshops for all HCWs” was supported by a minority of the HCWs 45(23.8%).

5.13 RETROSPECTIVE HCAIs AND THEIR ASSOCIATED MORTALITIES FROM RECORDS AT MUTOKO AND MUDZI DISTRICTS

Table 5.38 details the top ten causes of death and their death tolls at the Mutoko and Mudzi districts, during the years 2007 to 2008. Table 5.39 deals with top ten causes of death (and their death tolls) at the Mutoko and Mudzi districts, during the years 2009 and 2011. Table 5.38 and Table 5.39 show in detail the integrated causes of deaths in the Mutoko and Mudzi districts: during the years 2007, 2008, 2009, 2010 and 2011, there were 406, 420, 468, 497, and 454 deaths in the Mutoko district respectively, and 409, 387, 436, 451, and 450 deaths in the Mudzi district respectively.

There is no surveillance of hand hygiene compliance against HCAIs in Mutoko and Mudzi districts. This is a big gap contributing to the unknown burden of HCAIs and poor hand hygiene escalating HCAIs transmission cycle. The transmission cycle of HCAIs must be ethically broken. Therefore, patients with various conditions such as TB can be admitted into hospital or may walk into a healthcare setting, and unexpectedly acquire HCAIs, and die because of there being no surveillance in place to monitor patients with HCAIs. The clinicians may even think and record that they died of only TB, dysentery, AIDS, cancer or

malaria. Mortality rates will be attributed to the conditions that the patients are admitted with, and not the HCAs (the underlying co-morbidity) patients may have acquired in healthcare settings in Mutoko and Mudzi districts. In some developed countries they survey, monitor and document HCAs and their mortalities robustly. Mortalities in Mutoko and Mudzi healthcare settings is linked to the hidden HCAs and according to Baussano, Nunn, Williams, Pivetta, Bugiani and Scano (2011:488) HCWs are at higher risk for TB in their healthcare occupations.

Table 5.38 below shows top ten causes of death associated with HCAs and HCWs hand hygiene compliance.

TABLE: 5.38 TOP 10 CAUSES OF DEATHS IN THE MUTOKO AND MUDZI DISTRICTS (2007 TO 2009).
FRACTION = DEATH COUNTS / TOTAL DEATHS IN THE YEAR

Year	Cause of death	Death count	Total	Fraction
2007	AIDS	66	309	0.21359
	Diarrhoea	54	309	0.17476
	Dysentery	40	309	0.12945
	Malaria	32	309	0.10356
	New Serology	32	309	0.10356
	Pneumonia	23	309	0.07443
	Chest Pain	22	309	0.07120
	Meningitis	16	309	0.05178
	Hypertension	12	309	0.03883
	Pulmonary Tuberculosis	12	309	0.03883
2008	AIDS	54	299	0.18060
	Diarrhoea	45	299	0.15050
	Malaria	45	299	0.15050
	Pneumonia	34	299	0.11371
	New Serology	27	299	0.09030
	Dysentery	21	299	0.07023
	Hepatitis B	21	299	0.07023
	Meningitis	19	299	0.06355
	Pulmonary Tuberculosis	17	299	0.05686
	Gastro enteritis	16	299	0.05351
2009	AIDS	67	332	0.20181
	Diarrhoea	43	332	0.12952
	New Serology	41	332	0.12349
	Dysentery	37	332	0.11145
	Pneumonia	31	332	0.09337
	Malaria	28	332	0.08434
	Hypertension	23	332	0.06928
	Meningitis	21	332	0.06325
	Chest Pain	21	332	0.06325
	Hepatitis B	20	332	0.06024

TABLE: 5.39 TOP 10 CAUSES OF DEATHS IN THE MUTOKO AND MUDZI DISTRICTS (2010 TO 2011).
FRACTION = DEATH COUNTS / TOTAL DEATHS IN THE YEAR

Year	Cause of death	Death count	Total	Fraction
2010	New Serology	56	315	0.17778
	AIDS	52	315	0.16508
	Malaria	31	315	0.09841
	Dysentery	29	315	0.09206
	Chest Pain	28	315	0.08889
	Pneumonia	27	315	0.08571
	Gastro enteritis	24	315	0.07619
	Pulmonary Tuberculosis	23	315	0.07302
	Stomach Pain	23	315	0.07302
	Diarrhoea	22	315	0.06984
2011	AIDS	78	329	0.23708
	Diarrhoea	55	329	0.16717
	New Serology	38	329	0.11550
	Dysentery	36	329	0.10942
	Pneumonia	26	329	0.07903
	Malaria	22	329	0.06687
	Hepatitis B	21	329	0.06383
	Chest Pain	19	329	0.05775
	Suicide	18	329	0.05471
	Meningitis	16	329	0.04863

Table 5.40 shows the major causes of deaths in Mutoko District that include new serology, malaria, gastro enteritis, hypertension, tuberculosis, pneumonia, dysentery, meningitis, AIDS, and diarrhoea. Only one death was recorded in the five-year period from urinary tract infections, and two people were registered to have died from respiratory infections.

Since these individuals are immunocompromised when there is a lack of effective hand hygiene compliance, the patients will be put at high risk of acquiring HCAs and from the evidence of mortalities in the developed countries in which HCAs are actually a hidden danger. So it is without doubt that there are many deaths in developing countries in which HCAs are an unforeseen danger but unfortunately there is a lack of surveillance in many developing countries including Zimbabwe. They simply seem not to be there yet they are not monitored and documented henceforth HCAs cannot be quantified or their full scale cannot be recognised and established to be conclusive in marking their presence.

The data reveal that there is currently no surveillance in place to measure and monitor HCAs and there are no results on the direct cause of death or as co-morbidity specifically for HCAs were found documented. Further studies are recommended. No data were found that were specifically for deaths caused by the HCAs. So with this viewpoint being the case the numbers of individuals dying due to HCAs is likely to be high if they were actually monitored and documented. They are likely to be very significantly high because of the insufficiency of hand hygiene compliance in developing countries compared to the developed countries which actually monitor the HCAs and have robust surveillance and intervention measures in place to counteract them. Due to the lack of data regarding HCAs and their associated mortalities the data for causes of deaths that are usually associated with HCAs mortalities in Mutoko (Table 5.40) and in Mudzi district (Table 5.41) are used in that HCAs are hidden and unforeseen danger to patients, families, relatives and HCWs themselves due to high risk exposure to infections in the health care settings. The WHO states that,

“the global burden of HCAs is unknown because surveillance systems are virtually non-existent in most countries” (WHO 2009b:2). Therefore, further research is recommended.

Table: 5.40 CAUSES OF DEATHS IN THE MUTOKO DISTRICT

Causes of Death in Mutoko District	Year					Total
	2007	2008	2009	2010	2011	
Malaria	18	20	23	34	42	137
New Serology	45	33	38	27	19	162
Gastro Enteritis	22	17	45	32	21	137
Cerebral Vascular Accident	2	0	4	1	3	10
Hypertension	31	23	43	28	16	141
Pulmonary Tuberculosis	25	31	28	17	29	130
Congestive Cardiac Failure	2	5	1	3	5	16
Pneumonia	12	46	59	48	29	194
Hepatitis B	16	27	17	19	15	94
Stomach Pain	11	9	15	26	18	79
Chest Pain	18	23	17	24	22	104
Oesophagus Candida	1	0	2	0	1	4
Dysentery	32	29	44	38	47	190
Road Traffic Accident	2	0	0	11	3	16
Urinary Tract Infections	1	0	0	0	0	1
Prostate Cancer	4	1	0	0	2	7
Anaemia	0	4	0	0	3	7
Headaches	5	1	0	2	0	8
Respiratory Distress	0	0	1	0	1	2
Leg Pains	6	8	3	5	9	31
Kaposi Sarcoma	0	1	0	3	0	4
Acute Asthmatic Attack	2	0	4	3	2	11
Acute Renal Failure	3	0	4	1	1	9
Meningitis	12	25	19	32	22	110
Aids	72	65	69	78	84	368
Diarrhoea	42	37	25	38	44	186
Poison	3	1	0	2	6	12
Suicide	5	8	4	10	7	34
Acute Respiratory Infection (ARI)	8	4	0	6	2	20
Rheumatic heart Failure	5	2	1	9	0	17
Injuries, burns and scald	1	0	2	0	1	4
TOTAL	406	420	468	497	454	2245

Table 5.41 shows the deaths recorded in the past five years in the Mudzi District. Most of them were due to malaria, new serology, pneumonia and chest pains, AIDS, dysentery, and diarrhoea. Cerebral vascular accidents, oesophagus candida and urinary tract infections account for the fewest deaths.

Table 5.41 CAUSES OF DEATHS IN MUDZI DISTRICT

Causes of Death in Mudzi District	Year					Total
	2007	2008	2009	2010	2011	
Malaria	32	45	28	31	22	158
New Serology	32	27	41	56	38	194
Gastro Enteritis	11	16	9	24	15	75
Cerebral Vascular Accident	2	0	0	0	1	3
Hypertension	12	11	23	17	16	79
Pulmonary Tuberculosis	12	17	19	23	14	85
Congestive Heart Failure	8	7	16	6	10	47
Pneumonia	23	34	31	27	26	141
Hepatitis B	12	21	20	16	21	90
Stomach Pain	9	12	18	23	11	73
Chest Pain	22	14	21	28	19	104
Oesophagus Candida	0	0	1	0	2	3
Dysentery	40	21	37	29	36	163
Road Traffic Accident	2	0	0	0	3	5
Urinary Tract Infections	0	1	0	1	0	2
Prostate Cancer	1	0	0	1	2	4
Anaemia	4	3	0	1	3	11
Headaches	8	4	2	1	6	21
Respiratory Distress	2	4	0	6	2	14
Leg Pains	0	0	3	6	2	11
Kaposi Sarcoma	1	1	0	2	0	4
Acute Asthmatic Attack	4	2	3	6	7	22
Acute Renal Failure	5	1	2	0	4	12
Meningitis	16	19	21	22	16	94
Aids	66	54	67	52	78	317
Diarrhoea	54	45	43	22	55	219
Poison	6	2	4	7	6	25
Suicide	12	6	16	14	18	66
ARI	10	13	5	16	11	55
Rheumatic heart Failure	1	7	5	9	2	24
Injuries, burns and scald	2	0	1	5	4	12
Total	409	387	436	451	450	2133

The bar graph in Figure 5.9 compares the total numbers of deaths in the two districts from all the different diseases, conditions and causes, as reviewed from the Registrar General's Office in the respective districts. There were between 400 and 500 deaths in each district, with less than 400 deaths in the Mudzi District in 2008. Mutoko District recorded more deaths than the Mudzi District in all the five years from 2007 to 2011, except in 2007.

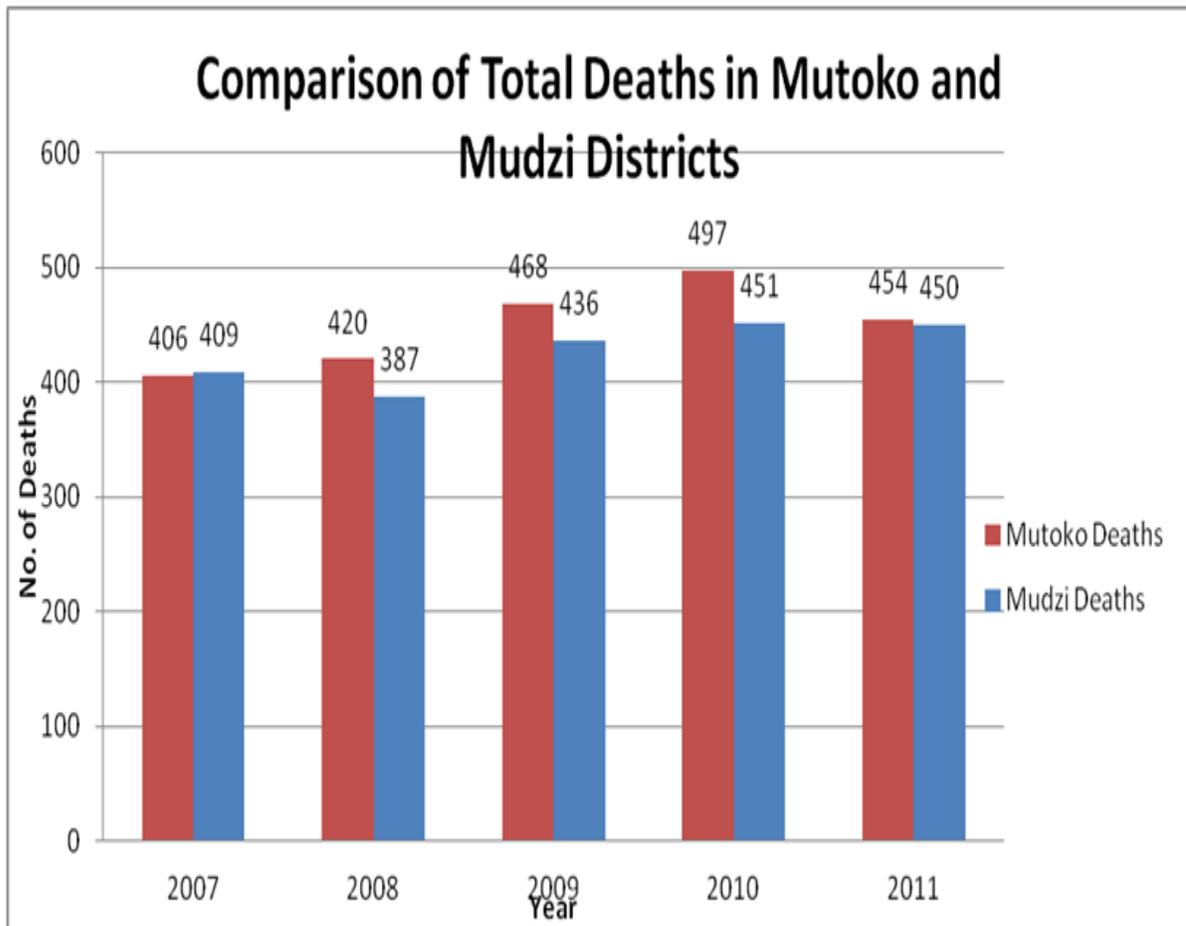


FIGURE 5.9 TOTAL DEATHS IN THE MUTOKO AND MUDZI DISTRICTS

5.14 CONCLUSION

The research findings were analysed, presented and described in this chapter. The findings were also validated, and corroborated with the Precede-Proceed

model coupled with the Theory of Planned Behaviour that lead to HCWs hand hygiene compliance alleviating the burden of infections HCAs and enhance the quality of life (QOL) as the vision in this study. The next chapter interprets and discusses the findings of the study.

CHAPTER 6

INTERPRETATIONS AND DISCUSSION OF THE FINDINGS

6.1 INTRODUCTION

There are six steps to interpretation and discussion of this chapter. According to Denzin (1989:48), stating research questions to be answered, and objectives to be fulfilled, deconstruction of the literature review and giving critical analyses of prior studies about the phenomena, codable moments of the phenomena as capturing and seen like as their reality and this includes relocating and resituating it in the naturalistic worldview and obtaining multiple perspectives of the phenomena. Bracketing reduces phenomenon to its basic constructs structures and abstracting the constructs so that its essential bare constructs are illuminated and features uncovered for detailed scrutinising in the research procedures of the research wheel. Additionally, constructing jigsaw puzzling back fitting the pieces in positions to form the full emerge again and contextualising a relocation or resituation of the phenomena under study back in the natural social world setting –the nest (Denzin, 1989:48).

Interpretation of the study findings takes the form of thick performances and not just thick descriptions but thick interpretation as well, the processual nature (Sergi & Hallin, 2011:191). Moreover Denzin (1989:33) explains that thick description traces the beginning and development of the events in the settings. The occurrences are presented textually, and they can then be interpreted and discussed. A thin description simply reports facts in superficiality, independent of the contextual situations. It is sobering and frustrating to reflect that throughout the world health care system there appears to be substantial HCAs incidence rates and low HCWs' hand hygiene compliance rates (McLaws, 2015:7; Mathur, 2011:611; Newitt, Myles, Birkin, Maskell, Slack, Nguyen-Van-Tam & Szatkowski, 2015:28; van Bunnik, Ciccolini, Gibbons, Edwards, Fitzgerald, McAdam, Ward,

Laurenson, Woolhouse, 2015:832; Durlach, McIlvenny, Newcombe, Reid, Doherty, Freuler, Rodríguez, Duse & Smyth, 2012:217; WHO, 2009a:12). According to the WHO (2009b: 5) poor hand hygiene compliance rates have been reported from both developed and developing countries. Adherence to recommended hand hygiene procedures by HCWs varies substantially, with mean baseline rates ranging from 5% to 89%, and an average rate of 38.7%. Even though HCAs outbreaks can be easily prevented and controlled, many HCWs do not remain continually vigilant in terms of hand hygiene compliance (McLaws, 2015:7; Wang, Shen, Yen, Wang, Jang, Lee, Wang & Chen, 2016:198; Agodi, Auxilia, Barchitta, Brusafarro, D'Alessandro, Grillo, Montagna, Pasquarella, Righi, Tardivo, Torregrossa & Mura, 2013:52; Luangasanatip, Hongsuwan, Limmathurotsakul, Lubell, Lee, Harbarth, Day, Graves & Cooper 2015:h3728).

However, according to Denzin (1989:63) interpretations emerge as experiences that are thickly described by the researcher. Experiences of occurrences were recorded as it really happened (originality of events) and the researcher relocated the experienced information in local social situations- contextualisation of HCWs hand hygiene compliance and HCAs prevention and control through application of Precede-Proceed model with Theory of Planned Behaviour. Researcher recorded thoughts, emotions and what participants were doing and their voices were represented on their views as they unfolded in order to comply with hand hygiene and prevent and control HCAs.

The demographic factors are considered in the social assessment or diagnoses of determinants in Phase 1 of the Precede part of the model. According to Figure 3.1, phase 1 identifies subjectively defined problems and priorities of individuals or communities. Happiness was assessed in the study through interviewing the patients using a questionnaire to assess different attitudes they had with respect to HCWs hand hygiene compliance during their care. If a patient is well and free of any sickness one will be comfortable, be employable, productive, have high

level of self-esteem and be able to achieve many activities including contributing to the economy free from unnecessary HCAs. Factors that help to foster HCWs' hand hygiene compliance in health care settings include enabling factors such as resources availability and adequacy, accessibility, and affordability, of resources to sustain HCWs hand hygiene compliance to alleviate HCAs.

6.2 HEALTHCARE WORKERS HAND HYGIENE PRACTICES

The purpose of this section is to discuss the results of the observed HCWs hand hygiene opportunities. In this study, it was found that the overall hand hygiene compliance was 403(70.7%) in the Mutoko and Mudzi districts health care institutions; the hand hygiene non-compliance rate was 167(29.3%). This suggests that hand hygiene standards are less than satisfactory and that there appears to be a gap in knowledge and skill, whereby some HCWs are unaware that their hands can transmit germs from one patient to another and others seem not to be bothered at all. HCWs' hands can easily spread micro-organisms, which can trigger HCAs outbreaks (WHO, 2009a:12). HCWs hand hygiene persistent observation undertaken consistently provides depth of experience and understanding of reality in efficacious hand hygiene compliance and control of HCAs (Lincoln & Guba, 1985: 304).

There is always room for improvement in terms of fostering hand hygiene compliance by the HCWs as evidenced by the non-compliance rate observed in the Mutoko and Mudzi district health care settings. Mainly HCWs use soap and water to wash hands and hardly available are alcohol gels to decontaminate hands whenever it is suitable to do so. The study also revealed that there could have been very little possibility of using alcohol gel in the health care institutions, and those found using it had provided for them; many HCWs did not possess any.

The findings are compatible with results in other studies. In one observational study in India, the participants included doctors, nurses, and ward aides working in different wards of the hospital. They were observed for compliance with hand washing procedures. Marra, Moura, Paes, Pavao, dos Santos and Edmond (2010:1) found that the overall hand hygiene compliance was 1402(62.3%), and alcohol hand rub gel used per patient per day representing 65.5% of the total product used from their study. Among all the reviewed studies published between 1977 and 2008, increased compliance rates at follow up did not exceed 81%. One study with a follow up of eight years showed a sustained compliance increase of a maximum of 66% and succeeded in parallel to maintain the achieved reduction in HCAs (Allegranzi & Pittet, 2009:307). Hand hygiene compliance with evidence-based guidelines is generally low throughout the world (Creedon, 2005:208; Creedon in Fitzpatrick & Kazer, 2011:320; Newitt, Myles, Birkin, Maskell, Slack, Nguyen-Van-Tam *et al.* 2015:28; WHO, 2009a:124; Huis, Schoonhoven, Grol, Donders, Hulscher & van Achterberg, 2013:464). Another observational study shows 1737 observations from 280 HCWs, nurses, student nurses, doctors, medical students, health care assistants, physiotherapists, radiotherapists, porters, and technicians. Doctors and medical students exhibited the highest rate of non-compliance (41%); porters had a rate of 38%; technicians and physiotherapists had a rate of 33%; and, nurses, student nurses and health care assistants had a rate of 28% of hand hygiene compliance. The overall level of non-compliance in the four hospitals in the study were, in increasing order, 24%, 29%, 33% and 44% (Creedon, 2008:34). In this study, the hand hygiene non-compliance rate of the HCWs in the Mutoko and Mudzi district health care institutions in Zimbabwe was comparable in literature marked as 167(29.3%).

According to Marra, Moura, Paes, Pavao, dos Santos and Edmond (2010:1), direct observation is not always the best way to assess hand hygiene compliance, even though it still remains one of the major methods of directly observing HCWs' hand hygiene opportunities for the purposes of collecting data, and still produces excellent results in order to prevent and control infections in

health care settings. Therefore, in this aspect direct observation remains the best way to assess hand hygiene compliance in some contexts. The data for hand hygiene compliance and non-compliance is therefore comparable with the results in the literature review. Therefore, hand hygiene should occur during the following 'moments': before patient contact, after patient contact, after contact with patient surroundings, before a clean or an aseptic procedure, and after body fluid exposure risk (WHO, 2009a:123; Fuller, McAteer, Slade, Cookson, Michie, Savage, Stone, 2009:5; Sax, Allegranzi, Uckay, Larson, Boyce & Pittet, 2007:13).

Allegranzi and Pittet (2009:306) explain that it is unfortunate that hand hygiene guidelines are more likely to be neglected during transmission to patient before patient contact, and prior to clean aseptic procedures (WHO, 2009a:123, Fuller, McAteer, Slade, Cookson, Michie, Savage, Stone, 2009:5; Sax, Allegranzi, Uckay, Larson, Boyce & Pittet, 2007:13). However, Allegranzi and Pittet, (2009:306) further explain that this is in line with the fact that care activities with a higher risk of cross transmission lead to a higher risk of poor compliance (WHO, 2009a:124; Huis, Schoonhoven, Grol, Donders, Hulscher & van Achterberg, 2013:464). Therefore, in this study the findings for the neglected moments for hand hygiene organised from the highest to the lowest are validated with findings from the literature review and are as follows: after touching the patient surroundings, before clean or aseptic procedure, before touching patient, after touching patient, after body fluid exposure risk, and, not drying hands.

Drying hands after washing or rubbing alcohol gel on hands is crucial (Huang, Ma, Stack, 2012:791); in fact, this could be considered as a sixth hand hygiene 'moment', without which hand hygiene compliance cannot be satisfactorily achieved. Disposable soft paper towels are the method of choice for drying hands, since communal towels are also a source of cross-contamination. Paper towel drying helps to remove bacterial counts on wet hands. Paper towels must be discarded into an appropriate foot-operated waste bin. Bacterial counts increase when the skin is damaged; therefore it is important to use hand

moisturiser to keep the skin in good condition (Huang, Ma, Stack, 2012:791; Person, Schilling, Owuor, Ogange & Quick, 2013:1). Improper decontaminating and drying of hands is an act of negligence that can put patients, clients, and healthcare workers themselves at risk of infection, which in turn may lead to complaints and litigation, especially if HCWs know the risks of hand hygiene non-compliance but in turn do not inform the patients of the risks when touching them (Huang, Ma, Stack, 2012:791; van Bunnik, Ciccolini, Gibbons, Edwards, Fitzgerald, McAdam, Ward, Laurenson, Woolhouse, 2015:832; Durlach, McIlvenny, Newcombe, Reid, Doherty, Freuler, Rodríguez, Duse & Smyth, 2012:217; Huis, Schoonhoven, Grol, Donders, Hulscher & van Achterberg, 2013:464). When patients acquire infections in health care settings they are bound to complain, and such complaints may be upheld in courts of law on grounds of negligence (Tan & Olivo, 2015:108; Aziz, 2014:428).

6.3 THE INTERVIEWED PATIENTS

In this section, focus is on patients as empowering agents for HCWs hand hygiene compliance to prevent and control HCAs in healthcare settings. The findings indicate that the patients were dissatisfied with some HCWs and their unclean hands. This in turn served as a positive influence for fostering HCWs' hand hygiene compliance. Patients do remind, tell, gather the courage to inform HCWs therefore empower hand hygiene compliance among HCWs. Patients who took no further action even if they saw the HCWs not adhering to the moments of hand hygiene are in need of health promotion education (WHO, 2009a:123). This suggests lack of health education promotion to such patients in context in Zimbabwe. These findings also suggest that there is need for more health education promotion among patients in the Mutoko and Mudzi districts in order to deal effectively with HCWs' hand hygiene compliance, with a specific focus HCAs control because over 270(47%) of patients were not prepared to remind HCWs about hand hygiene compliance. It is very important for patients to remind the HCWs about effective hand hygiene compliance as the HCWs may indeed

forget due to the busy nature of their jobs. Additionally, patient safety is of the utmost importance so when patients remind the HCWs they significantly contribute to best and safer acceptable practices to be carried out. Patients are the public and HCWs deal with the patients' public health including the HCWs themselves and therefore it is effective to teach patients as well in issues of hand hygiene as public health promotion to prevent and control HCAs. Therefore more factors to contribute to guidelines for fostering hand hygiene compliance come from the consumers of the product.

However, in this study, discomfort and dissatisfaction serve as early warning signs or scores of distress by patients, which may help to reinforce properly fostering hand hygiene compliance among the HCWs, and thus reduce unnecessary infections and mortalities particularly as there appeared to be no significant change in the mortalities during the five-year period, according to the retrospective review of records. An Early warning Scores Tool could be developed on the Early Warning Scores of distress in line with predicting hand hygiene compliance henceforth prevent HCWs non-hand hygiene compliance to prevent and control infections especially HCAs.

The epidemiological assessment of the model focussed on perceived perceptions of patients on HCWs' hand hygiene compliance. In this study, patients indicated discontentment by selecting a sad face, which meant that the majority were not happy on noticing that the HCWs were not exhibiting the expected hand hygiene behaviour, which in turn can affect the patients' health adversely. According to Green and Kreuter (2005:88), classic indicators of health problems include mortality-death, morbidity-disease or injury, disability-dysfunction, discomfort, and dissatisfaction. Wellness is a vital indicator being fit as a fiddle (Black, Groves & Hucker, 2011:365) is also included (Green & Kreuter, 2005:11). However, in this study, discomfort that is sadness in facial expression and dissatisfaction serve as early warning signs of distress by patients, which may help to foster proper hand hygiene compliance among the

HCWs, and thus reduce unnecessary HCAs particularly as there appeared to be no significant change in the mortalities during the five year period, according to the retrospective HCAs and their associated mortalities from mortalities records-archival data reviewed.

6.4 HEALTHCARE WORKERS ON CHALLENGES FACED

Among the reported challenges faced by HCWs in accomplishing hand hygiene compliance, the largest challenge cited by 174(92.1%) “was insufficient clean and safe water for use in the institutions”. The second-largest challenge was an “insufficient supply of or absence of, detergents like soap, bleach, alcohol gel and sanitiser” cited by 128(67.7%) of the HCWs sampled into the study. Some institutions were experiencing water cuts by the ZINWA (Zimbabwe National Water Authority) “due to unpaid water bills by the responsible authorities”. It was also reported that “boreholes and water pumps were frequently breaking down or that there was no fuel at all, hence the moments of hand hygiene could not be achieved”. Respondents 51(27.0%) also raised the other challenges of “having no gloves or protective clothing”, while 46(24.3%) of them “reported understaffing as a challenge to the execution of their daily duties in the health care settings”. Some of the HCWs also reported that at “times they were so busy that they forgot to change their gloves or decontaminate their hands”.

The findings therefore show that there was understaffing, and that the departments were usually so busy that HCWs forgot to change gloves or wash hands; however, alongside the 46(24.3%) of respondents who did, the other 143(75.7%) did not indicate such a challenge in their day-to-day duties in the clinical areas. Of the HCWs 51(27.0%) mentioned that they had “no gloves or protective clothing”. However, the reasons for lack of hand hygiene compliance, as reported by HCWs and the recommendations thereof made by the HCWs on the challenges they face in Mutoko and Mudzi districts are consistent with (WHO 2009a:72). Resources should be made available by the responsible authorities,

in a timely manner that should take a leading role through effective management and leadership in raising HCWs hand hygiene compliance (WHO, 2009a:99) but what flourishes in the contexts are among others lack of funds at health-care facilities, lack of medications, lack of working personnel, lack of equipment, lack of diagnostic and treatment tools, and inadequate structures (WHO, 2009c: 29). According to Green and Kreuter (2005:12) a second task in the epidemiological assessment is the identification of what determines health in genetics, behaviour of individuals, groups or communities and the environment. These three determinants account for premature deaths. According to Akyol (2007:431), from a study conducted on nurses at the University of Ege Faculty of Medicine it was found that nurses indeed needed to wash their hands often, but they were not able to do this due to: busy working conditions, insufficient supply of necessary materials; and skin drying and soreness of hands after frequent washing. However, skin drying and soreness of hands was not indicated as a thorny issue at Mutoko and Mudzi districts healthcare institutions.

Apart from improved hand hygiene and hand washing, additional factors must be considered (Akyol, 2007:431). To establish what would be the reasonable standard of care in individual cases, expert evidence could be provided in the courts of law during negligence claims (Brazier & Cave, 2007:110; Jackson, 2010:100). In terms of the study HCWs persistently neglecting to comply with hand hygiene compliance could potentially lead to higher morbidity and mortality rates. In the same manner, practical guidelines for hand hygiene compliance among HCWs and patients are seen as a standard of care that is important in preventing and controlling HCAs, especially those caused by non-compliance to hand hygiene, which could be classified as negligence in the duty of care.

If HCWs hand hygiene negligence is established, it involves duty of care follows the Bolam test in courts of law. Guidelines for hand hygiene compliance are essential, since expert evidence is required in a court of law when dealing with cases involving persistent negligence in HCWs' hand hygiene compliance duty of

care which would have resulted in many deaths occurring. Before involving the courts, all measures must be exhausted to improve hand hygiene non-compliance so as to enhance the safety of patients regarding their quality of care. Loss of lives due to recurrent gross negligence of hand hygiene is something that should be totally avoided, so in such cases courts may be involved in context. HCWs in the Mutoko and Mudzi districts face serious challenges that inhibit hand hygiene compliance. Nevertheless, the HCWs in this study made five critically important recommendations in order to improve hand hygiene compliance, despite these challenges.

Those findings were: Insufficient clean and safe running water, Insufficient or no detergents in the healthcare institutions, the problem of having no gloves or protective clothing. Additionally, there was also understaffing, HCWs were so busy that they forgot to change gloves, wash own hands or alcohol hand gel.

Challenges faced by HCWs in accomplishing hand hygiene compliance are assessed in phases 3, 4 and 5 of the model: phase 3 focusses on educational and ecological aspects of predisposing factors, reinforcing factors and enabling factors; the intervention alignment of phase 4 focuses on health education components; and, phase 5 focuses on administrative and policy assessment factors. Green and Kreuter (2005:12) outline predisposing factors such as knowledge, beliefs, attitudes, values, and perceptions; reinforcing factors, such as the attitudes, behaviour, and health and others for example: - peers, parents, employers; and, enabling factors, including availability of resources, accessibility rules or laws, skills, and engineering. The challenges faced link with the Precede-Proceed model and Theory of Planned Behaviour concepts of predisposing, reinforcing and enabling factors through organisational policy and regulation and educational strategies to HCWs' hand hygiene compliance. Predisposing, reinforcing and enabling factors entail factors that influence the behaviour and attitudes of HCWs with respect to hand hygiene compliance. Predisposing factors entail the intellectual and emotional characteristics of HCWs that cause

them to be at high or low risk to comply or not comply with effective hand hygiene practices in their respective healthcare institutions. Enabling factors comprise internal and external conditions that are linked directed to HCWs employing and rigorously following effective hand hygiene compliance practices that will reduce HCAs as well as morbidity and mortality rates. These enabling factors include availability of resources the HCWs need to achieve optimal hand hygiene compliance. Reinforcing factors with respect to this study comprises patients who are not critically ill or visitors of the patients such as family members and friends who can encourage or remind the HCWs to comply with effective hand hygiene compliance as bad hand hygiene practices could put their health at risk. These reinforcing factors also include health inspection commissioners to monitor hand hygiene of HCWs, employing effective use of posters, media to reinforce in the mind of HCWs efficacious hand hygiene practices. In phase 4 of the Precede-Proceed model coupled with Theory of Planned Behaviour, health education components impart direct health promotion programmes to public, patients, students, and HCWs to influence predisposing factors.

Health education also imparts learning to be influenced by reinforcing factors through staff training in workshops, supervision, and consultation including feedback on how to achieve and maintain the best practices of hand hygiene and optimal hand hygiene compliance. Organisational policy and regulation include training, organisational policies reinforcement of guidelines and allocation of resources in order to accomplish optimal hand hygiene compliance in the public health care institutions. Phase 5 marks the end of the Precede part of the model and the beginning of the implementation phase. Phase 3-based assessments correspond with Phase 6 in the Proceed part of the model that is, process evaluation and Phase 2 corresponds with Phase 7 impact evaluation. Moreover, Phase 1 of the Precede- Proceed Model social assessment corresponds with phase 8 outcome evaluations.

6.5 THE RETROSPECTIVE REVIEWED INFECTIONS HCAIs AND ASSOCIATED MORTALITIES FROM RECORDS AT MUTOKO AND MUDZI DISTRICTS

This section discusses HCAIs and associated mortalities in the two districts of Zimbabwe. According to Green and Kreuter (2005:88), classic indicators of health problems include death, disease or injury, dysfunction, discomfort, and dissatisfaction. The global burden of HCAIs is unknown (WHO, 2009b:2). As much as possible HCWs should do everything they can to ensure that these health problems are fully addressed. Mortalities were reviewed for five years retrospectively with regards to Mutoko and Mudzi districts. Table 5.39 details the top ten causes of death and their death tolls at the Mutoko and Mudzi districts, during the five year period 2007 to 2011. The total mortalities in Mutoko and Mudzi districts in Table 5.40 and 5.41 were 4,378. Table 5.40 and Table 5.41 show in detail the causes of deaths in the Mutoko and Mudzi districts: during the years 2007 to 2011, there were 406, 420, 468, 497, and 454 deaths in the Mutoko district and 409, 387, 436, 451, and 450 deaths in the Mudzi district respectively.

The major causes of deaths in Mutoko district include new serology, AIDS, malaria: patients as hosts are immunocompromised and are not able to resist invading opportunistic microorganisms. The patients with gastro enteritis, dysentery, and diarrhoea normally present dehydrated and are in dire need of rehydration therapy to replace the lost water and important electrolytes. Thereby patients needing intravenous access HCWs do venepuncture therefore breaching the skin's defence natural barrier entry of organisms into the blood stream. This can easily lead to blood stream infections with contaminated HCWs' hands. Patients with hypertension, pulmonary tuberculosis, pneumonia and the frequency of doing observations and the treatment pathways indicates that all measuring equipment to vital statistics should be scrupulously clean or decontaminated including HCWs to think stop spreading microorganisms from

one to another point. These mortalities are similar to Mudzi district within the five-year period under review. There is currently no clear surveillance monitoring and documentation in place to accurately deduce HCAs as the direct cause of death or as co-morbidities. According to National Audit Office (2009:5) HCAs in healthcare settings cause a wide range of symptoms from minor discomfort to serious morbidities and in some cases mortality. HCAs are inherent and unforeseen danger to patients, families, relatives and HCWs in their occupational jobs as they remain silently not clearly monitored and undocumented in the Mutoko and Mudzi districts in Zimbabwe. There is insufficient information. There is also no clear and enough evidence to be conclusive within country's public healthcare system of the presence of HCAs despite overwhelming evidence from World Health Organization, Centres for disease control and prevention and health journal reports globally. In these circumstances indeed HCAs are hidden and unforeseen danger and safety for patients, families and HCWs egregiously compromised beyond any doubt at this time and age.

Since there is insufficient evidence to be conclusive of HCAs it means that HCAs are not monitored or surveillanced therefore they are a hidden burden and need to be monitored and pinpointed to establish specifically what types they are, respectively and therefore further research is recommended. But there are evidence-based infections, which could affect admitted patients in healthcare settings needing. There are the following top ten causes of death in which HCAs could be hidden, unmonitored and undocumented in Mutoko and Mudzi districts in Zimbabwe: - AIDS, Diarrhoea, Malaria, Pneumonia, New Serology, Dysentery, Hepatitis B, Meningitis and Pulmonary TB. Moreover, the inconclusiveness of HCAs in Zimbabwe as a developing country is supported due to the difficulties of diagnosing HCAs in developing countries (WHO, 2009a:3). This is because of the fewness and unreliability of laboratory data, limited access to diagnostic facilities and poor health care system record keeping that adds as obstacle to reliable HCAs burden estimates. Therefore, limited data on HCAs from these settings are available from the literature (WHO, 2009a:3). There should be no

excuse in the light of what is now known not to document HCAs in Zimbabwean contextual health care system for accountability and control and accepting responsibility for public health in country.

Various HCAs are not listed in the tally sheet (T5) in Zimbabwe. This finding is of great significance with respect to the context of my study because of the high morbidity and mortality rates that are associated with HCAs across the globe. Also due to the significant impact on the quality of life (QOL) HCAs potentially can have if they are not effectively controlled.

6.6 CULTURES, CONTEXTS AND LANGUAGES IN HAND HYGIENE AND INFECTION CONTROL

With the diverse cultures, contexts and languages in Zimbabwe and indeed along with other nations' globally there should be ability to confidently identify, name, document and code to categorise HCAs in order to prevent and control in the ecological socio-religio- economic- political environment in context. New serology is one of the names of HIV/AIDS categories socially constructed through language as expressed and named by the society in Zimbabwean context during the time when there was much of stigma attached. Because of the stigma and the widespread misinformation associated with the HIV, education in Southern Africa has been difficult but worthwhile in reducing transmission and improving the likelihood of a patient to seek treatment before infects others and becomes critically ill. According to the Massachusetts Institute of Technology MIT (2013:1) past HIV early stage, the infection is clinically latent for a period of six months to several years before it progresses to AIDS as defined by the concentration of CD4+ immune cells infected by the virus in the host's blood. However, such stigmatisation may be limited to those afflicted by the disease or may include others by the social definition (Berger *et al.*, 1979:185). Additionally, social factors like education, stigma associated with HIV, and even denial of the existence of the virus all play roles in both incidence and care inequalities (MIT,

2013:2). Scambler and Hopkins (1986:33); Haralambos *et al.* (2013:340) are of the stance that people respond to felt stigma in at least four ways: selective concealment, covering up, medicalising their behaviour, and condemning the condemners. However according to Haralambos *et al.* (2013:301) the idea of the normalcy and abnormality human body is the issue of disability (morbidity). People with impairments become socially marginalised disabled people. One way of attitudes towards people is that there is a social stigma attached to being disabled. This is a shared status with other groups such as those who are HIV-positive and those suffering from cancer. It appears people attach moral attributes to illness and disability with some people seen as brave and innocent whilst others are being punished for their immoral and unhealthy lifestyles. Furthermore, Berger *et al.* (1979:173) explain that the conversational apparatus maintains reality by talking about various experiences and allocating them a definitive place in the reality of the world and that this reality- generating potency of conversation is already given in the fact of linguistic objectification. Language objectifies the world, transforming experiences into a cohesive order. In establishing this order, language realises a world in the double sense of apprehending and producing it in face to face situations of individual existence and language may lead to objectify unfolding biographical experiences. Therefore, HCAs are not objectified in vernacular language.

The researcher has presented guidelines for fostering hand hygiene compliance among HCWs in chapter 8, emanating from the findings of this study. However, according to Grove, Gray and Burns (2015:456), the quality and usefulness of guidelines should be assessed by the HCWs themselves as well as health care providers before implementation. This involves examining the following: the significance of the HCAs namely in the Mutoko and Mudzi districts in Mashonaland East province in Zimbabwe; the strength of the evidence in the researcher's findings; the link between the local area's needs with national and international standards; the cost-effectiveness of using the guidelines in the real clinical worldview for improvement in public health, integrating them with clinical

expertise (Wonderling, Sawyer, Fenu, Lovibond & Laramé, 2011:758). Monitoring outcomes resulting from the guidelines as well as refining redefining them via continuous evaluation and further research should always be done (Grove, Burns & Gray, 2013: 500). This applies inextricably to the fostering of hand hygiene compliance among HCWs in context to prevent and control HCAs.

6.7 CONCLUSION

The research findings were interpreted, discussed and conclusions made in this chapter. Moreover, the findings were validated, and corroborated with the Precede-Proceed model coupled with the Theory of Planned Behaviour that lead to HCWs hand hygiene compliance alleviating the burden of infections HCAs and quality of life (QOL) as the vision in this study. The findings answer the question what is the HCWs' hand hygiene compliance? The answer covers the objective; determine the factors inhibiting compliance to hand hygiene practices among HCWs at Mutoko and Mudzi districts in Zimbabwe. The overall hand hygiene compliance was 403(70.7%) in the Mutoko and Mudzi districts health care institutions; the hand hygiene non-compliance rate was 167(29.3%).

This enabled the development of guidelines for fostering hand hygiene compliance to prevent and control infections focussing on HCAs among HCWs at the Mutoko and Mudzi district public health care institutions in Zimbabwe. The next section concludes research findings of the interviewed patients. The findings also give answers to the following questions: If HCWs do not cleanse their hands to keep them clean before one is touched, which of the following faces will best represent one's attitude or mood? If one is being treated by doctor nurse or any other Health care Provider: - In hospital or health care institution what will one do to make sure that each of your providers washes hands or rubs alcohol gel on their hands before being touched? Will you please be able to name or describe by appearance the health care provider who will have skipped a wash or did not cleanse hands to the person in- charge of the ward in which you are

being treated in a calm manner? Will you say something to correct your health care provider, doctor, nurse or any other health care provider about their failure to wash or rub alcohol gel on their hands or did not dry hands after washing them? The answers contribute to the objectives: - Describe the different approaches used for investigating hand hygiene behaviours among HCWs during patient care at Mutoko and Mudzi districts health care institutions and explore methods for fostering hand hygiene compliance among HCWs, and for preventing and controlling HCAs at Mutoko and Mudzi districts health care institutions.

This enabled the development of guidelines for fostering hand hygiene compliance to prevent and control HCAs among HCWs at the Mutoko and Mudzi district public health care institutions in Zimbabwe. The next section concludes the research findings on the challenges faced by HCWs in Zimbabwe. What challenges do you face in accomplishing hand hygiene compliance? What are your recommendations in order to raise compliance? The answers contribute to the objective: - Explore methods for fostering hand hygiene compliance among HCWs, and for preventing and controlling HCAs at Mutoko and Mudzi districts health care institutions. This enabled the development proceeding to the presentation of guidelines for fostering hand hygiene compliance henceforth prevent and control HCAs among HCWs at the Mutoko and Mudzi district public health care institutions in Zimbabwe. The next section focusses on conclusions on the research findings from retrospective reviewed infections focussing on HCAs and their associated mortalities from the records. The research question answered, and objective achieved were: - What are the HCAs related mortalities in Mutoko and Mudzi districts? This fulfilled the objective that investigated HCAs associated mortalities in Mutoko and Mudzi districts. The next Chapter (Chapter 7) addresses validation and corroboration for validity and trustworthiness of the guidelines.

CHAPTER 7

TRUSTWORTHINESS, VALIDITY AND DEVELOPMENT OF GUIDELINES

7.1 INTRODUCTION

This chapter is about trustworthiness and validity of the findings of the study with international standards with reference to the research problem, questions and objectives outlined in tables 1.1 to 1.4 and in Chapter 1 sections. Figure 7.0 is application of theoretical grounding that enhances our responses to research problem, questions and objectives and illustrates the credibility of findings with the flexibility and scalability of the model concepts in addressing a wide range of geographical and ecological levels, settings, and populations. Thereafter the findings lead to development of guidelines or HCWs hand hygiene compliance and HCAs prevention and control.

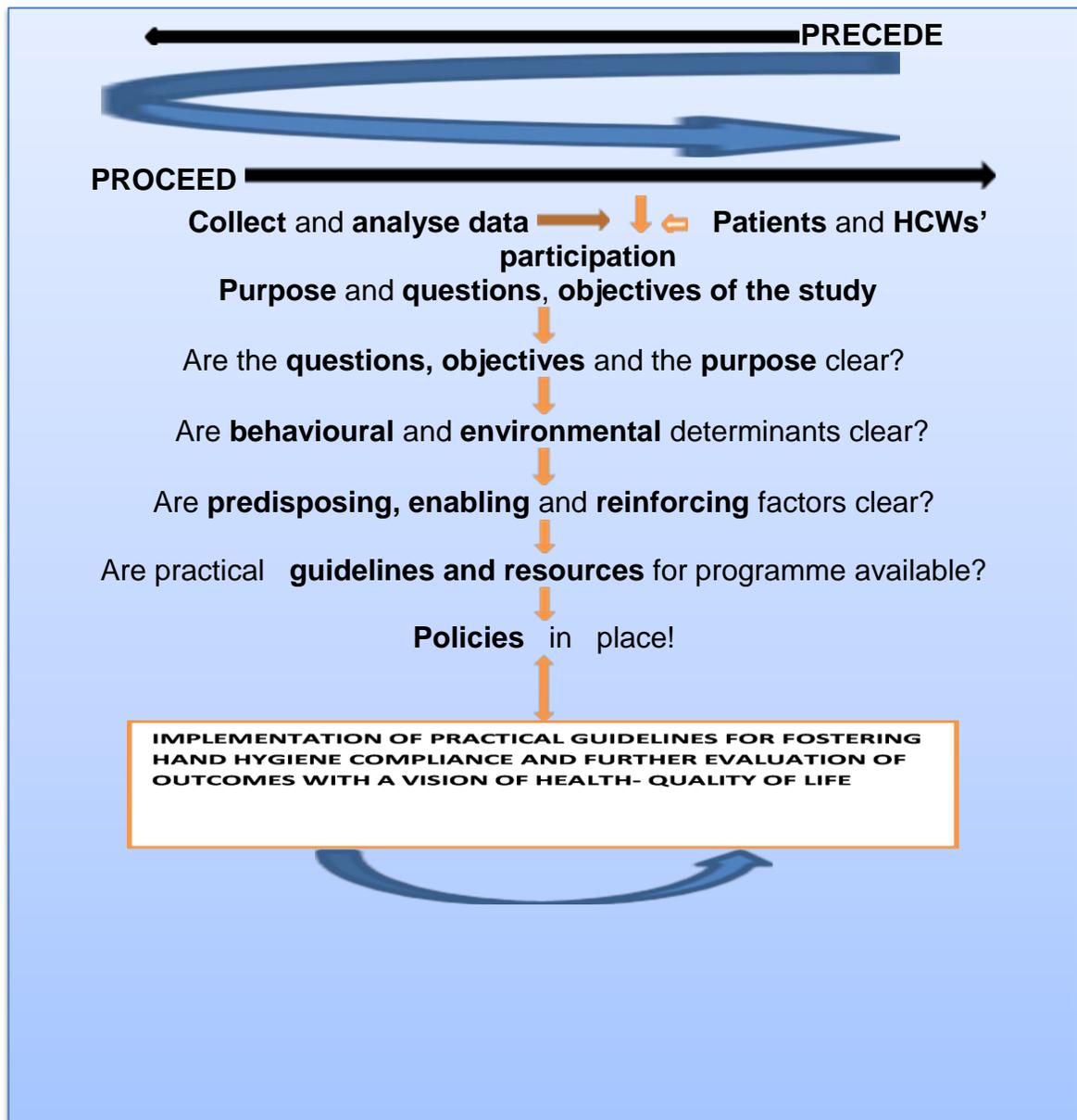
Zimbabwe is a member of the World Health Organization in matters of public health. Therefore, the country should collaborate with the organisation in matters of improving the health status of its population. However, HCAs are not strongly monitored and are not on tally sheet lists (T5) to enable data collection processes for the nation. Hand hygiene surveillance publications to reduce HCAs for Zimbabwe are difficult to trace. The WHO country cooperation strategy is the World Health Organization corporate's strategy at country level and considers the organisation's policies, guidelines, the global, regional directions and balances these with the needs of the people of the Republic of Zimbabwe (WHO, 2009d:1). Healthcare policies and systems of the country get best emphasising on planning, implementation and surveillance healthcare performance to alleviate the disease burden (WHO, 2009d:3). According to Sundin and Fahy (2008:18) the researcher recreates the identified fostering factors into themes that explain in theory the phenomena under study and that this regeneration is integrated with

analyses in order to develop guidelines for fostering hand hygiene compliance and infection control and prevention with a focus on HCAs.

The guidelines were based on the findings of this study. They arose because of the conclusions drawn and the recommendations made. The findings were validated and corroborated using the Precede-Proceed model (Figures 1.4, 3.1 to 3.2, 7.0 and Tables 7.1 and 7.2 as well as validated with other researchers' findings in the literature reviewed in books and journal reports. However, each evidence statement stands alone as accessible, clear, key information used to support the recommendations based on conclusions derived from the study (National Institute for Health and Care Excellence (NICE, 2014:108). Furthermore NICE (2014:108) explains that guidelines should ensure that the relationship between the recommendations and the evidence of findings is clear and that the guidelines are clear without cross references to other supporting matters. Guidelines should be based on the validity of the evidence in the study to clinical practice of HCWs. In this chapter the focus is on the validity, trustworthiness of findings leading to development of guidelines for fostering hand hygiene compliance and HCAs alleviation among HCWs. This was in the interest of patients' and HCWs safety to themselves at the Mutoko and Mudzi district health care institutions in Zimbabwe

7.1.1 Figure 7.0 Utilisation of Precede-Proceed and Theory of Planned Behaviour

The model concepts are involved in validity and trustworthy of credibility of findings of the research process in a research wheel. Figure 7.0 illustrate the flexibility and scalability of the model concepts in addressing a wide range of social, geographical and ecological problems, settings, and populations as applied in Mutoko and Mudzi districts in Zimbabwe on HCWs hand hygiene compliance and prevention and control of HCAs.



(Researcher devised and adapted from, Green & Kreuter, 2005:29).

Figure 7.0 Precede-Proceed model used for validation and trustworthy

7.2 THE BEST PROCESSES OF DEVELOPING GUIDELINES

In intervention alignment, (Figures 3.1 and 3.2) use theories that are employed to map specific interventions to specific predisposing, enabling and reinforcing factors, match the ecological assessment factors with the wide programme concepts of HCWs hand hygiene compliance and HCAs prevention and control, pool prior interventions and community acceptable interventions that might have less evidence to support them but that might be needed, and patch or fill up the gaps (Figure 7.1). The researcher utilised Precede-Proceed model concepts for guidance in developing guidelines. However guidelines are evidence-based best practices from research; best experiences from previous programmes as well as best processes from theory, descriptive data and local wisdom in practice-based planning and evaluation (Figure 3.1).

TO PROCEED:

MATCH, MAP (P) and PATCH to align with the planning models that use these terms well as acronyms. As acronyms MATCH takes Multilevel Approach to Community Health, MAPP is mobilising for action through Planning and Partnership and PATCH acts as Planned Approach to Community health.

Intervention alignment in Phase 4; matching, mapping, pooling and patching are procedures to finalise touches on formal hand hygiene programme plan such as resources allocation, responsibilities, timetable and a budget (Figures 3.1 to 3.2 and 7.0 to 7.1). In this study the guidelines were developed, validated and corroborated for trustworthiness.

Therefore, the researcher used the findings from this study, a mixed methodology (qualitative and quantitative approach), to develop the guidelines on HCWs hand hygiene compliance and HCAs prevention and control, being

guided by the Precede-Proceed model coupled with the Theory of Planned Behaviour. Equipped with the findings generated, the researcher developed guidelines from the first phase of Proceed model, phases 4, 5 and 6, Green and Kreuter, (2005:15) that meant the stage of intervention alignments, educational strategies of the health programme and organisational policy and regulations. This chapter details the purpose and scope of the guidelines, definitions of related concepts, abbreviations used, the target audience and a full description of the guidelines. Validity and trustworthiness strategies prior to guideline implementation and evaluation indicate the responsible persons in Figure 7.1, as well as the contexts, and time frames for evaluation of HCWs hand hygiene programme. In this study, the guidelines serve as a unique contribution for current evidence-based practice in HCWs' hand hygiene compliance, which HCWs, leaders or managers can implement in their respective healthcare institutions for improvements.

The presented guidelines, if properly and reasonably followed, should fulfil the title of this study and that means answering the research questions and meeting the objectives to solve the research problem that affects the community in Mutoko and Mudzi districts: -“Guidelines for fostering hand hygiene compliance and infection control among healthcare workers at Mutoko and Mudzi districts health care institutions in Zimbabwe” for the benefit of patients, visitors, and HCWs themselves in the job occupations. According to NICE (2014:173), a list of recommendations should start with outlining what needs to be done. Recommendations should be specific and exact about the intervention being recommended, and the group of people for whom they are formulated. Recommendations should be direct instructions that are clear and easy to follow.

The guidelines are presented to HCWs and the communities in the Mutoko and Mudzi district health care institutions in Zimbabwe, so they can use them to foster hand hygiene compliance in healthcare settings. The developed guidelines are a feedback to the research participants following the granted permissions by the

MRCZ, MOH & CW, PMD and PNO Mashonaland East, the DMO, and DNO of Mutoko and Mudzi districts healthcare institutions. The researcher used Figures 3.1 to 3.2 Precede-Proceed model that guided the study and Figure 7.0 and Tables 7.1 and 7.2 for trustworthy and validity of findings to guidelines development.

The first step in the development of guidelines was the incorporation of conceptual and operationally defined terms. The operationalised concepts in section 1.6 to 1.7.1 of the study linked to Precede-Proceed model coupled with the Theory of Planned Behaviour were used to provide a logical structure in each guideline. Therefore, each guideline spells out “the vision of the desired outcome and working backwards to discover the factors that influence the attainment of that vision of the quality of life” as illustrated in Figure 3.1. The vision would be adhered to by HCWs, assessment, planning, implementation and evaluation as hand hygiene champions, barristers and strategists for implementing and further evaluating a hand hygiene health programme by the HCWs themselves in their own health care institutions in the Mutoko and Mudzi district public health care institutions in Zimbabwe. The guidelines developed in this chapter were validated and ensured for trustworthiness with findings from the literature reviewed (Figures 1.4, 3.1 to 3.2, 7.0 and Table 7.1 to 7.2).

Taking into consideration Lincoln and Guba (1985:290), there is existing trustworthiness when findings of qualitative strands represent reality of life situations. Therefore, the criteria of credibility, transferability, dependability and confirmability are outlined. In addition, there is authenticity as original contribution of this study to knowledge of HCWs hand hygiene compliance and infection control and prevention in contexts.

Table 7.1 Ensuring trustworthiness of the study

Criteria	Strategy	Application		
Credibility	Engagement	<p>Building rapport with participants. Explained purpose of the study and ethical issues involved for obtaining consent. Understanding HCWs behaviours by participatory observing hand hygiene compliance in healthcare settings until saturation.</p> <p>Indepth interviews with participants as patients' and self – administered. Questionnaires contribution to HCWs hand hygiene. The happenings in truthful reality in the health care settings are represented and presented textually that can then be interpreted and thickly discussed as trustworthy.</p>	Credibility , worth of believing as a true and narration of occurrences from the mixed methodology aspect qual part: persistant consistency of observations, experiences in real life situations, thick descriptions by the reseacher do facilitate transferability, auditability, dependability and confirmability and communication with others in social construction of reality the hermeneutics about the thicknesses of observations.	Confirmability , Interpretation of findings in form of thick performances, beyond thick descriptions, (Sergi & Hallin 2011:191). Denzin (1989:33) explains that thick description traces the beginning, and development of the events that means (development of guidelines).
	Reflection	<p>Researcher reflecting on perspectives about HCWs hand hygiene compliance against HCAIs in Mutoko and Mudzi districts to avoid biases.</p>	Peer review as that colleagues or peers examine the data and results before the final document is produced for validity, integrity, credibility, trustworthiness, quality and originality.	Authenticity: - concerned with the extent to which the participants' own genuine contributions were enhanced by the reseacher as a result of having participated in the investigatory processes (Schwandt 2015:12).
Transferability	Sampling	<p>Representativeness of the population under study and there was in findings homoscedasticity.</p>	Transferability: - Interpreting of the study findings from thick performances beyond the thick descriptions as the processual nature does facilitate transferability that is conveyance to another context, as a resituation	This study and an accompanying publishable article examined by three independent examiners as a organised by the University of South Africa examination section; arbitrated and upheld, and moreover further reviewed by the appointed promoter as supervisor of the arbitrated needed corrections in order to be confirmed to the (UNISA) senate of the University that the final corrections were done to satisfaction of supervisor satisfaction.
	Data collection	<p>Used combined qualitative and quantitative methodology for complementarity.</p>		
Dependability	Thick description	<p>Thick description also lead to thick interpretation and discussion of findings.</p>	Dependability as capable of worthy of believability and confirmability . Other researchers should follow tables 1.1 to 1.4 for audit trail.	
	Dense description	<p>Dense description of qualitative, quantitative methodology to enhance the research wheel in answering questions, objectives to solve problem.</p>		
Confirmability	Audit trail			

Table 7.2 Ensuring validity

Criteria	Strategy	Application		
Epistemic	Proceed-Precede model, Theory of Planned Behaviour in context.	Theory as guidelines production and presentation for HCWs hand hygiene compliance and HAIs prevention and control.	A systematic way of producing validity	Valid knowledge
Methodology and emerged design	Qualitative and Quantitative approach	Research wheel for answering questions, devising and adopting appropriate emerged design tables 1.1 to 1.4		Mixed methodology data
Instruments	Appropriately selected for information collection. Questionnaires were translated by English and Shona specialists, ensure consistency they were valid and reliable tools for data collection	Observation tool Questionnaires for patients interviews pilot tested Self- administered HCWs' questionnaires.		
Samples	Samples for observation, interviews and self-administered questionnaires	HCWs n=95 and n=570, HCWs (n=189), n=574 Interviewed patients. HAIs related mortalities in Mutoko and Mudzi districts, Zimbabwe		
Internal and external Validity (legitimation)	Consistency internal and external validity	Cronbach's alpha coefficient Homoscedasticity of residuals		
Content	Conceptually, operationally	representative of the contents measured		
Construct Operationalising	Operationalising the constructs with fairness	representation of truth		
Statistical conclusion	Statistical treatment	information conclusion	authentic	Richness, valid
Reliability	Stability	Consistencies of observations and internal homogeneity		
Selecting appropriate foci	to answer research questions and fulfill objectives	Mixed methodology approach for the research wheel	Quantitative Qualitised	Qualitative Qualitised
Member checking	Reliability co-efficient	Member checks on piloting of instruments Blind review examination of thesis and publishable article	Dr. P.T. Manyeza verified guidelines representing HCWs	Rev. N. Manyeza verified guidelines representing Public
Arbitration	Arbitration recommendations set and the requirements to be met by the doctoral student	All corrections were done according to arbitrator's recommendations	Promoter Professor S.P.Human	To the satisfaction of Professor M.M Moleki
Supervisor	Supervised recommendations of the arbitrator	Supervised corrections and recommended final editing, submission and graduation	arbitrator's requirements met	Degree may be conferred
Editing	Edited and supervised thesis	Professor S. Modesto (Dean-) edited for English language proficiency	Editorial Certificate issued	proficient, worked on for the last time
MRCZ and UNISA	Protecting the public	MRCZ and UNISA	permissions	letters in annexe
Literature search	Performed to obtain evidence on trustworthiness, validity of scales and information	EMBASE, Ovid MEDLINE search strategy, EBSCO CINHAL, Knowledge Network library search databases Scotland,	Univuersity of South Africa Library databases and	Google Scholar. In -text paraphrasing and referencing
Structure,organisation and internal consistency	paragraphs have a topic sentences ,communicate introduction,body,conclusion	Interpretation to derive meanings leading to guidelines and presentation	Structures substructures	Five levels

7.2.1 Application of Precede-Proceed model concepts to develop guidelines

Mapping, matching, pooling, patching, and validating findings leading to guidelines development for validity, trustworthiness using thematic analyses and statistical analyses. This was guided throughout the whole study by the Precede-Proceed model with Theory of Planned Behaviour as shown in Tables 7.3 to 7.6 below and Figures 1.4, 3.1, 3.2 and 7.0.

**Table 7.3 APPLICATIONS OF PRECEDE-PROCEED MODEL CONCEPTS DEVELOPING GUIDELINES:
THEME ONE**

THEMES	FINDINGS	PRECEDE- PROCEED MODEL CONCEPTS	STRATEGIES	INTERVENTION ALIGNMENT MAP MATCH POOL PATCH TO DEVELOP GUIDELINES
Hand hygiene for HCWs	Compliance rate was 403(70.7%).	Predispose Reinforcing Enabling HCWs to do hand hygiene compliance and alleviation of HCAsI in the health care system	Predisposition Reinforcement Enablement for motivational Behaviour change to complying with hand hygiene	Educational workshop programmes including curriculae in schools Use posters to guide as teaching material for HCWs Motivate HCWs behaviours' towards best health care practice guidelines Enable Hand hygiene campaigns using moments of hand hygiene Encourage further research in hand hygiene compliance
	Non-compliance rate was 167(29.3%)	Predispose Reinforcing Enabling HCWs to do hand hygiene compliance and alleviation of HCAsI in the health care system	Predisposition Reinforcement Enablement for motivational Behaviour change to complying with hand hygiene	Show HCWs how to do hand hygiene in the clinical working areas Prevent and control HCAsI because they exist. Teach HCWs who do not carry out hand hygiene in the working settings because HCAsI are a hidden danger to public health in Mutoko and Mudzi districts

Table 7.4 THEME TWO

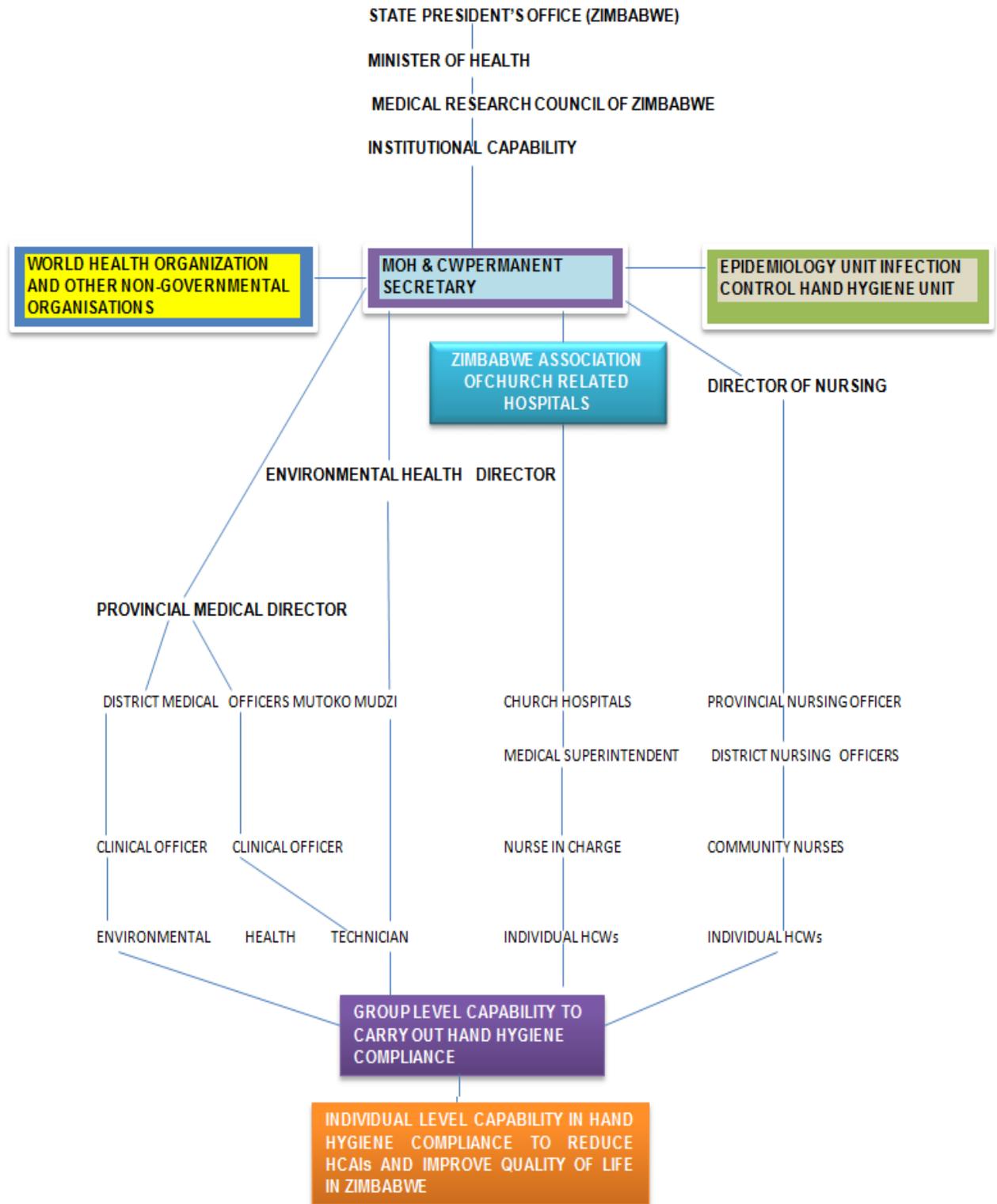
THEMES	FINDINGS	PRECEDE-PROCEED MODEL CONCEPTS	STRATEGIES	INTERVENTION ALIGNMENT MAP MATCH POOL PATCH TO DEVELOP GUIDELINES
<p>HCWS empowerment</p>	<p>The patients were sad: Before HCWs aseptic procedure on the patient: After body fluid exposure risk: After HCWs touch patient surroundings, before touching patient.</p> <p>Patients would urge the HCWs to wash their hands. Patients would remind HCWs to wash hands. Patients would tell HCWs to wash hands. Some patients would take no further action. Patients' intending to report HCWs to the manager in charge after a failed hand hygiene moment. Patients would gather the courage to inform the responsible authorities of the bad hand hygiene practice of the HCWs. Some patients were uncertain whether to report or not. This was in line with out of fear of reprisals from the HCWs. Other patients did not know what to do in the situation of HCW's failed hand hygiene.</p>	<p>Reinforcing Enabling HCWs' Behaviours changes Quality of life</p>	<p>Multiconceptual strategies and approaches</p> <p>Predispositioning Reinforcement Enablement for Behaviour change towards best Health</p>	<p>Patient health educational promotional public health programmes in hand hygiene</p> <p>Enhancements to empower HCWs to give them voices to speak out on matters that affect their health directly focusing on HCWs hand hygiene matters.</p> <p>Prevent and control HCAIs from happening in any health care setting under any circumstance.</p>

Table 7.5 THEMES THREE TO SIX

THEMES	FINDINGS	PRECEDE-PROCEED MODEL CONCEPTS	STRATEGIES	INTERVENTION ALIGNMENT MAP MATCH POOL PATCH TO DEVELOP GUIDELINES
Resources for healthcare workers to accomplish hand hygiene and alleviate HCAs	Insufficient clean and safe running water Insufficient or no detergents in the health institutions no gloves or protective clothing Understaffing, and and understanding	Reinforcing Enabling	Reinforcement Enablement for Behaviour change towards Health	Provide resources so that HCWs could use available resources to make their hands clean because clean hands save many lives by preventing and controlling infections
Healthcare workers face challenges	HCWs being so busy that they forget to change their gloves or decontaminate their own hands.	Predisposing Reinforcing Enabling Behaviour	Predisposition Reinforcement Enablement for Behaviour change towards Health	Reminding each other as working colleagues, or by patients or patients' family members and friends
Educational strategies	Lack of motivating HCWs to monitor Hand hygiene compliance The need for further updating training	Educational strategies Predisposing Reinforcing Enabling Behaviour for quality Health	Predisposition Reinforcement Enablement for Behaviour change towards Health	Educational updating courses to enable HCWs hand hygiene compliance to happen to best health outcome standards
Guidelines, Regulations, Policies,	Appears not to be in place With respect to the HCAs some illnesses classified in Zimbabwe are poorly diagnosed termed as ill defined symptoms, whereas others are accurately documented on the tally sheets (T5 forms), the monthly reporting forms used for the epidemiology unit in Zimbabwe). HCAs and hand hygiene compliance were not clearly monitored to prevent and control. Additionally,	Organisational, guidelines regulations and policies Predisposing Reinforcing Enabling Behaviour Change for the best	Predisposition Reinforcement Enablement for Behaviour change towards prevention and control of infections for quality Life by hand hygiene	Ensure that guidelines are in place for hand hygiene and infection control to influence development of policies to Reinforce and Enable motivational Behaviour change to quality Health by training and updating in further researches

Table 7.6 THEMES SEVEN AND EIGHT

THEMES	FINDINGS	PRECEDE-PROCEED MODEL CONCEPTS	STRATEGIES	INTERVENTION ALIGNMENT MAP MATCH POOL PATCH TO DEVELOP GUIDELINES
Environment and cross transmission	<p>The two worst non-compliance rates are after surroundings contact and before aseptic procedure</p> <p>There is limited surveillance of HCWs' hand hygiene standards</p>	<p>Predisposing Reinforcing Enabling Behaviour links with environment and genetics affecting population health such as Tuberculosis</p>	<p>Predisposition Reinforcement Enablement for Behaviour change by HCWs towards Health by hand hygiene compliance in the environment by Surveillance monitoring of environment and documenting HCAIs</p>	<p>Standards monitoring hand hygiene compliance Monitor and document HCAIs in context localities environments for HCAIs burden control and prevention for alleviation</p>
Infections including HCAIs	<p>HCAIs Lack of HCWs and organisational accountability in the robust prevention and control of Infections focusing on HCAIs and mortalities through hand hygiene compliance Lack of surveillance systems of HCAIs compounded by lack of surveillance systems of hand hygiene compliance among HCWs to alleviate HCAIs in Mutoko and Mudzi districts. There is a gap contributing to the unknown burden of HCAIs and poor hand hygiene escalating HCAIs transmission cycle.</p> <p>Therefore, patients with various conditions such as TB can be admitted into hospital or may walk into a healthcare setting, and unexpectedly acquire HCAIs, and die because of there being no surveillance in place to monitor patients with HCAIs</p>	<p>Health that chain links with environment, behaviour, genetics, predisposing, reinforcing, enabling with further links to educational strategies and organisational policies and regulations</p>	<p>Patients' rights to be vocal for health and safety from HCAIs including the HCWs themselves on own safety during working with patients</p>	<p>Improved Quality of life Reality monitoring HCAIs in context at all times in all health care centres in Zimbabwe</p> <p>Add HCAIs on the tally sheets (T5) for monitoring prevention and control.</p> <p>Surveillance of HCWs hand hygiene compliances and keep records for future reference and for continuing further research. The transmission cycle of HCAIs chain cycle should be broken; The clinicians may misdiagnose and record that they died of only TB, dysentery, AIDS, cancer or malaria. Mortality rates will be accounted to the conditions that the patients are admitted with not the HCAIs (the underlying co-morbidity) patients may have acquired in healthcare settings in Mutoko and Mudzi districts. Survey, monitor and document HCAIs and their mortalities robustly. HCAIs could be expressed, named and lexicologically coded differently in different cultural healthcare contexts that need to be interpreted to be understood in context.</p>



(This organogram is researcher devised according to the state institutions).

Figure 7.1 Proposed organogram for fostering hand hygiene compliance, and infection control and prevention in Zimbabwe

The organogram's successes are made through further assessment, planning, implementation, and reviews. Further evaluations for feedback to HCWs in Zimbabwe should be done annually, bi-annually, and every five years.

This is how the institutions are organised in Zimbabwe as represented by the organogram. Without the organogram HCWs hand hygiene compliance would not be monitored nor HCAs be meaningfully prevented and controlled in line with international standards worldwide.

The organogram Figure 7.1 for implementation, ongoing evaluation, and timelines has also been presented. The researcher develops guidelines for fostering hand hygiene compliance among HCWs, with a focus on preventing and controlling HCAs. This organogram clearly communicates visually the flow of authority from the President's Office through the MRCZ, Ministry of Health partnership with WHO at country level, to the individual HCWs with responsibility, accountability and information sharing. Therefore, the responsible individuals in various positions of authority should have a vision of leadership as guided by Precede-Proceed model coupled with Theory of Planned Behaviour (Green & Kreuter, 2005:10). This enables improvement of the quality of life in the Mutoko and Mudzi district health care institutions in Zimbabwe.

Guidelines were integrated within the Precede-Proceed model coupled with the Theory of Planned Behaviour as elaborated in Figure 1.4 for fostering hand hygiene compliance among HCWs. This is evidence-based practice from the findings in the multiphase design using the mixed methodology approach. For the reader there are four stages to be able to develop the ability to use thematic analyses in the Precede – Proceed model below as follows: sensing themes: - this means recognising and capturing the code able moments, doing it reliably capturing the moment and consistently encoding it, codes or codebook

development, interpretation of information, and themes in the context of a theory or model such as Precede-Proceed or mixed (Boyatzis, 1998:11). This means that a researcher remains at the highest academic realm contributing to knowledge development, the compliance and non-compliance rates of HCWs hand hygiene in context, and guidelines as theories by the ethical authority invested in the researcher through the ethical permissions underlying this thesis was the extent to which the researcher reveals an extensive as well as intensive knowledge in the discipline to the frontline boundaries of the current knowledge. The researcher was able to extend evidences as marks of contribution to knowledge in the original worldview.

However, in developing codes and themes Boyatzis (1998:29) explains that there are three stages a researcher should go through, making decisions on sampling, design and methodology, and themes development and codes using, theory driven, literature review driven, and from the raw data as inductive, deductive or abstraction to include changes occurring in hypothesis forming a continuum from theory driven to data driven approaches as a research wheel. The last stage is validating and using the codes.

The moments of hand hygiene have influence in preventing and controlling HCAs in contexts by linking to educational strategies, organisational policies and regulation, Predisposing, Reinforcing, Enabling and Genetics. Also in link are the following, HCWs hand hygiene compliance, Environmental issues management, Quality Of Life=QOL. In order to prevent and Control HCAs which are a silent danger in clinical healthcare settings in contexts HCWs should be visionary leaders in Mutoko and Mudzi districts in Zimbabwe.

Within the organogram (Figure 7.1) among those in the healthcare settings are students and all who meet patients's needs directly. It is strongly advisable for all

HCWs to strictly abide by the moments of hand hygiene to alleviate infections focussing on HCAs.

7.2.1.1 Contextual

Everything happens in the environment inclusive of all the phases of the Precede-Proceed model. Henceforth all activities do happen within the environmental geographical ecosystem for the research defined key concepts to be operationalised within the Precede – Proceed model themes to bring about alleviation of HCAs and the outcome of Quality of Life in real context.

7.2.1.2 If hands are visibly soiled

HCWs should use uncontaminated soap and water. HCWs should not use alcohol-based gel if hands are visibly soiled. There should be no smoking, use of open fire or other sources of ignition within the vicinity of alcohol gels because they are flammable liquids and vapour causes serious eye irritation, for external use only and store between 0 and 43 degrees Celsius (WHO, 2009a:243; CDC, 2002:45). Foster compliance with rigour hand hygiene techniques among HCWs: before touching patient, before clean or aseptic procedure, after body fluid exposure risk, after touching patient, after touching patient surroundings as per (WHO, 2009a:123). Thereby prevent and control HCAs in order to achieve an acceptable quality of life. Hand hygiene compliance with evidence-based guidelines is generally low throughout the world (Creedon, 2005:208; Creedon in Fitzpatrick & Kazer, 2011:320; Newitt, Myles, Birkin, Maskell, Slack, Nguyen-Van-Tam *et al.*, 2015:28; WHO, 2009a:124). Therefore, hand hygiene should occur during the following 'moments': before patient contact, after patient contact, after contact with patient surroundings, before a clean or an aseptic procedure, and after body fluid exposure risk (WHO, 2009a:123).

7.2.1.3. Unfortunate hand hygiene guidelines likely to be neglected

Allegranzi and Pittet (2009:306) explain that it is unfortunate that hand hygiene guidelines are more likely to be neglected during transmission to patient before patient contact, and prior to clean aseptic procedures (WHO, 2009a:123; Fuller, McAteer, Slade, Cookson, Michie, Savage, Stone, 2009:5; Sax, Allegranzi, Uckay, Larson, Boyce & Pittet, 2007:13). However, Allegranzi and Pittet (2009:306) further explain that this is in line with the fact that care activities with a higher risk of cross transmission lead to a higher risk of poor compliance (WHO, 2009a:124; Huis, Schoonhoven, Grol, Donders, Hulscher & van Achterberg, 2013:464). Therefore, in this study the findings for the neglected moments for hand hygiene organised from the highest to the lowest are validated with findings from the literature review. According to Jones and Metz in Baran and Jones (2016:203) for rich, thick description the researcher writes vividly giving and shaping circumstances for the reviewer to fully understand and be clouded in what is happening as the correct real lived experiences of the participants. Moreover Schwandt (2015:69); Denzin (1989:33) explain that all descriptions are some form of interpretations, truthful representations of existing experiences only in textual account as reconstruction integrating the health events studied through rhetoric texts written by the researcher. The reader should feel a recreated setting contextualised, a mood in the data collecting experience, data analyses for evidences based on the data gathered to facts claims and conclusions of findings after validation for worth of truthfulness over at which point the reviewing is an opportunity as though the reviewer is saturated by the vividness of the data. However, Jones and Metz in Baran and Jones (2016:202) define peer review as that colleagues or peers examine the data and results before the final document is produced for validity, integrity, credibility, trustworthiness, quality and originality. This includes examining findings, developed guidelines and their presentation thereafter as air of finality, authentic through to summary, conclusions and recommendations of the study in the concluding chapter 9.

Figures 5.5 to 5.7 reflect the findings of the study in comparison and validating with the expected World Health Organization standards of best practices. The figures show the findings as a measure against the quality of standard requirements of the World Health Organization and other non governmental organisations with related literature of other similar researchers.

The reviewed, data of deaths in Mutoko and Mudzi districts with reference to Figure 5.9 is used in which HCAs are hidden and unforeseen danger to patients. This includes families, relatives and HCWs themselves due to high exposure risk to infections in the health care settings they work.

7.3 CONCLUSION

Precede-Proceed model concepts have guided the development of guidelines for fostering HCWs' hand hygiene compliance in Mutoko and Mudzi districts in Zimbabwe. Therefore, guidelines could be adopted, adapted, implemented and furthermore evaluated by the HCWs, community, families and health care leaders themselves as the guidelines belong to them as their own participatory production in the Zimbabwean unique socio-economic cultural contexts. Precede concepts make sure that there is appropriateness of the HCWs' hand hygiene programme to meet the healthcare needs of individuals, families in the community and that Proceed confirms the programme of the organisation is available, accessible, acceptable and accountable to policy makers, administrators, consumers, clients. Consequently, according to the Alma-Ata (1978:3) concepts confirmed by Proceed, align with Primary Health Care concepts; available, accessible, acceptable at a cost the countries and communities can afford and openness to accountability with some responsibility as the duty of care in hand hygiene compliance and infection control for public health.

However, in describing social science guidelines as interventions alignment in policy making and use of evidence, they are not treatments aimed at individuals' therapeutic value. Instead they are complex systems thrust upon complex systems so too is the geographic ecological environment in which evidence on them may be used (Pawson, 2006:168; Pawson, 2013:33). Furthermore, keep on teaching the learnt needs of people embedded in different contexts (L). Link the assessed needs to the Responsibility and Accountability in Organisational Leadership and Management (RAAIOLAM). The (L) link to (RAAIOLAM) leads to Resources (R) that are predisposing, reinforcing and enabling factors to engineering Recognition of human behaviour and efforts in achieving set goals as guided by Precede-Proceed model with Theory of Planned Behaviour for HCWs hand hygiene and infection prevention and control (R). Lastly this leads to the outcome results (R) and rewards (R) of success in quality of life (QOL). The next chapter, Chapter 8 enabled the developed guidelines presentation for fostering hand hygiene compliance to prevent and control infections targeting HCAs among HCWs at the Mutoko and Mudzi district public health care institutions in Zimbabwe.

CHAPTER 8

PRESENTATION OF GUIDELINES

8.1 INTRODUCTION

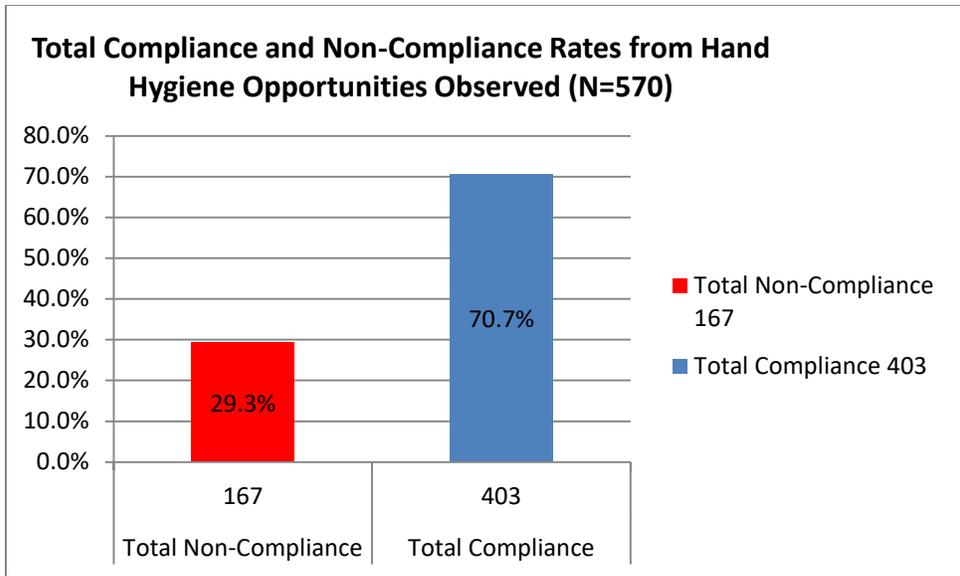
This chapter presents the “Guidelines for fostering hand hygiene compliance and infection control among healthcare workers at Mutoko and Mudzi Districts in Zimbabwe”. Presentation of these guidelines followed (Figures 1.4, 3.1 to 3.3) of the Precede-Proceed model concepts in conjunction with Theory of Planned Behaviour starting with quality of life in reverse of the model concepts.

8.2 QUALITY OF LIFE

Quality of life is the focal point of everyone in any community and in any healthcare setting globally to alleviate HCAs. Quality of life is at the end of the Precede-Proceed model concepts, but it is also at the starting entry point of the Precede part of the model forming Phase 1 the social assessments needs.

8.2.1 Prevent HCAs in order to alleviate their detrimental effects in the communities in Mutoko and Mudzi districts, in Zimbabwe henceforth raise the Quality of Life of the people (QOL) by reducing morbidities and mortalities.

8.2.2 Control HCAs to improve the Quality of Life of the people (QOL) in the communities in Mutoko and Mudzi districts, in Zimbabwe.



**FIGURE 8.1 PRECEDE-PROCEED MODEL INTEGRATING GUIDELINES:
HCWs HAND HYGIENE COMPARATIVE STANDARDS OF COMPLIANCE**

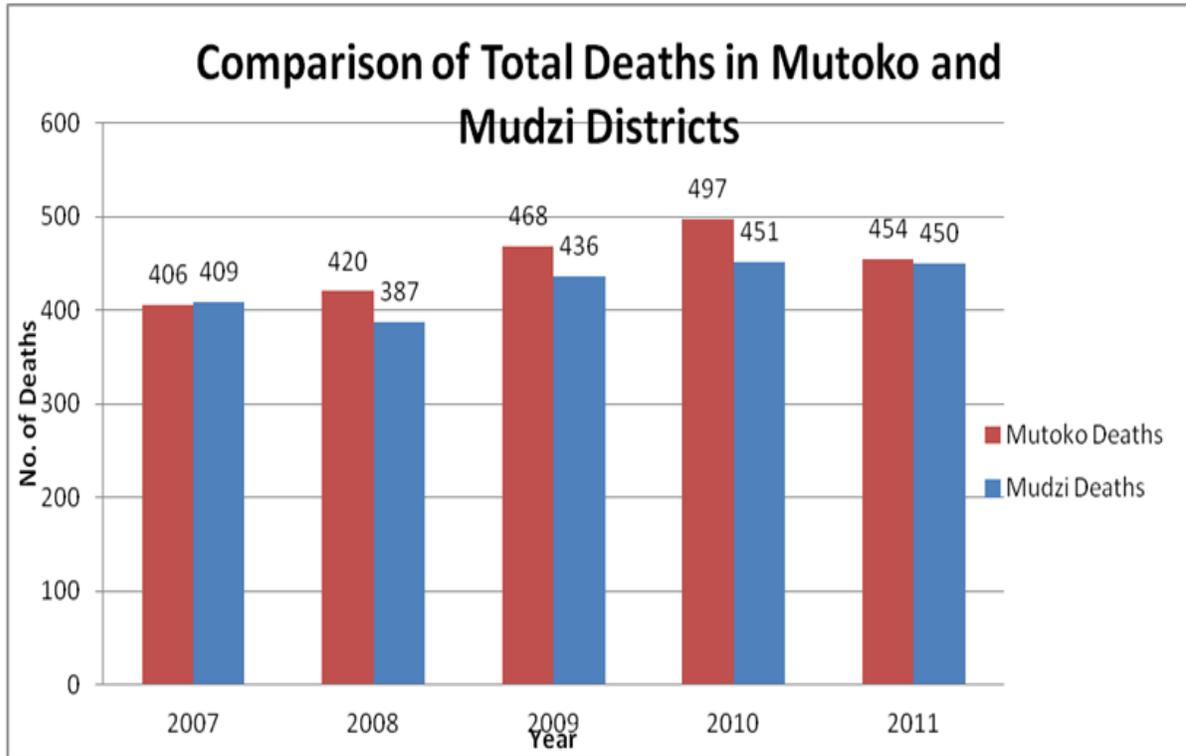


FIGURE 8.2 SOCIAL DETERMINANTS OF QUALITY OF LIFE IN MUTOKO AND MUDZI DISTRICTS

8.2.3 HCWs should be led by leaders who embrace guidelines and policies in working areas to improve hand hygiene compliance so as to alleviate HCAs that are a hidden danger in Mutoko and Mudzi districts, in Zimbabwe healthcare systems.

8.2.4 HCWs should use the guidelines that were developed as guided by the Precede-Proceed model to alleviate HCAs in Mutoko and Mudzi districts.

8.2.5 Document robustly surveillance of HCWs' hand hygiene compliance to help to prevent and control HCAs in context.

8.2.6 Record all HCAs giving as evidences of their existence in context on the tally sheet (T5) in Mutoko and Mudzi districts in Zimbabwe to help further research and best prevention and control.

8.3 SOME PATIENTS ARE IMMUNOCOMPROMISED

Health and Genetics are directly influenced by the health of the population in the communities of Mutoko and Mudzi in Zimbabwe. Genetically influenced are also HCWs' behaviours in hand hygiene compliance and the predisposing factors.

8.3.1 HCWs should be vigilant with hand hygiene compliance to prevent HCAs and reduce mortalities to save lives in Mutoko and Mudzi districts in Zimbabwe.

8.3.2 Patients are to be happy and satisfied with respect to healthcare received from HCWs fostering hand hygiene compliance for the best outcome in alleviating HCAs leading to quality of life in Mutoko and Mudzi communities.

8.3.3 Adopt and use as appropriate interventions, measures and in management integrate guidelines and policies of health care settings in Mutoko and Mudzi districts in Zimbabwe pertaining to HCWs hand hygiene compliance *vis - a - vis* HCAs alleviation.

8.3.4 Advocate for patients, protecting all patients particularly those at very high risk of contracting HCAs that are preventable by playing the role model in hand hygiene compliance as HCWs.

8.4 HCWs' HAND HYGIENE BEHAVIOURS WITHIN PRECEDE-PROCEED MODEL

Carry out hand hygiene compliance when caring for all patients including the immune-compromised individuals such as those with HIV and tuberculosis or being treated for cancer the oncology patients. Protect everyone for safety from HCAs and make hands clean before using and after attending to patient's healthcare needs.

8.4.1 Break the chain of HCAs by following hand hygiene compliance guidelines among HCWs: before touching patient, before clean or aseptic procedure, after body fluid exposure risk, after touching patient, after touching patient surroundings and ensure hands are dry.

8.4.1.1 *Uncover skin below the elbows to enable hand hygiene to be carried out properly and thoroughly.*

8.4.1.2 *Wash hands with uncontaminated, warm, running water that is worth the quality of being drinkable.*

8.4.1.3 *Use uncontaminated liquid soap from wall-mounted cartridges.*

8.4.1.4 *Use alcohol gels to rub on hands for hand hygiene compliance for 20 to 30 seconds until hands are thoroughly cleaned and air dried paying close*

attention to all parts of the hands.

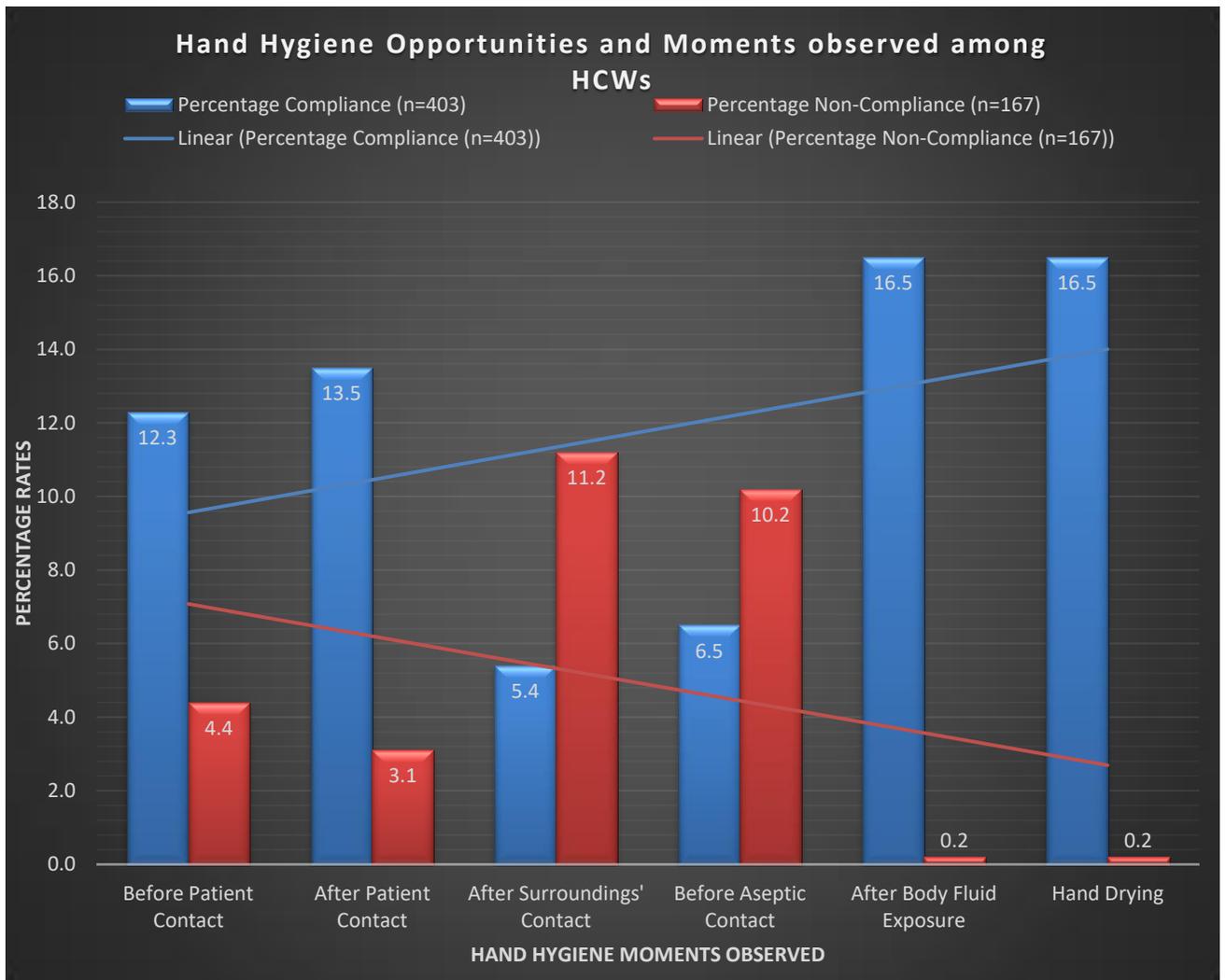
8.4.1.5 Hands should be dried after hand washing, by using disposable paper towels.

8.4.1.5.1 It is strongly advisable for all HCWs to strictly abide by the moments of hand hygiene to prevent and control infections focusing on HCAs.

- Attend refresher courses (workshops: doctors, nurses and all other HCWs who touch patients directly should) in view of adopting and implementing guidelines for fostering HCWs hand hygiene compliance.*
- Use, uncontaminated soap and drinkable running water to wash hands. Alternatively use alcohol gels in the health care institutions except when hands are visibly dirty and when nursing patients with Clostridium difficile; in this situation use soap and clean safe running water.*
- Alcohol gels should be provided by the employer to HCWs to promote hand hygiene compliance, and to further prevent and control HCAs.*
- Donations of alcohol gels from breweries or pharmaceutical companies could help to contribute to the hand hygiene promotion programme.*
- Comply with HCWs hand hygiene regulations policies and guidelines, especially before carrying out aseptic procedures on patients such as catheterisation, venepuncture and lumbar punctures to prevent and control HCAs.*
- Avail, access, and afford alcohol gel at the point of patient care for use by the HCWs in healthcare settings to alleviate HCAs.*
- Carry alcohol gels in uniform size pockets for easy use at the point of care when hands are not visibly dirty during patient care.*
- Use alcohol gels because Mycobacterium tuberculosis (TB causing bacterium) is killed instantly if present on hands of HCWs as they are Alcohol Acid Fast.*
- Do not use alcohol gels on spore forming microorganisms, they are ineffective.*

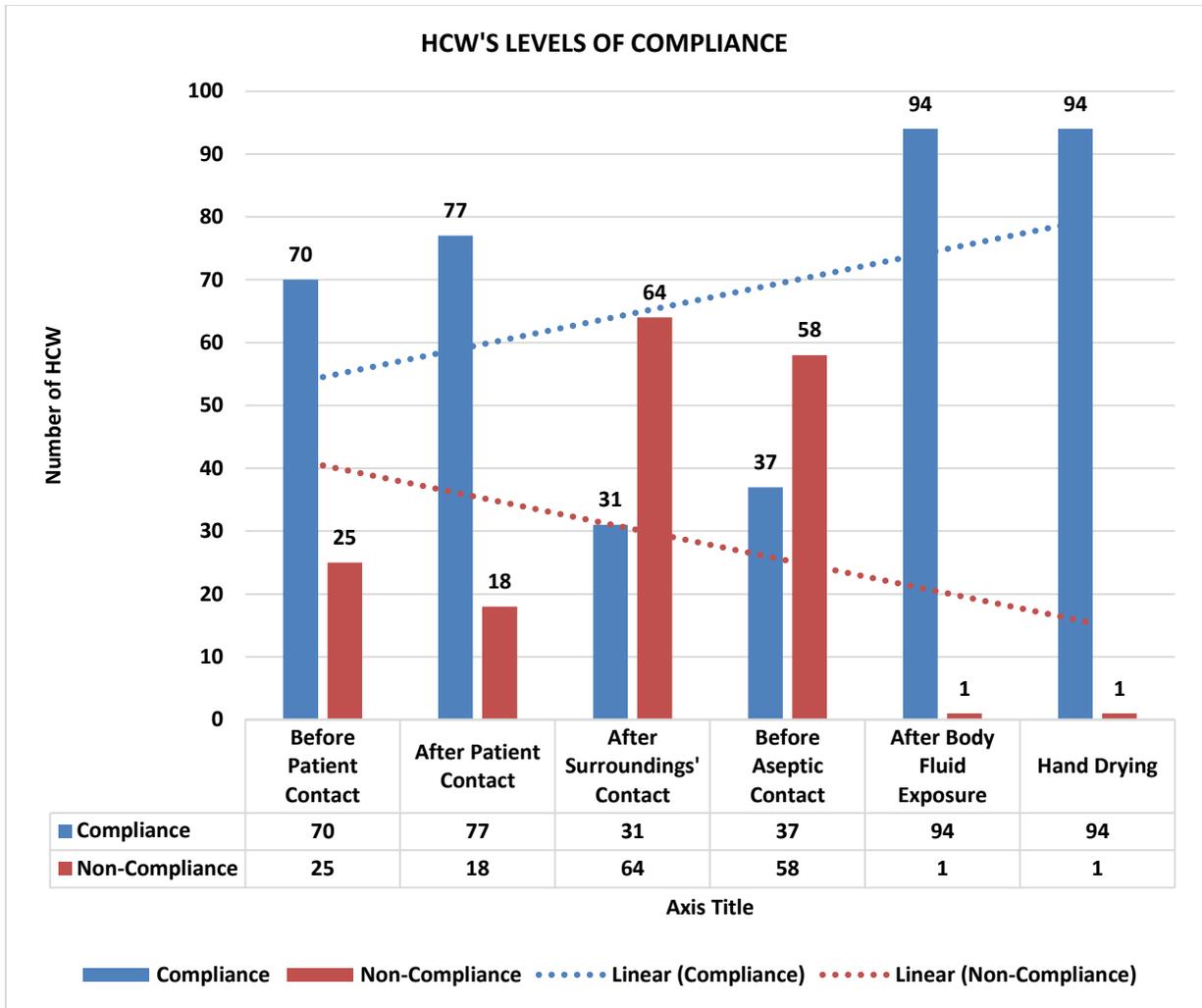
- *Strictly do hand hygiene after touching patient surroundings such as bed linen, lockers and curtains because these items are in the patient's bed space environmental zone.*
- *Drying hands should always be carried out by all HCWs since wet hands help to spread HCAs.*
- *Clean hands properly and thoroughly for HCWs to control and prevent HCAs to save lives in healthcare settings and blocks chances for HCAs to spread.*
- *Be vigilant to control or prevent HCAs altogether under a zero-tolerance approach in healthcare organisations.*
- *Report continuously HCAs on a tally sheet (T5) of monthly monitoring in relation to hand hygiene surveillance audits in Zimbabwe among HCWs, and carry out further evaluation, and feedback to employers and HCWs as a reinforcement of compliance in health care settings.*
- *Audit continuously on monthly basis monitoring of hand hygiene surveillance in Zimbabwe.*
- *Wash your hands thoroughly or use alcohol gels to decontaminate hands.*
- *Dry your hands thoroughly before the next move to the next patient.*

Figure 8.3 guides in hand hygiene opportunities and moments observed. Figure 8.4 guides HCWs in levels of hand hygiene compliances.



(Devised by researcher)

FIGURE 8.3 GUIDES HAND HYGIENE OPPORTUNITIES AND MOMENTS OBSERVED TO MOTIVATE HEALTHCARE WORKERS TO DO FURTHER RESEARCH IN CONTEXTS



(Devised by researcher)

FIGURE 8.4 GUIDES HCWs LEVELS OF COMPLIANCE

8.5 PREDISPOSING

There is a plethora of factors that influence health behaviour, which in turn are grouped into predisposing factors that influence HCWs' motivation to change in order to achieve hand hygiene compliance in healthcare settings to alleviate HAIs:

8.5.1 Requirements for healthcare workers

Patients and HCWs should use predisposing factors, reinforcing factors, enabling factors, health education promotion strategies, organisational policies, and regulations to foster hand hygiene compliance among HCWs, patients, families, and visitors in the healthcare institutions:

8.5.2 Promote hand hygiene compliance across all social groups of the communities.

8.5.3 Ensure that hand hygiene resources are available and accessible for everyone to use regardless of social class in healthcare organisations.

8.6 REINFORCING

Reinforcing factors come into play following a behaviour occurrence and can encourage or discourage continuation of the favoured behaviour. In order to encourage continuation of HCWs hand hygiene compliance: -

8.6.1 Avail policies, regulations and guidelines that are considered to foster HCWs' hand hygiene compliance, resulting in the control and prevention of HCAs in the Mutoko and Mudzi districts public health care institutions in Zimbabwe.

8.6.2 Willingness of HCWs to comply with hand hygiene in attitudes and behaviour to follow the guidelines for fostering HCWs hand hygiene compliance is important to prevent and control HCAs.

8.6.3 Support fostering HCWs hand hygiene compliance by exemplary behaviours of other people, peers, parents, patients, in partnership with employers and even the country's overall government as employer.

8.6.4 Ensure availability and accessibility for HCWs in Mutoko and Mudzi districts in Zimbabwe the following:

- 8.6.4 .1 *Uninterrupted supply of clean, purified, and safe water.*
- 8.6.4 .2 *Hand washing facilities with running tap water.*
- 8.6.4.3 *Full complement of staff to work on a span of duty.*
- 8.6.4.4 *Diesel or electric water pumps, and boreholes, so that there is always a water supply for hand washing.*
- 8.6.4.5 *Hold workshops as refresher courses for HCWs henceforth strengthening educational strategies that raise hand hygiene compliance to alleviate HCAs.*
- 8.6.4.6 *Remind HCWs amicably when they forget to do hand hygiene by consumers of healthcare services in healthcare environments.*
- 8.6.4.7 *Urge HCWs to do hand hygiene by patients when HCWs do not clean hands during attending to patients.*
- 8.6.5 *Feedback HCWs on the performance on hand hygiene compliance.*
- 8.7.6 *Collaborate with the WHO in matters of improving hand hygiene compliance of its population even in remote rural based healthcare institutions because Zimbabwe is a member of the WHO.*
- 8.6.7 *Robustly monitor HCAs and document on tally sheet lists for surveillance, and hand hygiene compliance surveillance audit monthly in order to reduce HCAs and to assist with future further research.*

8.7 ENABLING

8.7.1 Supportive changes in HCWs' behaviours or work environments include

- 8.7.1.1 *Avail resources for HCWs to access and utilise in order to achieve hand hygiene compliance.*
- 8.7.1.2 *Do skilful, strategic hand hygiene compliance to prevent and control HCAs.*
- 8.7.1.3 *Remove barriers for HCWs to achieving hand hygiene compliance*
- 8.7.1.4 *Champion HCWs hand hygiene compliance in the communities to*

prevent and control HCAs.

8.7.2 For the five main critical challenges faced by healthcare workers

8.7.2.1 Provide clean and safe continuous drinkable water supply so that it is always available.

8.7.2.2 Provide sufficient detergents in the health care institutions for availability to use.

8.7.2.3 Provide gloves and other protective clothing and equipment for HCWs to use.

8.7.2.4 Provide full staffing levels to alleviate staff shortages that lead to stress levels accompanied by being very busy.

8.7.2.5 Repair boreholes and water pumps when they break down as matter of emergency, and there should always be fuel available to run the water pump engines for essential services to keep running smoothly and to alleviate HCAs.

8.7.2.6 Uplift forgetfulness to help HCWs hand hygiene compliance to changing gloves, wash hands or use of alcohol gels to rub to prevent and control HCAs.

8.8 EDUCATIONAL STRATEGIES

8.8.1 Adopt the guidelines in curricula of schools, colleges and environmental authorities as educational strategies on HCWs hand hygiene compliance guidelines.

8.8.2 Foster the guidelines for HCWs hand hygiene compliance to become a normalcy of social community culture through learning.

8.8.3 Teach HCWs the guidelines as educational strategies for fostering HCWs' hand hygiene compliance.

8.8.4 Evaluate HCWs hand hygiene compliance guidelines to ensure they are effective in preventing and controlling HCAs.

8.9 ORGANISATION POLICIES, REGULATIONS AND GUIDELINES

8.9.1 Adopt the guidelines readily into the health care system one works in of a country like Zimbabwe, in places such as Mutoko and Mudzi districts healthcare organisational policies and regulations.

8.9.2 Incorporate the guidelines readily into the health care system one works in such as Mutoko and Mudzi districts healthcare organisational policies and regulations.

8.9.3 Implement the guidelines readily into the health care system one works in of a country like Zimbabwe, in places such as Mutoko and Mudzi districts healthcare organisational policies and regulations to predispose, reinforce and enable HCWs hand hygiene compliances.

8.9.4 Foster the guidelines for HCWs hand hygiene compliance to alleviate HCAs and improve quality of life.

8.9.5 Value the guidelines as own to ensure HCWs' hand hygiene compliance happens so that HCAs are prevented and controlled in various healthcare settings such as those of Mutoko and Mudzi districts in Zimbabwe.

8.9.6 Review the guidelines further in view of the resources that are needed to implement a proposed programme's methods and strategies in healthcare settings taking into consideration provision of human power, money, material and time constraints.

8.9.7 Evaluate the guidelines furthermore as continuous process to assess the resources that are needed to continuously implement a proposed programme's methods and strategies in healthcare settings taking into consideration provision of human power, money, material and time constraints in order to achieve HCWs' hand hygiene compliance.

8.9.8 Adapt the guidelines for use in organisational policies in health care settings in Mutoko and Mudzi districts.

8.9.9 Monitor hand hygiene compliance and HCAs in communities.

8.9.10 Document and report hand hygiene compliance and existence of HCAs in health care settings.

8.9.11 Ensure that healthcare services are designed around those who need to use them; patients, families and communities thereby management and leadership structures should implement policies and strategies especially use the current guidelines.

8.9.12 Provide resources for improving hand hygiene compliance to prevent and control HCAs by management and leadership organisational structures.

8.9.13 Plan organisational policies and regulations for the provision of basic essential resources such as clean running water, uncontaminated soap, drying paper towels and that these should be available, affordable and accessible in healthcare facilities.

8.10.14 Institutional policies, regulations procedures and guidelines should use reinforcing factors such as, patients reminding HCWs, reporting HCWs to the managers in charge, HCWs reminding each other and patients having a right to complain about poor hand hygiene practices. In addition, strengthen educational

strategies for fostering hand hygiene compliance among HCWs, thereby preventing and controlling HCAs.

8.9.14.1 *Clean hands before touching patients, before clean or aseptic procedures, after exposure to body fluids, and after HCWs touch patient's surroundings.*

8.9.14.2 *Remind each other as HCWs or by patients to perform hand hygiene in a collaborative, amicable and calm manner during duty of care with patients.*

8.9.14.3 *Carry on doing hand hygiene promotion educational strategies or campaigns for hand hygiene compliance.*

8.9.14.4 *Give feedback to HCWs for health education promotion in the Mutoko and Mudzi district public health care institutions.*

8.9.14.5 *Make hand hygiene compliance highest priority and should be addressed with the right organisational cultures in order to deal effectively with HCAs in the communities.*

8.10 ENVIRONMENT

Environment is considered to play a role in all the phases of the Precede-Proceed model. Henceforth, all activities do happen within the environment for the research defined key terms to be operationalised within the Precede – Proceed model concepts to bring about the outcome of quality of life in the context.

8.10.1 *Assess and evaluate continually HCWs guidelines to be in-cooperated in own (HCWs) healthcare settings' policies and procedures from time to time.*

8.10.2 *Plan guideline strategies to be inclusive of health education programmes directed towards HCWs for fostering hand hygiene compliance and also organisational policies and regulations to be adopted and implemented from the developed guidelines.*

8.10.3 Comply with hand hygiene guidelines, policies and regulations in the organisations to alleviate HCAs in the environment's healthcare settings.

8.10.4 Follow standard precautions against HCAs to prevent and control them from spreading in the environment.

8.10.5 Attend to hand hygiene strictly after touching patient surroundings such as bed linen, lockers, and curtains to prevent HCAs spreading.

8.10.6 Ensure dry hands after cleansing because wet hands help to spread microbes from patient to patient leading to HCAs and into the environmental health care settings.

8.10.7 Report hand hygiene surveillance monitoring among HCWs on tally sheet (T5) monthly monitoring.

8.10.8 Research further hand hygiene compliances evaluations to maintain the highest hand hygiene practices in health care environments' settings through guidelines and policy statements.

8.10.9 Feedback to employer and employee, HCWs hand hygiene compliance performances for improvements to alleviate HCAs.

8.10.10 Cleanse hands after surroundings contact and before carrying out aseptic procedures such as venepuncture, lumbar puncture, and catheterisation.

8.10.11 Comply absolutely with guidelines for hand hygiene compliance when it is reasonable to do so, abide with isolation precautions, clean patient environment, change protective clothing between patients, and dispose off sharps and sharps bins as role models even for all healthcare students because HCWs hand hygiene compliance plays a core key role in preventing and controlling transmission of HCAs in the environment's healthcare settings.

8.11 CONCLUSION

Precede-Proceed model concepts with Theory of Planned Behaviour have guided the development of guidelines for fostering HCWs hand hygiene compliance in Mutoko and Mudzi districts in Zimbabwe. Therefore, guidelines should be adopted, adapted, moulded, implemented and furthermore evaluated by the HCWs themselves in the multicultural contexts. The guidelines belong to the HCWs of Mutoko and Mudzi districts in Zimbabwe but can also be extrapolated to other healthcare institutions nationally in Zimbabwe, across the African continent from Cape to Cairo and globally. The next Chapter, (Chapter 9) presents the summary, conclusions and recommendations of the study.

CHAPTER 9

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

9.1 INTRODUCTION

This chapter addresses the following: Summary of main findings from each strand of the study, conclusions drawn from the study, recommendations made, contributions of the study, limitations of the study and conclusions. The conclusions are based strictly on the key findings in the study based on the specific questions and objectives. Recommendations are therefore strictly based on the conclusions derived from the study results as evidence. Recommendations focus on the participants of the study as guided by the model pooling relationships among patients, HCWs hand hygiene compliance and HCAs. The purpose of the study from the scholarly view point was firstly to develop guidelines as the offshoots of addressing the particular research problem to promote hand hygiene compliance among HCWs, at Mutoko and Mudzi districts in Zimbabwe, with a focus to prevent and control HCAs. From the findings, the researcher derived recommendations and developed guidelines for fostering hand hygiene compliance among HCWs at Mutoko and Mudzi districts in Zimbabwe.

9.2 SUMMARY OF THE STUDY

This study was conducted in the Mashonaland East Province in Zimbabwe, Southern Africa region. The study settings were two government district hospitals and two church-related mission hospitals, as well as 36 primary rural health centres, government of Zimbabwe and church-missionary related run healthcare institutions.

Researcher contributed guidelines as an offshoot from the findings to fill in gaps identified in literature because there is validity and trustworthiness in order to make HCWs to practice effectively in hand hygiene compliance issues. The Precede-Proceed model coupled with Theory of Planned Behaviour also guided in literature review, methods, collection, analysing data, validation and corroboration together with other specific literature review in World Health Organization, Centres for Disease Control and Prevention, journals and books.

Therefore by using Precede-Proceed model concepts into the research wheel continuum the needs of the public as patients and HCWs in clinical healthcare settings were identified in Phase 1 in order to improve the quality of life in context. In Phase 2, the researcher identified the factors that advancedly influence the outcome the public expects in their care as patients' interests including HCWs themselves on what they need that must be changed and determined which of them are most likely to be changed. For Phase 1 and 2 research questions and objectives were constructed in order to find solutions to research problems and develop guidelines as an offshoot of findings for fostering HCWs hand hygiene compliance and infection prevention and control as summarised in tables 1.1 to 1.4.

Predisposing, enabling, and reinforcing factors were identified in Phase 3. In Phase 3 and 4 guidelines were developed as interventional theory. In Phase 4 the Government of Zimbabwe MOH & CW should deal with the administrative and policy issues that include generating funding and mobilising other resources for the utilisation of the guidelines in order to foster HCWs hand hygiene compliance. Implement the guidelines in Phase 5. HCWs should carry out hand hygiene audits as well as HCAs monitoring and further process evaluative researches to make corrections for further improvements of the guidelines in HCWs own rights and contexts in phase 6. In Phase 7, there is need to evaluate whether the guidelines are having the intended impact and the HCWs themselves should be able to continually assess as that process. Lastly is the

outcome evaluation of the intended goal to give rise to quality of life in Phase 8. The reader is referred to Figures 3.1 to 3.2 and tables 7.1 to 7.4 for further clarity on the application of Precede-Proceed model concepts and coupled with Theory of Planned behaviour.

9.2.1 Healthcare workers (n=95) were observed and (n=570) hand hygiene opportunities

This study was a non-experimental, exploratory, descriptive, and contextual in nature, using the mixed methodology approach. Demographic characteristics of patients were discussed in fore frontiers to enable the reader to have a clear vision of the HCWs business commitment with patients during duty of care. Hand hygiene of (n=95) HCWs was observed, and (n=570) hand hygiene opportunities were seen that included compliance and non-compliance. Hand hygiene patterns were identified on analyses and underpinned by inductive logic reasoning towards logic discovery.

Hand hygiene compliance has been identified as one of the cornerstones of primary health care based on practical sound and socially acceptable, self-reliance and self-determination through full participation at an affordable cost and universally accessible. Hand hygiene is necessary for ensuring the promotion of healthcare prospects for HCWs and families in hand hygiene compliance, which in turn appear to benefit the nation in preventing and controlling HCAs. Hand hygiene observed opportunities inform interviewed patients' data and HCWs' data on challenges they face and furthermore inform the retrospective review of HCAs associated morbidities and mortalities.

9.2.2 Patients interviewed and healthcare workers self-administered questionnaires

Interview schedules were administered to elicit data leading to ways to foster HCWs hand hygiene compliance in Mutoko and Mudzi district hospitals, from 574 patients. Self-administered questionnaires were also used to collect data from 189 HCWs, to investigate the challenges they faced in accomplishing hand hygiene compliance. Furthermore, statistical consultation tests were carried out to search for factors leading towards development of guidelines for fostering hand hygiene compliance in order to prevent and control HCAs. This was underpinned by the deductive logic reasoning of the study for justification.

9.2.3 Retrospective review of healthcare associated infections and mortalities

A retrospective review of HCAs associated mortalities on records at the Mutoko and Mudzi district health care institutions was carried out. When hand hygiene compliance, and infection prevention and control are carried out among HCWs, this means that outbreaks of HCAs (such as the common cold, TB, pneumonia, diarrhoea, and opportunistic MRSA infections as well as other emerging infections) could be reduced or prevented, resulting in improvement of Quality of Life (QOL), within health care institutions in the remote rural Mutoko and Mudzi districts in Zimbabwe in Southern Africa.

9.3 CONCLUSIONS OF THE STUDY

9.3.1 Healthcare workers were observed and hand hygiene opportunities

In this study, it was concluded that among the HCWs in the Mutoko and Mudzi district public health care institutions, the hand hygiene compliance rate was 403(70.7%), and the non-compliance rate was 167(29.3%). This appears to leave a gap of 167(29.3%) opportunities of spreading HCAs through contaminated HCWs hands in Mutoko and Mudzi districts health care institutions in Zimbabwe.

With reference to Figures 8.4 and 8.5 it was concluded that the HCWs' hand hygiene compliance is low and the HCWs hand hygiene patterns are not even. It can be concluded that as one move from one moment to the next, the level of linear compliance increases towards the last moment, whereby hand drying was done by 94(16.5%) HCWs whilst 1(0.2%) did not comply with hand hygiene in the study. For those who did not comply, the level of linear non-compliance decreased throughout the moments.

9.3.2 Patients and healthcare workers

Majority of patients expressed sad faces indicating that they did not want to be touched by HCWs with dirty hands. Whilst some of the patients would remind HCWs and others would report to person in charge of the unit. However HCWs also expressed the challenges they face in achieving hand hygiene compliance. HCWs also made their own recommendations, which foster guidelines for HCWs hand hygiene compliance in Mutoko and Mudzi districts in Zimbabwe.

9.3.3 Review focus on healthcare associated infections and associated mortalities

HCAIs could not be conclusively established because there was no enough evidence. There was no sufficient evidence of infections documented as HCAIs in the reviewed mortalities records. However, HCAIs remain hidden and are an unforeseen danger in health care institutions in Mutoko and Mudzi districts in Zimbabwe.

Figure 8.3 reflects death rates in the two districts from all recorded conditions on mortalities by the Registrar General's Office of the respective districts. Mutoko District had more deaths than Mudzi District in all the five years from 2007 to

2011, except in 2007. Whereas Mudzi district had higher death rates in the other years except in 2008.

9.4 CONCLUSIONS OF THE STUDY BY QUESTIONS AND OBJECTIVES

The research questions and objectives were fully addressed with reference to tables 1.1 to 1.4 summarised in chapter 1. These research questions and objectives were achieved in the study comprising of:-

9.4.1 Healthcare workers were observed and hand hygiene opportunities

The first research question was aligned to the first objective. This was addressed when the researcher observed HCWs (n=95) hand hygiene opportunities (n=570) in the healthcare settings. This is elaborated in Table 1.1

9.4.2 Patients and healthcare workers

Research questions aligned to the objectives were addressed for the interviewed patients, and HCWs challenges they faced in accomplishing hand hygiene compliance in the healthcare settings to prevent and control HCAs. These are shown in Tables 1.2 and 1.3.

9.4.3 Review of healthcare associated infections and related mortalities

What are the HCAs associated mortalities at Mutoko and Mudzi districts in Zimbabwe? What is the relationship between promotion of hand hygiene among patients, HCAs and the HCWs hand hygiene compliance? This aspect of the study was answered. The fourth objective was covered in retrospect review of HCAs and their associated mortalities even though HCAs are not clearly

evidenced, surveillanced, monitored and documented on tally sheets (T5) the country uses.

9.5 CONTRIBUTIONS OF THE STUDY

The study is an advocate barrister fostering hand hygiene 70.7% compliance *vis-a-vis* 29.3% non-compliance. This study has contributed new guidelines to the body of knowledge of clinical hand hygiene compliance with a focus to prevent and control HCAs. This study has highlighted some gaps in knowledge within the healthcare context in Mutoko and Mudzi remote districts in Zimbabwe that were intervention aligned. Some of the gaps were hand hygiene compliance rates, the burden of HCAs and contextualised guidelines for HCWs to use in the healthcare settings. Some of the identified gaps are recommended for further study with regard to hand hygiene compliance *vis-a-vis* prevention and control of HCAs. Additionally, this study provided a foundational database for regulators in organisations and researchers, educators and administrators for management and leadership in practice plus courses as change agents' champions. The following recommendations are made for further research, education and clinical practice.

9.6 RECOMMENDATIONS OF THE STUDY

The guidelines should also be adapted for use in organisational policies in health care settings. Guidelines should also be addressed in curricula of schools, colleges and environmental authorities as educational strategies on hand hygiene at earlier stages of learning.

9.6.1 Healthcare workers were observed and hand hygiene opportunities

9.6.1.1 Provision of resources

It is recommended that the responsible authorities should swiftly resolve the needs and provide resources needed by HCWs including the alcohol gels to rub to cleanse hands when necessary. The needs of the HCWs are of paramount importance. The HCWs need continued support in implementing the guidelines that are presented in Chapter 8. Additionally, resources such as alcohol gels to rub on hands should be made available, accessible, and affordable whenever they are needed, as an armoury to fight against HCAs. These resources should be made available at the point of care for use by the patients' bed sides. Other personal protective equipment must be provided, as well as the provision of clean safe tap water, appropriate soaps, and hand drying resources while HCWs carry out their daily duties in the healthcare occupation.

9.6.1.2 Gaps

There are gaps that leave 167(29.3%) opportunities of spreading HCAs through uncleaned HCWs hands in Mutoko and Mudzi districts health care institutions in Zimbabwe. There is need for ongoing refresher courses and provision of resources on hand hygiene to address these gaps. The burden of HCAs in the Mutoko and Mudzi districts in the country is still unknown due to lack of surveillance. Guidelines should strengthen policies in public health.

9.6.1.3 Ongoing Surveillance

There is need for ongoing surveillance monitoring of hand hygiene compliance in health care institutions. HCAs should always be monitored and documented. What is monitored can be prevented and controlled and audit trailed for follow up.

9.6.1.4 Research

There is need for further research in hand hygiene compliance *vis - a - vis* infection prevention and control. Further research should be carried out in order to know the burden of HCAs in the two districts and the country as a whole.

9.6.2 Patients and healthcare workers

9.6.2.1 Should receive full assistance without delays

The identified factors by HCWs need to be addressed as a matter of urgency by the responsible authorities. The HCWs in the two districts should receive full assistance as in a timely manner. In the health care institutions, they are working they should receive help from the government as well as by non-governmental organisations or by the World Health Organisation either the Africa region office, or another international NGO office to meet their needs to promote hand hygiene.

9.6.2.2 Patients expressed their views

Patients expressed their view points for HCWs to improve on hand hygiene compliance before they are touched by the HCWs. Majority had sad faces indicating they did not want to be touched before HCWs does a clean or aseptic procedure on them and after touching patients' surroundings by HCWs with unclean hands. Majority of patients would remind HCWs and or report to person in charge of the unit. However, HCWs also expressed the challenges they face in accomplishing hand hygiene compliance and these need to be addressed as a matter of urgency without delays because it affects lives.

9.6.2.3 Recommendations made by healthcare workers

9.6.2.3.1 *“Uninterrupted supply of clean, purified, and safe water”*.

9.6.2.3.2 *“Hand washing facilities with running tap water”*.

9.6.2.3.3 *“Full complement of staff”*.

9.6.2.3.4 *“Diesel or electric water pumps, and boreholes, so that there is always a water supply for hand washing”.*

9.6.2.3.5 *“Holding of workshops for all HCWs was supported by a minority of the HCWs”.*

9.6.3 Mortalities in the two districts

Mortalities do not directly depict HCAs as they are a hidden danger, they need close monitoring and surveillance and that is lacking in Mutoko and Mudzi in Zimbabwe to enable coding in further follow up studies.

9.6.4 Recommendation for research, education and practice

9.6.4.1 Research

It is recommended that there should be continuous surveillance to monitor the HCWs hand hygiene compliance, and a continuous database of HCWs' compliance should be made available to DMOs and DNOs in the Zimbabwean districts and elsewhere globally. Each district and province should conduct their own studies so that HCWs' hand hygiene compliance rates are monitored and known throughout the country's public health care institutions. Officials further up the hierarchy should also be involved in directing the prevention and control of HCAs, including the Provincial Medical Director, officials in the Head Office of the MOH & CW for the epidemiology unit of the country, the Permanent Secretary for Health, and the minister for the Ministry of Health (who reports in parliamentary debates to the house of parliament). There should be further hand hygiene research in healthcare institutions throughout Zimbabwe. This will help researchers to build more databases, which will help to advance future research studies, organisational policy and regulation, and educational strategies that influence, predispose, reinforce, and enable HCWs to improve their hand hygiene compliance, as required by the MOH & CW in Zimbabwe, and by the

WHO. In the WHO, (2015a) International Classification of Diseases (ICD), HCAs should be clearly included and categorised as a group of diseases or conditions to be closely monitored, as HCAs contribute to YLLs (years of life lost) and DALYs (disability-adjusted life years) by killing patients unnecessarily or rendering them incapacitated (Bhattacharya, 2011:213). It is recommended that further research be done. The unknown substance used by HCWs for hand hygiene calls for further study to be conclusively known from which further intervention could be undertaken.

9.6.4.2 Education

The existence of guidelines should guide HCWs and enable them to use research evidence in practice and focus on improving hand hygiene compliance in context. Hand hygiene compliance should be based on an ever-developing body of knowledge derived from research and theory. HCWs should be educated to become both open-minded and hold a critical view of hand hygiene practices. Therefore they can identify areas of concerns and problems that need to be addressed by hand hygiene research (Macnee & McCabe, 2008:275). According to Bryman (2008:373) most exploratory researchers consider theory as something emerging resulting from collection and analyses of information. Others contradict this and instead advocate that qualitative information can and should have a role in relation to testing of theories also. Much of exploratory research involves the testing of theories in the processual nature of the research. HCWs would need some workshops to update their knowledge in hand hygiene compliance that result in HCAs prevention and control in Mutoko and Mudzi districts' healthcare settings in Zimbabwe

9.6.4.3 Practice

In administration, theory is useful in guiding patient care for patient safety, particularly hand hygiene compliance among the HCWs. In this study, HCWs in

the Mutoko and Mudzi districts should reduce and prevent infections (HCAIs). Theory is useful in helping an administration to understand comprehensively what is happening in health care settings with regard to hand hygiene, so that it can improve (Meleis, 2012:197). Guidelines presented for HCWs hand hygiene compliance and HCAIs prevention and control in patient care issues are theories. However, researcher contributed knowledge to the clinical field, and developed clinical practice guidelines for evidence-informed practice in hand hygiene compliance. There is need for further assessments, planning, research, evaluation, and feedback to HCWs on their hand hygiene compliance to alleviate HCAIs prevention and control.

9.7 LIMITATIONS OF THE STUDY

9.7.1 The study did not include surgical theatres

Hand hygiene compliance opportunities of HCWs in operating theatres were not observed. However eventhough HCWs were purposive sampled that limits generalisabilty to the population. Since this was a mixed methodology study generalisabilty could be extended to other districts in Zimbabwe situation with regards to HCWs hand hygiene compliance and HCAIs prevention and control.

9.7.2 Hand hygiene observations during night duty

HCWs hand hygiene opportunities were not observed during nights carried out due to time, personnel, and financial constraints.

9.7.3 The data collection was labour-intensive

Data collection was laborious and time-consuming therefore the data collection work was concentrated during day time.

9.7.4 The overall healthcare workers' compliance results

Hawthorne effect could have affected the compliance results as the HCWs were aware that they were being observed. Naturalistic observations were carried out without any control on HCWs daily routine duties. Observer bias was limited by bracketing and using inter-rated assessments prior to making the observations and periodically during the study period, in order to assess consistency. This was performed to make sure that the results were valid, credible and trustworthy. Cronbach's coefficient alpha also determined the internal consistency.

9.7.5 Mortalities do not directly depict healthcare associated infection rates

HCAIs were not monitored nor under surveillance in Zimbabwe at the time of study henceforward are they a hidden danger to the public? Therefore the study's approach from a mixed research point of view, the researcher could have included review of microbiological medical laboratory results to add more limelight into HCAIs in Mutoko and Mudzi districts health care institutions but laboratory data in most developing countries are unreliable in diagnosis of healthcare associated infections.

9.7.6 The healthcare associated infections are not clearly classified

HCAIs if they are not clearly classified in the ICD, it makes it much more difficult to monitor, prevent and control. If they were classified clearly it will make it easier for coders and HCWs to survey and monitor for prevention and control. HCWs in context utilise (T5) for the national data collection of condition profiles.

9.8 GENERALISATION, TRANSFERABILITY OF RESEARCH FINDINGS

Cronbach's coefficient alpha determined the internal consistency of the construct. The research majorly used multiphase research design for the mixed approach.

The research was guided by the Precede-Proceed model coupled with Theory of Planned Behaviour. There was statistical consultation to enable inferential statistics. Homoscedasticity in the histogram of residuals was found confirming statistical conclusion validity and integrity of the study from the statistical tests that were undertaken. Therefore, the findings could be generalised (transferable to other contexts) even though the study was only carried out in Mashonaland East Province in Zimbabwe at Mutoko and Mudzi districts. Further studies could be done using the data from this study that was guided by the Precede-Proceed model coupled with Theory of Planned Behaviour.

9.9 CONCLUSION

This mixed methodology research was an eye opener and a learning curve for the researcher. The study has transformed the researcher's academic life completely in adding new contribution to the existing body of knowledge in hand hygiene compliance. This Chapter summarises, concludes and makes recommendations of the study. Above all the study developed and presented guidelines. Hand hygiene compliance should be continuously monitored, carried out in a meticulous manner, ingrained and nurtured to become part of human behaviour in HCWs' work and community health systems, in order to improve quality of life by preventing and controlling HAIs. Hand hygiene compliance benefits both HCWs and communities because it saves lives, improves wellness, reduces suffering, reduces the costs and burdens of unnecessary infections to patients' families, reduces morbidity and mortality, and raises quality of life. Health education in hand hygiene should be promoted in communities: the whole family should be fully educated to raise hand hygiene cleanliness, and thereby raise quality of life across nations. There should be on-going hand hygiene compliance in healthcare settings, so that this can be culturally embedded and nurtured. The healthcare environment in the Mutoko and Mudzi district health care institutions tends to be dominated by female personnel, but both female and male personnel should be empowered to spearhead improvements as change

leaders in hand hygiene championing. HCWs in the Mutoko and Mudzi health care institutions in Zimbabwe need comprehensive support in all their efforts to accomplish ongoing hand hygiene compliance, general hygiene, and environmental cleanliness to prevent and control HCAs for quality of life.

The Precede-Proceed model coupled with the Theory of Planned Behaviour guided the conceptualisation, progression, and conclusions. Making theory clear is how ideas are consistently conceptualised and well understood, and is important to the application of theory for guiding research, practice, education, and administration. However, to have clarity in concepts is to have theoretical and operational definitions that are consistent. Concepts, when operationally defined, have content and construct validity. Therefore, the Precede-Proceed model coupled with Theory of Planned Behaviour is flexible and scalable to many ecological levels and in many health care settings. The Precede-Proceed model allows for full participation of HCWs, healthcare institutions and patients in a study context, and is a platform for evidence-based best practice. The model guides the development of guidelines and allows for implementing and evaluating these guidelines. Approaches to guidelines should be prioritised, as recommendations for implementation henceforth seriously upheld at all times by HCWs and the organisations they are employed to work, along with further new evaluations and future on-going surveillances for a feedback.

On a final note, this study has contributed guidelines for fostering hand hygiene compliance among HCWs to alleviate HCAs. Research is a “diligent, systematic study to validate and refine existing knowledge, and generate new knowledge that influences in one way or another delivery of evidence-based practice”. ‘Diligent’ and ‘systematic’ study is a sign of planning, collectiveness, and perseverance (Grove, Gray & Burns, 2015:3). Conclusively, in this study the empirical body of knowledge is the original contribution of the guidelines for fostering hand hygiene compliance and HCAs prevention and control among HCWs at the Mutoko and Mudzi district health care institutions in Mashonaland

East, Zimbabwe, in the Southern African region. Chapter 9 summarises, draws conclusions of findings and makes recommendations of the study fostering HCWs hand hygiene compliance in rural remote contexts.

REFERENCES

- Aamodt, A.M. (1991a). Ethnography and Epistemology: Generating nursing knowledge. In Morse, J.M., (Ed.). *Qualitative nursing research: A contemporary dialogue*. London: Sage Publications.
- Agha, M. (2012). Epidemiology and Pathogenesis of *C. difficile* and MRSA in the Light of Current NHS Control Policies: A Policy review. *Annals of Medicine and Surgery*, (1):39-43.
- Agodi, A. Auxilia, F. Barchitta, M. Brusaferrò, S. D'Alessandro, D. Grillo, O.C. Montagna, M.T. Pasquarella, C. Righi, E. Tardivo, S. Torregrossa, V. & Mura, I. (2013). Trends, risk factors and outcomes of healthcare-associated infections within the Italian network SPIN-UTI. *J Hosp Infect* 84(1):52-8.
- Agresti, A., (2013). *Categorical data analysis: 3rd edition*. Hoboken: John Wiley and Sons.
- Ajzen, I. (2005). *Attitudes, Personality and Behavior*. Chicago. 2nd edition. Milton Keynes, Open University Press/McGraw Hill: In Polit, D.F. & Beck, C.T. (2014). *Essentials of Nursing Research: Appraising Evidence for Nursing Practice*. 8th edition. Philadelphia: Wolters Kluwer.
- Akingbade, O.A. Olalekan, A.O. Okerentugba, P.O. Innocent- Adiele, H.C. Onoh, C.C. Nwanze, J.C. & Okonko, I.O. (2012). Multi-Drug Resistant (MDR), Urinopathogens among Patients Attending a Tertiary Hospital in Lagos, Nigeria. *Researcher*, 4(5):35-39.
- Akyol, A.D. (2007). Hand hygiene among nurses in Turkey: opinions and practices. *Journal of Clinical Nursing*, 16(3):431-7.

Aldeyab, M.A., McElnay, J.C., Scott, M.G., & Darwish Elhajji, F.W., (2014). Hospital antibiotic use and its relationship to age-adjusted comorbidity and alcohol-based hand rub consumption. *Epidemiol Infect* 142(2):404-8.

Alma- Ata. International conference on primary health care, Alma-Ata, USSR, 6-12 September 1978 Geneva: WHO, (1978). Available from www.who.int/hpr/NPH/docs/declaration_almaata.pdf; https://www.unicef.org/about/history/files/Alma_Atata_conference_1978_report.pdf (accessed 14 May 2017).

al Kadi, A. & Salati, S.A. (2012). Hand Hygiene Practices among Medical Students. *Hindawi Publishing Corporation Interdisciplinary Perspectives on Infectious Diseases*, Volume 2012; Article ID 679129.1-6.

Al-Tawfiq, J.A., & Pittet, D., (2013). Analyses / reviews of literature: Improving hand hygiene compliance in healthcare settings using behaviour change theories: Reflections. *Teaching and Learning in Medicine*, 25(4), 374–382.

Allegranzi, B. Gayet-Ageron, A. Damani, N. Bengaly, L. McLaws, M.L. Moro, M.L. Memish, Z. Urroz, O. Richet, H. Storr, J. Donaldson, L. & Pittet, D. (2013). Global implementation of WHO's multimodal strategy for improvement of hand hygiene: a quasi-experimental study. *Lancet Infect Dis*, 13 (10) 843–51.

Allegranzi, B. & Pittet, D. (2009). Role of hand hygiene in healthcare-associated infection prevention. *Journal of Hospital Infection*, 73(4); 305-315.

Alligood, M.R. (2014). *Evolution of Nursing Theories: Introduction to Nursing Theory: Its History, Significance, and Analysis. Nursing theory: Utilization & application*. 5th edition. Maryland Heights, MO: Mosby-Elsevier.

Archer, M.S. (1995). *Realistic Social Theory: The Morphogenetic Approach*. Cambridge, UK: Cambridge University Press.

Argyrous, G. (2011). *Statistics for research with a guide to SPSS: 3rd edition*. London: SAGE Publications.

Aziz, A. (2014). Hand hygiene compliance for patient safety. *British Journal of Healthcare Management*, 20(9):428.

Babbie, E. (2010). *The practice of social research: 12th edition*. Belmont: Wadsworth.

Baran, M.L., & Jones, J.E. Creating and implementing a mixed method research study. In Baran, M.L. & Jones, J.E., (2016). (Eds.). *Mixed methods research for improved scientific study*. Hershey, PA. IGI Global.

Barnett, A.G., Page, K., Campbell, M., Brain, D., Martin, E., Winters, S., Hall, L. Paterson, D. & Graves, N. (2014). Changes in healthcare-associated infections after the introduction of a national hand hygiene initiative. *Health-care Infection*, 19(4):128-134.

Bartholomew, L.K. Markham, C. Mullen, P. & Fernandez, M.E. Planning Models for theory- based Health promotion interventions: In Glanz, K. Rimer, B. K. & Viswanath, K. (2015). (Eds). 5th edition. *Health Behaviour: Theory, Research and Practice*. San Francisco: John Wiley & Sons.

Baussano, I. Nunn, P. Williams, B. Pivetta, E. Bugiani, M. & Scano, F. (2011). Tuberculosis among healthcare workers. *Emerg Infect Dis*, 17(3):488-494.

Berger, P. & Luckmann, T. (1979). *The Social Construction of Reality. A Treatise in the Sociology of knowledge*. Hammondsworth: Penguin Books.

Bergum, V. Boyle, J.S. Stern, P.N. Munhall, P.L. Hutchinson, S.A. Lipson, J.G. Morse, J.M. Tripp-Reimer, T. Knafel, A. May, K.A. & Anderson, J.M. *Dialogue on*

Bracketing: In Morse (1991a). (Ed.). *Qualitative Nursing Research: A Contemporary Dialogue*. Revised ed. Newbury Park: Sage Publications.

Bhattacharya, S., (2011). Is screening patients for antibiotic-resistant bacteria justified in the Indian context? *Indian Journal of Microbiology*, 29(3):213-217.

Black, D. Groves, R. Hucker, H. & McKeown, C. (2011). 11thedition. *Collins Paperback English Dictionary*, Glasgow: Harper-Collins Publishers.

Blaxter, L., Hughes, C., & Tight, M. (2010). *How to research*. 4thedition. Maidenhead: Open University Press.

Bolam v Friern Hospital Management Committee: 1957. 2 All ER 118 in Brazier, M. & Cave, C. (2007). *Medicine: patients and the law*. Penguin Books: Clays Ltd.

Braly, V., Amuta, A., & McNeill, E.B. (2012). A Section of the PRECEDE–PROCEED Model and Its Application in Fictional Podunk, Texas: A Strategy for Preparing Future Health Education Specialists to Use Planning Models. *Journal of Health Education Teaching Techniques*. 2 (2), 1–15. Available from: js.sagamorepub.com/jhett/article/download/6075/4921 (accessed 12 August 2016).

Brazier, M., & Cave, C. (2007). *Medicine: patients and the law*. Penguin Books: Clays Ltd.

Brink, P.J. *Issues of reliability and validity*: In Morse, J.M. (1991a). (Ed.). Revised Edition, *Qualitative Nursing Research: A contemporary dialogue*. Newbury Park: Sage Publications Ltd.

Bryman, A. (2008). *Social Research Methods*. 3rdedition. Oxford: Oxford University Press.

Bryman, A., & Bell, E. (2015). *Mixed methods research: combining quantitative and qualitative research*. In *Business research methods*. 4th edition. Oxford: Oxford University Press.

Boyatzis, R.E. (1998). *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks: Sage Publications.

Burke, S.J., Lass, E., Thistle, P., Katumbe, L., Jetha, A., Schwarz, D., Bolotin, S., Barker, R.D., Simor, A. & Silverman, M., (2014). Increased Incidence of Tuberculosis in Zimbabwe, in Association with Food Insecurity and Economic Collapse: An Ecological Analysis: *PLoS ONE* 9(2): e83387. doi:10.1371/journal.pone.0083387.

Burns, N., & Grove, S.K. (2009). *The Practice of Nursing Research: Appraisal, Synthesis, and Generation of Evidence*. 6th edition. St Louis, Missouri: Saunders Elsevier.

Butterfoss, F.D. Kegler, M.C., & Franscisco, V.T., (2008). Theories of Organizational Change: In Glanz, K. Rimer, B.K. & Viswanath, K. 4th edition. *Health Behaviour and Health Education: Theory, Research and Practice*. San Francisco: John Wiley & Sons.

Calfee, D.P. Salgado, C.D. Milstone A.M. Harris, A.D. Kuhar, D.T. Moody, J. Aureden, K. Huang, S.S. Maragakis, L.L. & Yokoe, D.S., (2014). Strategies to prevent methicillin-resistant *Staphylococcus aureus* transmission and infection in acute care hospitals: update. *Infect Control & Hosp Epidemiol*, 35(7):772-96.

Caron, A. Cornelis, D. Foggin, C. Hofmeyr, M. & de Garine-Wichatitsk, M. (2016). African buffalo movement and zoonotic disease risk across Transfrontier Conservation Areas: Southern Africa. *Emerg Infect Dis*, 22(2):169-361.

CDC. (2002).Centers for Disease Control and Prevention.Guideline for Hand Hygiene in Health-Care Settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. MMWR 51 (RR- 16): [inclusive page numbers]. Available from: <https://www.cdc.gov/mmwr/PDF/rr/rr5116.pdf> (accessed 8 August 2015).

CDC: (2013). Centre for Disease Control and Prevention. Antibiotic resistance threats in the US: US Department of Health and Human Services. Available from: <http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf#page=14> (accessed 10 December 2015).

Chassin, M.R., Mayer, C., & Nether, K. (2015). Infection Prevention and Control: Improving Hand Hygiene at Eight Hospitals in the United States by Targeting Specific Causes of Noncompliance. *The Joint Commission Journal on Quality and Patient Safety*, 41(1):4-12.

Chinn, P.L., & Kramer, M.K., (2004). *Integrated knowledge development*. 6th edition. St Louis: CV Mosby: In Meleis, A.I. (2012). *Theoretical Nursing Development and Progress*: 5thedition. Wolters Kluwer Health: Philadelphia: Lippincott Williams & Wilkins.

Chinn, P.L., & Kramer, M.K., (2011). *Integrated knowledge development in nursing*: 8th edition. St. Louis: Elsevier-Mosby. In Alligood, M.R., (2014). *Evolution of Nursing Theories: Introduction to Nursing Theory: Its History, Significance, and Analysis*. *Nursing theory: Utilization & application*. 5thedition. Maryland Heights, MO: Mosby-Elsevier.

Claassens, M.M., van Schalkwyk, C., du Toit, E., Roest, E., Lombard, C.J, Enarson, D.A., Beyers, N, & Borgdorff, M.W. (2013). Tuberculosis in healthcare workers and infection control Measures at Primary Healthcare Facilities in South

Africa. PLoS ONE 8(10): e76272. doi:10.1371/journal.pone.0076272: Available from:

https://www.researchgate.net/publication/257464916_Tuberculosis_in_Healthcare_Workers_and_Infection_Control_Measures_at_Primary_Healthcare_Facilities_in_South_Africa (accessed 21 September 2018).

Craig, D.V. (2009). *Action research essentials*. San Francisco: Jossey-Bass.

Community Tool Box: (2018). Chapter 2, Section 2. PRECEDE- PROCEED. Generic representation of the Precede- Proceed Model: Available from: <http://ctb.ku.edu/en/table-contents/overview/chapter-2-other-models-promoting-community-health-and-development/section-2> (accessed 10 September 2018).

Contzen, N., Meili, I.H., & Mosler, H.J., (2015). Changing handwashing behaviour; in southern Ethiopia: a longitudinal study on infrastructural and commitment interventions. *Soc Sci Med*, 124:103-14.

Copeland, A.J., Cartner, T., Edmonds, L.S., & Tian, K., (2015). Alcohol-Based Hand rubs Formulated Developed Specifically for High-use Environments Can Improve Key Skin Condition Measures While Maintaining Aesthetics and Antimicrobial Efficacy. *AJIC*, 43(6):S38. Available from: [http://www.ajicjournal.org/article/S0196-6553\(15\)00339-9/pdf](http://www.ajicjournal.org/article/S0196-6553(15)00339-9/pdf) (accessed 18 October 2015).

Coward, D.D. (1990). Critical Multiplism: a research strategy for nursing science. Image; *Journal of Nursing Scholarship*: 22(3).163-167. In Grove, S.K. Burns, N. & Gray J.R., (2013). *The Practice of Nursing Research: Appraisal, Synthesis and Generation of Evidence*, 7th edition. Elsevier Saunders: St Louis.

Cozby, P.C. (2009). *Methods in behavioural research*. 10th edition. Boston: McGraw- Hill.

Creedon, S.A. (2005). Healthcare workers decontamination practice: compliance with recommended guidelines. *Journal of Advanced Nursing*, 51(3):208-216.

Creedon, S.A. Slevin, B, De Souza. V., Mannix, M, Quinn, G., Boyle, L. Doyle, A. O'Brien, B. O'Connel, N., & Ryan, L. (2008). Hand hygiene compliance: exploring variations in practice between hospitals. *Nursing Times*, 104 (49): 32-35.

Creedon, S.A. (2011). *Nosocomial Infections: Hidden HCAs WHO* in Fitzpatrick, J.J. & Kazer, M.W. *Encyclopedia of Nursing Research: 3rd edition*. New York: Springer Publishing Company. Available from: https://books.google.co.uk/books?id=ij9w1f5wQ3wC&pg=PA320&lpg=PA320&dq=hidden+HCAs+WHO&source=bl&ots=CP8KQt9WkW&sig=7UjM3twdNp8InAm6MVDL3P7I8Z0&hl=en&sa=X&ved=0CEIQ6AEwBWoVChMlvOqJk--MxwIVQ9geCh1s_A7N#v=onepage&q=hidden%20HCAs%20WHO&f=false (accessed 5 May 2014).

Creswell, J.W. & Plano Clark, V.L. (2006). Chapter 1: Understanding mixed methods research in *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage. Available from: https://www.sagepub.com/sites/default/files/upm-binaries/10981_Chapter_1.pdf (accessed 10 September 2018).

Creswell, J.W. (2007). *Qualitative inquiry & research design. Choosing among five approaches*. 2nd edition. Thousand Oaks, C.A: Sage Publications.

Creswell, J.W. (2009). *Research design: Qualitative, quantitative and mixed methods approach*. 3rd edition. Los Angeles C.A: Sage: In Burns, Grove & Gray,

(2013). *The Practice of Nursing Research: Appraisal, Synthesis and Generation of Evidence*. 7th edition. St Louis: Elsevier Saunders.

Creswell, J.W. & Plano Clark, V.L. (2011). *Designing and conducting mixed methods research*. 2nd edition. Thousand Oaks, C.A: Sage.

Creswell, J.W. & Plano Clark, V.L. (2018). *Designing and conducting mixed methods research*. 3rd edition. Thousand Oaks, C.A: Sage.

Crosby, R., & Noar, S.M. (2011). What is a planning model? An introduction to PRECEDE-PROCEED. *J Public Health Dent*, 71(1):S7-S15.

Crotty, M. (1998). *The foundations of social research: meaning and perspective in the research process*. London: Sage Publications.

Cruickshank, M. & Ferguson, J. (2008). (Eds.). *Reducing harm to patients from healthcare associated infection: the role of surveillance*. Australian Commission on Safety and Quality in Health Care: Available from: <http://www.safetyandquality.gov.au/wp-content/uploads/2008/01/Reducing-Harm-to-Patient-Role-of-Surveillance1.pdf> (accessed 15 October 2014).

Damani, N., (2012). *Manual of infection prevention and control*. 3rd edition. Oxford: Oxford University Press.

Daniel, E. (2016). The usefulness of qualitative and quantitative approaches and methods in researching problem -solving ability in science education curriculum: *Journal of Education and Practice*, 7(15), 91-100.

Datta, P., Rani, H., Chauhan, R., Gombar, S. & Chander, J. (2014). Health-care-associated infections: Risk factors and epidemiology from an intensive care unit in Northern India. *Indian J Anaesth*, 58(1):30-5.

Davis, G.S., Sevdalis, N., & Drumright, L.N., (2014). Spatial and temporal analyses to investigate infectious disease transmission within healthcare settings: *J Hosp Infect*, 86(4):227-43.

Dearmon, V. *Evidence-based leadership practices*: In Hall, H.R. & Roussel, L. A. (2014). *Evidence-based practice: An Integrative approach to research, administration, and practice*. Burlington, MA: Jones and Barnett Learning.

Denzin, N.K. (1989). *Interpretive Interactionism: Applied social research methods series*. Volume 16. Newbury Park: California. Sage Publications.

Denzin, N.K., & Lincoln, Y.S., (2005). (Eds.). 3rd Edition. *The Sage handbook of qualitative research*. Thousand Oaks. Sage Publications.

Dickoff, J., James, P. & Wiedenbach, E. (1968). Theory in practice discipline art 1. Practice oriented research. *Nursing Research*, 17(5): 415-435: In Moleki M.M. (2008). Critical care nursing students' experience of clinical accompaniment in open distance learning (ODL): A phenomenological perspective, Health Studies: University of South Africa. Available from: http://uir.unisa.ac.za/xmlui/bitstream/handle/10500/2966/dissertation_moleki_%20m.pdf?sequence=1 (accessed 2 December 2013).

Diercke, M., Beermann, S., Tolksdorf, K., Buda, S., & Kirchner, G. (2018). [Infectious diseases and their ICD coding: What could be improved by the introduction of ICD-11?] *Bundesgesundheitsblatt*, 61(7):806-811. Springer Berlin Heidelberg. Available from: <https://doi.org/10.1007/s00103-018-2758-3> (accessed 18 August 2018).

Dimond, B. (2008). *Legal Aspects of Nursing*: 5th edition. Essex: Pearson Education Limited.

Dormer, B. A., (1948). Tuberculosis in South Africa: Journal article: *Proceedings of the Transvaal Mine Medical Officers' Association*, 27 (298) 63-73. Available from: <https://www.cabdirect.org/cabdirect/abstract/19482702285> (accessed 20 September 2018).

Dormer, B.A., Friedlander, J., & Wiles, F.J., (1943). Proceedings of the Transvaal Mine Medical Officer's Association 23 (257). In Oswald, N.C., (1946). Pulmonary tuberculosis in African native troops: From a military hospital, Middle East Forces. *Thorax*, (1), 100. Available from: <https://thorax.bmj.com/content/thoraxjnl/1/2/100.full.pdf> (accessed 5 October 2018).

Driscoll, D.L., Appiah–Yeboah, A., Salib, P. & Rupert, D. J. (2007). Merging Qualitative and Quantitative Data in Mixed Methods Research: How To and Why Not. *Ecological and Environmental Anthropology*: 3(1).

Duerden, B., Fry, C., Johnson A. P., & Wilcox, M.H., (2015). The Control of Methicillin-Resistant *Staphylococcus aureus* Blood Stream Infections in England: *Open Forum Infect Dis* 2(2): ofv035. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4567090/> (accessed 2 December 2015).

Durlach, R. McIlvenny, G. Newcombe, R.G. Reid, G. Doherty, L. Freuler, C. Rodríguez, V. Duse, A.G. & Smyth, E.T. (2012). Prevalence survey of healthcare-associated infections in Argentina: comparison with England, Wales, Northern Ireland and South Africa. *J Hosp Infect* 80(3):217-23.

Editorial, (2015). Healthcare associated infections in the USA. *The Lancet*, 385(9965): 304. Available from:

[http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(15\)60101-5.pdf](http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(15)60101-5.pdf)

(accessed 3 March 2015).

Ellingson, K., Haas, J.P., Aiello, A.E., Kusek, L., Maragakis, L.L., Olmsted, R.N., Perencevich, E., Polgreen, P.M., Schweizer, M.L., Trexler, P., VanAmringe, M., & Yokoe, D.S. (2014). Strategies to prevent, healthcare-associated infections, through hand hygiene. *Infect Control Hosp Epidemiol*, 35(8):937-60.

Engelbrecht, M.C. & Van Rensburg, A.J., (2013). Tuberculosis infection control practices in primary healthcare facilities in three districts. *Southern African Journal of Epidemiology and Infection*, 28 (4): 221-226.

Engelbrecht M. van Rensburg, A.J. Kigozi, G. & van Rensburg, H.C.J. (2016). Factors associated with good TB infection control practices among primary healthcare workers in the Free State Province, South Africa. *BMC Infectious Diseases*, 16:633 DOI 10.1186/s12879-016-1984-2. Available from: <https://bmcinfectdis.biomedcentral.com/track/pdf/10.1186/s12879-016-1984-2?site=bmcinfectdis.biomedcentral.com> (accessed 20 September 2018).

Engelbrecht, M.C. Kigozi G, van Rensburg, A.P.J., & van Rensburg, H.C.J., (2018). Tuberculosis infection control practices in a high-burden metro in South Africa: A perpetual bane for efficient primary health care service delivery. *African Journal of Primary Health Care & Family Medicine*: 10(1). Available from: https://www.researchgate.net/publication/325452281_Tuberculosis_infection_control_practices_in_a_high-burden_metro_in_South_Africa_A_perpetual_bane_for_efficient_primary_health_care_service_delivery (accessed 29 November 2018).

Fitzpatrick, J.J., & Kazer, M. (2011). *Encyclopedia of Nursing Research: 3rd edition*. New York Springer Publishing Company. Available from:

https://books.google.co.uk/books?id=ij9w1f5wQ3wC&pg=PA320&lpg=PA320&dq=hidden+HCAIs+WHO&source=bl&ots=CP8KQt9WkW&sig=7UjM3twdNp8InAm6MVDL3P7I8Z0&hl=en&sa=X&ved=0CEIQ6AEwBWoVChMlvOqJk--MxwIVQ9geCh1s_A7N#v=onepage&q=hidden%20HCAIs%20WHO&f=false

(accessed 5 May 2014).

Ford, N. Shubber, Z. Meintjes, G. Grinsztejn, B. Eholie, S. Mills, E.J. Davies, M.A. Vitoria, M. Penazzato, M. Nsanzimana, S. Frigati, L. O'Brien, D. Ellman, T. Ajose, O. Calmy, A. & Doherty, M. (2015). Causes of hospital admission among people living with HIV worldwide: a systematic review and meta-analysis. *Lancet HIV*, 2(10):e438-44. Available from:

[http://www.thelancet.com/pdfs/journals/lanhiv/PIIS2352-3018\(15\)00137-X.pdf](http://www.thelancet.com/pdfs/journals/lanhiv/PIIS2352-3018(15)00137-X.pdf)

(accessed 7 December 2015).

Frieden, T. (2014). National strategy for combating antibiotic resistant bacteria: *U.S. Centers for Disease Control and Prevention*: Whitehouse, Washington. Available from:

https://www.cdc.gov/drugresistance/pdf/carb_national_strategy.pdf

(accessed 18 November 2016).

Fuller, C. McAteer, J. Slade, R. Cookson, B. Michie, S. Savage, J. & Stone, S. (2009). Modified Hand Hygiene Observation Tool (MHHOT). Available from: Hand Hygiene Observation Tool (HHOT). Revised version incorporating the WHO'S 5 moments for hand hygiene. On behalf of the FIT study team. *Royal Free & University College Medical School: UCL*. Available from:

[http://www.birmingham.ac.uk/Documents/college-mds/haps/projects/cfhcp/psrp/Appendices/Appendix9-HHOT\(2009\).pdf](http://www.birmingham.ac.uk/Documents/college-mds/haps/projects/cfhcp/psrp/Appendices/Appendix9-HHOT(2009).pdf)

(accessed 10 November 2009).

Gadaga, H. Lehohla, M. & Ntuli, V. (2013). Traditional fermented foods of Lesotho. *Journal of microbiology, biotechnology and food sciences*, 2 (6):2387-2391.

Galloway, N.L. Doitsh, G. Monroe K.M. Yang, Z. Muñoz-Arias, I. Levy, D.N. & Greene, W.C. (2015). Cell-to-Cell Transmission of HIV-1 Is Required to Trigger Pyroptotic Death of Lymphoid-Tissue-Derived CD4 T Cells. *Cell Reports*, 12 (10):1555-1563.

Georgia State University & University Library, (2015). GSU Library Research Guides at Georgia State University: Political Science: SPSS. WHAT IS SPSS? Available from: <http://research.library.gsu.edu/c.php?g=115844&p=754649> (accessed 7 July 2015).

Giddens, A., (2001). *Sociology*. 4th edition. Cambridge: Blackwell Publishers.

Gielen, A.C. McDonald, E.M. Gary, T.L. & Bone, L.R. Using the Precede - Proceed Model to apply Health Behaviour theories: In Glanz, K. Rimer, BK. & Viswanath, K. (2008). (Eds.). 4th edition. *Health Behaviour and Health Education: Theory, Research and Practice*. San Francisco: John Wiley & Sons.

Gluyas, H. (2015). Understanding non-compliance with hand hygiene practices. *Nursing Standard*, 29(35):40-46.

Goto, M. Ohl, M.E., Schweizer, M.L., & Perencevich, E.N., (2014). Accuracy of administrative code data for the surveillance of healthcare-associated infections: A systematic review and meta-analysis. *Healthcare Epidemiology, CID*. 58 (1):688-696.

Gould, D.J., Drey, N. S., Moralejo, D., Grimshaw, J., & Chudleigh, J., (2008). Interventions to improve hand hygiene compliance in patient care: *Journal of hospital Infection*, 68 (3):193-202.

Gould, D., & Drey, N. (2013a). Student nurses' experiences of infection; prevention and control during clinical placements. *American Journal of Infection Control*, 41(9):760-763.

Gould, D., & Drey, N. (2013b). Types of interventions used to improve hand hygiene compliance and prevent healthcare associated infection. *Journal of Infection Prevention*, 14(3):88-93.

Glanz, K. Rimer, B.K., & Viswanath, K. (2008). (Eds.). 4thedition. *Health Behaviour and Health Education: Theory, Research and Practice*. San Francisco: John Wiley & Sons.

Ghareeb, P.A. Bourlai, T. Dutton, W. & McClellan, W.T. (2013). Reducing pathogen transmission in a hospital setting: Handshake versus fist bump: a pilot study. *Journal of Hospital Infection*, 85(4):321–323.

Graff, J.C. *Mixed methods research*: In Hall H.R. & Roussel, L.A. (2014). *Evidence Based Practice: An Integrative approach to research, administration and practice*. Burlington, MA: Jones & Barlett Learning.

Gray, P. & Costello, M. (1987). Context: as determinant of methodology in multi-client service organizations. Paper presented at the annual meeting of the American Evaluation Association, Boston.

Green, L.W., & Kreuter, M.W., (2005). *Health Program, Planning: An Educational and Ecological Approach*. 4thedition. New York, NY: McGraw - Hill.

Green, L.W., & Kreuter, M.W., (2005). *Health Programme, Planning: An Educational and Ecological Approach*. 4thedition. New York: McGraw Hill. In Community Tool Box: (2018). Chapter 2. Section 2: PRECEDE- PROCEED. Generic representation of the Precede-Proceed Model.

Available from: <http://ctb.ku.edu/en/table-contents/overview/chapter-2-other-models-promoting-community-health-and-development/section-2> (accessed 10 September 2018).

Green, L.W. (2007). PRECEDE- PROCEED & RE- AIM as Frameworks for Practice - Based - Planning and Evaluation. If We Want More Evidence Based Practice, We Need More Practice Based Evidence. CDC, Oral Health Workshop. October 24. Atlanta University of California at San Francisco.

Greene, J.C. (2007). *Mixed methods in social inquiry*. San Francisco: Jossey-Bass.

Greene, J.C., Caracelli, V.J. & Graham, W.F. (1989). Toward a conceptual framework for mixed-method evaluation designs: Educational Evaluation and Policy Analysis, 11, pp. 255-274. Available from: <http://links.jstor.org/sici?sici=0162-3737%28198923%2911%3A3%3C255%3AATACFFM%3E2.0.CO%3B2-F> (accessed 10 July 2015).

Grove, S.K., Burns, N., & Gray, J.R. (2013). *The Practice of Nursing Research: Appraisal, Synthesis and Generation of Evidence*. 7thedition. St. Louis: Elsevier Saunders.

Grove, S.K., Gray, J.R., & Burns, N. (2015). *Understanding Nursing Research: Building an evidence - based practice*. 6thedition. St. Louis: Elsevier Saunders.

Haas, J.P., & Larson, E.L., (2007). Measurement of compliance with hand hygiene. *Journal of Hospital Infection*, 66(1):6-14.

Haas, J.P., & Larson, E.L., (2008). Compliance with hand hygiene guidelines: Where are we in 2008? *Am J Nurs*, 108(8): 40- 44.

Hall, R. (2012). *Mixed Methods: In search of a paradigm*. The University of New South Wales: Available from:
http://www.auamii.com/proceedings_Phuket_2012/Hall.pdf (accessed 8 December 2015).

Hall, H.R., & Roussel, L.A., (2014). *Evidence-Based Practice: An Integrative Approach to Research, Administration and Practice*. Burlington, MA: Jones & Bartlett Learning.

Hand Hygiene Australia, (2016). 5 Moments for Hand Hygiene.
'Based on the 'My 5 moments for Hand Hygiene: Available from:
www.hha.org.au/home/5-moments-for-hand-hygiene.aspx (accessed 15 June 2013).

Handy, C., (1999). *Understanding Organisations*. The Fourth Edition of this landmark study. London: Penguin Books.

Haralambos, M., & Holborn, M. (2008). *Sociology: Themes and Perspectives*. 7th edition. London: Harper Collins Publishers Limited.

Haralambos, M., Holborn, M., Chapman, S., & Moore, S. (2013). *Haralambos & Holborn: - Sociology: Themes and Perspectives*. 8th edition. London: Harper Collins Publishers Limited.

Hawtin, L., & Hoadley, M. (2014). Clostridium Difficile Infection (CDI) Policy for Management of Clostridium Difficile Infection: (Sporadic Cases, Period of increased Incidence or outbreak Situation). Version4. James Paget University Hospitals NHS Foundation Trust: Available from: <http://www.jpaget.nhs.uk/media/62221/412-Clostridium-Difficile-Infection.pdf> (accessed 23 March 2015).

Health Protection Agency, (2012). Infection due to a novel arenavirus: Available from: http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1224745724704 (accessed 15 August 2013).

Health Protection Scotland, (2017). Germs: wash your hands of them (Scotland's National Hand Hygiene Campaign). Five Moments for Hand Hygiene: Available from: <http://www.washyourhandsofthem.com/resources/campaign-archive/your-5-moments-for-hand-hygiene.aspx> (accessed 25 February 2017).

Higgins, A., & Hannan, M.M., (2013). Improved hand hygiene technique and compliance in healthcare workers using gaming technology: *J Hosp Infect*, 84,32-37. Available from: [https://www.journalofhospitalinfection.com/article/S0195-6701\(13\)00055-8/pdf](https://www.journalofhospitalinfection.com/article/S0195-6701(13)00055-8/pdf) (accessed 25 April 2018).

Hollander, M., Wolfe, D.A., & Chicken, E., (2014). *Nonparametric Statistical Methods*, 3rd edition. New Jersey: John Wiley & Sons.

Holtzblatt, K., Wendell, J.B., & Wood, S. (2005). *Rapid contextual design: A how to guide to key techniques for user-centred design*. San Francisco, CA: Morgan Kaufman.

Huang, C., Ma, W., & Stack, S., (2012). The Hygienic Efficacy of Different Hand-Drying Methods: A Review of the Evidence. *Mayo Clin Proc*, 87(8):791-798.

Huis, A., Schoonhoven, L., Grol, R. Donders, R., Hulscher, M. & van Achterberg, T. (2013). Impact of a team and leaders-directed strategy to improve nurses' adherence to hand hygiene guidelines: a cluster randomised trial. *Int J Nurs Stud*, 50(4):464-74.

Hunt, K. & Lathlean, J. In Gerrish, K. & Lathlean, J. (2015). *The research process in nursing*. 7th edition. Oxford: Wiley Blackwell.

Huff, R.M., Kline, M.V., & Peterson, D.V., (2015). (Eds.). 3rd edition. *Health promotion in multicultural populations: A handbook for practitioners and students*. Thousand Oaks. California: Sage Publications.

Huttner, A. Harbarth, S. Carlet, J. Cosgrove, S. Goosens, H. Holmes, A. Jarlier, V. Voss, A. Pittet, D. and for the World Healthcare- Associated Infections forum participants. (2013). Antimicrobial resistance: a global view from the World Healthcare - Associated Infections Forum. *Antimicrobial Resistance and Infection Control*; (2):31. Available from: <https://doi.org/10.1186/2047-2994-2.31> (accessed August 2015).

Ivankova, N.V. (2015). *Mixed Methods Applications in Action Research: From Methods to Community Action*. Thousand Oaks. California: Sage Publications.

Jackson, E., (2010). *Medical Law, Text, Cases and Materials*: 2nd edition. New York: Oxford University Press.

Jones, J.E., & Metz, A.J., *Making sense of all the words: Analysing qualitative data*. In Baran, M.L., & Jones, J.E., (2016). (Eds.). *Mixed methods research for improved scientific study*. Hershey, PA. IGI Global.

Johnson, R.B. & Christensen, L.B. (2008). *Educational Research: Quantitative, Qualitative and Mixed Approaches*. 3rdedition. Thousand Oaks: Sage Publications.

Johnson, R.B. & Christensen, L.B. (2017). *Educational Research: Quantitative, Qualitative and Mixed Approaches*. 6thedition. Thousand Oaks: Sage Publications.

Johnson, R.B. & Onwuegbuzie, A.J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33 (7):14-26. In Onwuegbuzie, A.J., & Combs, J.P. (2011). *Data Analysis in Mixed Research: A Primer*. *International Journal of Education*, 3 (1): 1-10: E13. Available from: <http://macrothink.org/journal/index.php/ije/article/viewFile/618/550> (accessed 3 December 2015).

Kerlinger, F.N. (1986). *Foundations of Behavioural Research*. 3rdedition. Fort Worth, TX: Harcourt Brace. In Johnson, B., & Christensen, L., (2008). *Educational Research: Quantitative, Qualitative and Mixed Approaches*. 3rdedition. Thousand Oaks: Sage Publications.

Kilpatrick, C. Hosie, L. & Storr, J. (2013). Hand hygiene- when and how should it be done? *Nursing Times*; 109; 38:16-19. In Storr, J. & Kilpatrick, C. Improving adherence to hand hygiene practice. *Nursing Times*; 109: 38: 12-13. Available from:<http://www.nursingtimes.net/Journals/2014/04/09/f/n/o/Improving-adherence--to-hand-hygiene-practice-250913.pdf> (accessed 17 October 2014).

Kumar, R. (2011). *Research Methodology; A step by step guide for beginners*: 3rdedition. London: Sage Publications.

Kumar, R. (2014). *Research Methodology; A step by step guide for beginners*: 4th edition. London: Sage Publications.

Lacey, A. The Research Process: In Gerrish, K. & Lacey, A. (2010). *The Research Process in Nursing*. 6th edition. Oxford: Wiley-Blackwell.

Larson, M.G. (2008). Statistical Primer for Cardiovascular Research: Analysis of Variance. *Circulation*, 117: 115-121.

Lee, N.J. (2010). Preparing for thesis and viva: - some practicalities. *Nurse Researcher. The International Journal of Research Methodology in Nursing and Health Care*, (17) 3. RCN Publishing Company.

Lincoln, Y.S., & Guba, E.G., (1985). *Naturalistic Inquiry*. Newbury Park: Sage Publications.

LoBiondo -Wood, G., & Haber, J., (2010). 7th edition. *Nursing Research; Methods and Critical Appraisal for Evidence- Based Practice*. St Louis, Missouri: Mosby Elsevier.

Lopez, A.D., Mathers, C.D., Ezzati, M. Jamison, D.T., & Murray, C.J.L., (2006). Global and regional burden of diseases and the risk factors, 2001: Systematic analysis of population health data. *Lancet*, 367(9524):1747–1757.

Loveday, H.P. Wilson, J.A. Pratt, R.J. Golsorkhi, M. Tingle, A. Bak, A. Browne, J. Prieto, J. & Wilcox, M. (2014). Epic3: National Evidence- based guidelines for preventing healthcare- associated infections in NHS Hospitals in England. *Journal of Hospital Infection*, 8651:S1- S70.

Luangasanatip, N., Hongsuwan, M., Limmathurotsakul, D., Lubell, Y., Lee, A.S. Harbarth, S. Day, N.P. Graves, N. & Cooper, B.S. (2015). Comparative efficacy

of interventions to promote hand hygiene in hospital: systematic review and network meta-analysis. *BMJ*, 351:h3728 doi: Available from: <https://doi.org/10.1136/bmj.h3728> (accessed 3 April 2017).

Macnee, C.L., & McCabe, S. (2008). *Nursing Research Reading and Using Research in Evidence- Based Practice*. 2nd edition. Wolters Kluwer Health: Lippincott Williams & Wilkins.

Magill, S.S., Edwards, J.R., Stat, M., Bamberg, W., Beldavs, Z.G., Dumyati, G. Kainer, M. A., Lynfield, R., Maloney, M., McAllister-Hollod, L., Nadle, J., Ray, S.M., Thompson, D.L., Wilson, L.E., & Fridkin, S.K. (2014). Multistate Point-Prevalence Survey of Health Care–Associated Infections: *N Engl J Med*, 370:1198-208.

Mahomed, S., Mahomed, O., Sturm, A.W, Knight, S., & Moodley, P. (2017). Challenges with Surveillance of Healthcare-Associated Infections in Intensive Care Units in South Africa: *Critical care research and practice*, (4):1-7. Available from: https://www.researchgate.net/publication/320367051_Challenges_with_Surveillance_of_Healthcare-Associated_Infections_in_Intensive_Care_Units_in_South_Africa (accessed 21 September 2018).

Malotle, M.M., Spiegel J.M., Yassi, A.D., Ngubeni, L.M., O’Hara. P.A., Adu, E.A. Bryce, N. Mlangeni, G.S., Gemell, M., & Zungu, M., (2017). Occupational tuberculosis in South Africa: are healthcare workers adequately protected? *Public Health Action. International Union Against Tuberculosis and Lung disease*, (7) 4 pages 258-267. Available from: https://www.researchgate.net/publication/322269447_Occupational_tuberculosis_in_South_Africa_are_health_care_workers_adequately_protected (accessed 21 September 2018).

Marchetti, A., & Rossiter, R. (2013). Economic burden of healthcare-associated infection in US acute care hospitals: societal perspective. *J Med Econ*, 16(12):1399-404.

Marimuthu, K., Pittet, D., & Harbarth, S. (2014). The effect of improved hand hygiene on nosocomial MRSA control: Antimicrob Resist Infect Control. *Antimicrob Resist Infect Control*, 3:34.

Marra, A.R. Moura, D.F. (Jr). Paes, A.T. dos Santos, O.F. & Edmond, M.B. (2010). Measuring Rates of hand hygiene adherence in the intensive care setting: A comparative study of direct observation, product usage, and electronic counting devices: *Infection control Hospital Epidemiology*, 31; 796-801.

Marwick, C.A., Yu, N, Lockhart, M.C., McGuigan, C.C., Wiuff C, Davey P.G., & Donnan P.T., (2013). Community-associated Clostridium difficile infection among older people in Tayside, Scotland, is associated with antibiotic exposure and care home residence: cohort study with nested case-control. *J Antimicrob Chemother*, 68 (12):2927-33.

Marshall, C. & Rossman, G.B., (2011). *Designing qualitative research*. 5th edition. Thousand Oaks, CA: Sage. In Grove, S.K., Burns, N., & Gray, J.R., (2013). *The practice of nursing research: Appraisal, synthesis and generation of evidence*. 7th edition. St Louis: Elsevier Saunders.

Mathur, P. (2011). Hand hygiene: Back to the basics of infection control. *Indian J Med Res*, 134(5):611-620.

Matlo, C. (2012). Using the PRECEDE-PROCEED MODEL. Available from: http://www.sfu.ca/uploads/page/23/GERO820_2012FALL_PRECEDE-PROCEED.pdf (accessed 20 December 2014).

Mazi, W., Senok, A.C., Al-Kahldy, S., & Abdullah, D. (2013). Implementation of the world health organization hand hygiene improvement strategy in critical care units: *Antimicrobial Resistance and Infection Control*, 2:15.

McAteer, J. Stone, S. Fuller, C. Charlett, A. Cookson, B. Slade, R. & Michie, S. (2008). NOSEC/FIT group: Development of an observational measure of healthcare worker hand-hygiene behaviour: the hand-hygiene observation tool (HHOT). *J Hosp Infect*, 68(3): 222-229. Available from: <https://www.birmingham.ac.uk/Documents/college-mds/haps/projects/cfhcp/psrp/Appendices/Appendix4-DevelopmentoftheHHOT.pdf> (accessed 10 November 2009).

McLaws, M.L. Maharlouei, N, Yousefi, F. & Askarian, M. (2012). Predicting hand hygiene among Iranian healthcare workers using the theory of planned behavior. *American Journal of Infection Control*, 40 (4), 336–339.

McLaws, M.L. (2015). The relationship between hand hygiene and health care-associated infection: it's complicated. *Infect Drug Resist* 8:7-18.

Medeiros, E.A. Grinberg, G. Rosenthal, V.D. Bicudo Angelieri, D. Buchner Ferreira, I. Bauer Cechinel, R. Zanandrea, B.B. Rohnkohl, C. Regalin, M. Spessatto, J.L. Scopel Pasini, R. & Ferla, S. (2015). Impact of the International Nosocomial Infection Control Consortium (INICC): multidimensional hand hygiene approach, in 3 cities in Brazil. *Am J Infect Control*, 43(1):10-5.

Meleis, A.I. (2012). *Theoretical nursing development and progress*: 5th edition. Wolters Kluwer Health: Philadelphia: Lippincott Williams & Wilkins.

MIT, (2013). A Global Health Perspective on HIV/AIDS: Available from: <https://ocw.mit.edu/courses/sloan-school-of-management/15-232-business->

[model-innovation-global-health-in-frontier-markets-fall-2013/team-projects/MIT15_232F13_a1_hiv-aids_2.pdf](#) (accessed 4 June 2017).

MOH & CW, (2009-2013). *The National Health Strategy for Zimbabwe: A Summary; Equity and Quality in Health: A people's Right*. MOH & CW: Harare. Available from: apps.who.int/medicinedocs/documents/s17996en/s17996en.pdf (accessed 5 July 2012).

Moleki, M.M. (2008). *Critical care nursing students' experience of clinical accompaniment in open distance learning (ODL): a phenomenological perspective*, Health Studies: University of South Africa. Available from: http://uir.unisa.ac.za/xmlui/bitstream/handle/10500/2966/dissertation_moleki_%20m.pdf?sequence=1 (accessed 2 August 2012).

Morse, J.M. (1991a). (Ed.). *Qualitative nursing research: a contemporary dialogue*. London: Sage Publications.

Morse, J.M. (1991b). Approaches to qualitative - quantitative methodological triangulation: *Nursing research*, 40(2), 120-123. Available from: https://www.researchgate.net/profile/Janice_Morse/publication/231749811_Development_of_a_Scale_to_Identify_the_Fall-Prone_Patient/links/54e88a070cf27a6de10f01bc/Development-of-a-Scale-to-Identify-the-Fall-Prone-Patient.pdf (accessed 30 November 2017).

Morse, J.M. (2012). *Qualitative health research, creating a new discipline*: Walnut Creek: Left Coast Press.

Mulekar, M.S. Jezek, K. & Fruh, S.M. *Data Analysis*: In Hall H.R. & Roussel, L.A. (2014). (Eds.). *Evidence Based Practice: An Integrative approach to research, administration and practice*. Burlington, MA: Jones & Bartlett Learning.

Naidoo, J. & Wills, J. (2016). *Models and approaches to health promotion*. 4th edition. In foundations for health promotion. China: Elsevier.

National Audit Office: (2009). Reducing Healthcare Associated Infections in Hospitals in England: Available from: <https://www.nao.org.uk/wp-content/uploads/2009/06/0809560es.pdf> (accessed 5 July 2014).

National Institute for Health and Care Excellence (NICE): (2014). Process and methods: Developing NICE guidelines: the manual. National Institute for Health and Clinical Excellence NICE: Manchester. Available from: <http://www.nice.org.uk/Media/Default/About/what-we-do/our-programmes/developing-NICE-guidelines-the-manual.pdf> (accessed 4 February 2015).

National Patient Safety Agency: (2008). NHS. Clean your hands in Northern Ireland. Available from: <http://www.npsa.nhs.uk/corporate/news/clean-your-hands-in-northern-ireland> (accessed 6 July 2008).

Nazarko, L. (2015). Infection control: Clostridium difficile. *British Journal of Healthcare Assistants*, 9:20.

Newitt, S. Myles, P.R. Birkin, J.A. Maskell, V. Slack, R.C. Nguyen-Van-Tam, J.S. & Szatkowski, L., (2015). Impact of infection control interventions on rates of Staphylococcus aureus bacteraemia in National Health Service acute hospitals: East Midlands, UK, using interrupted time-series analysis. *J Hosp Infect* 90(1):28-37.

OCHA Online: (2009a). Mashonaland East Province – Map: Overview. Figure1.2. Available from:

<http://reliefweb.int/sites/reliefweb.int/files/resources/0DACCB96D027F14785257664007EDE01-map.pdf> (accessed 22 May 2012).

OCHA Online: (2009b). Mashonaland East Province – Map: Overview. Figure 1.3. Zimbabwe: Political and Administrative Boundaries. Available from: <http://reliefweb.int/map/zimbabwe/zimbabwe-political-and-administrative-boundaries-05-oct-2009> (accessed 2 September 2012).

Olson, A.D., Meyer, L. Prins, M. Thiebaut, R. Gurdasani, D. Guiguet, M. Chaix, M.L. Amornkul, P. Babiker, A. Sandhu, M.S. & Porter, K. (2014). An evaluation of HIV elite controller definitions within a large seroconverter: cohort collaboration. *PLoS One*, 9(1):e86719. Available from <file:///G:/Evaluation%20of%20HIV%202014.pdf> (accessed 3 April 2017).

Onwuegbuzie, A.J., & Combs, J.P., (2011). Data Analysis in Mixed Research: A Primer. *International Journal of Education*, (3), 1: 1-10: E13. Available from: <http://macrothink.org/journal/index.php/ije/article/viewFile/618/550> (accessed 2 December 2015).

Onwuegbuzie, A.J. (2012). Putting the Mixed back into quantitative and qualitative research in educational research and beyond: Moving toward the radical middle, *International Journal of multiple research approaches*, 6(3), 192-219.

OSHA (Occupational Safety and Health Administration): In Zelman, M. & Milne-Zelman, C.L. (2014). *Infection Control and Safety: A Guide for Healthcare Providers*. Pearson Education: New York.

Ostertagová, E., & Ostertag, O., (2013). "Methodology and application of One-way: ANOVA." *American Journal of Mechanical Engineering*, 256-261.

Parahoo, K. (2014). *Nursing Research; Principles, process and issues*. 3rd edition. London: Palgrave Macmillan.

Parriot, A. Saint, S. Olmsted, R.N. & Krein, S. (2015). Associations between Hospital Infection Prevention/control Program Infrastructure and Evidence-based Device Associated Infection Prevention Practices: *AJJC*, 43:S3.

Pasricha, J. Harbarth, S. Koessler, T. Camus, V. Schrenzel, J. Cohen, G. Pittet, D. Perrier, A. & Iten, A. (2013). Methicillin-resistant *Staphylococcus aureus* risk profiling: who are we missing? *Antimicrob Resist Infect Control*, 2(1):17.

Paterson, G.K., Harrison, E.M., & Holmes, M.A., (2014). The emergence of Methicillin-Resistant *Staphylococcus aureus*: *Trends Microbiol*, 22(1):42-7.

Patton, M.Q. (2015). *Qualitative research & evaluation methods: integrating theory and practice*. 4th edition. Thousand Oaks, CA: Sage Publications, Inc.

Pawson, R. (2006). *Evidence – based policy, a realist perspective*. London: Sage Publications.

Pawson, R. (2013). *The science of evaluation: a realist manifesto*. London: Sage Publications.

Person, B., Schilling, K., Owuor, M., Oganje, L., & Quick, R.A., (2013). Qualitative Evaluation of Hand Drying Practices among Kenyans: PLoS ONE, 8(9):e74370. doi: Available from: <http://doi.org/10.1371/journal.pone.0074370> (accessed 3 April 2017).

Peterson, S.J., & Bredow, T.S., (2009). *Middle range theories. Application: to nursing research*. 2nd edition. Philadelphia, PA: Lippincott Williams & Wilkins. In

Hall, H.R., & Roussel, L.A: *Philosophical and theoretical perspectives guiding inquiry*: In Hall, H.R. & Roussel L.A. (2014). *Evidence-based practice: an integrative approach to research, administration and practice*. Burlington, MA: Jones & Bartlett Learning.

Pfoh, E., Dy, S., & Engineer, C., Chapter 8. Interventions to Improve Hand Hygiene Compliance: Brief Update Review. In Shekelle, P.G. Wachter, R.M. Pronovost, P.J. Schoelles, K. McDonald, K.M. Shojania, K. Reston, J. Berger, Z. Johnsen, B. Larkin, J.W. Lucas, S. Martinez, K. Motala, A. Newberry, S.J. Noble, M. Ranji, S.R. Rennke, S. Schmidt, E. Shanman, R. Sullivan, N. Sun, F. Tipton, K. Treadwell, J.R. Tsou, A. Vaiana, M.E. Weaver, S.J. Wilson, R. & Winters, B.D. (2013). Making Health Care Safer: An Updated Critical Analysis of the Evidence for *Patient Safety Practices*. Evidence Reports/Technology Assessments: *Agency for Healthcare Research and Quality*, 211:67-72. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK133371/?report=printable> (accessed 20 July 2015).

Phillips, J.L., Rolley, J.X., & Davidson, P.M., (2012). Developing Targeted Health Service Interventions Using the PRECEDE-PROCEED Model: Two Australian Case Studies. *Nursing Research and Practice*: Available from: <file:///C:/Users/Owner/Downloads/279431.pdf> (accessed 9 April 2014).

Pittet, D., Allegranzi, B., & Boyce, J. (2009). The World Health Organization Guidelines on Hand Hygiene in Health Care and Their Consensus Recommendations for the World Health Organization World Alliance for Patient Safety First Global Patient Safety Challenge Core Group of Experts. *Infect Control Hosp Epidemiol* 30 (7):611-622. Available from: http://sgh.org.sa/sf/files/ICHE_WHO_HH_guidelines_July_09.pdf (accessed July 2013).

Polit, D.F., & Beck, C.T., (2008). 8thedition. *Nursing research: generating and assessing evidence for nursing practice*: Philadelphia: Wolters Kluwer Health, Lippincott & Williams.

Polit, D.F., & Beck, C.T., (2010). 7thedition. *Essentials of Nursing Research: Appraising Evidence for Nursing Practice*. Philadelphia: Wolters Kluwer Health, Lippincott & Williams.

Polit, D.F., & Beck, C.T., (2014). 8thedition. *Essentials of Nursing Research: Appraising Evidence for Nursing Practice*. Philadelphia: Wolters Kluwer.

Porter, C.M. (2015). Revisiting Precede-Proceed: A leading model for ecological and ethical health promotion. *Health Education Journal*, 1-12. DOI: 10.1177/0017896915619645. Available from: https://www.researchgate.net/publication/288904723_Revisiting_Precede-Proceed_A_leading_model_for_ecological_and_ethical_health_promotion (accessed 5 August 2016).

Public Health Ontario: (2011). A Quick Guide to Just Clean Your Hands: Ontario's Evidence- based Hand Hygiene Program for Hospitals. Available from: <http://www.publichealthontario.ca/en/eRepository/a-quick-guide-to-just-clean-your-hands.pdf> (accessed 7 September 2011).

Rarelibra Online: (2014). Mashonaland East province districts Map of Zimbabwe. Available from: MapInfo Professional v8.5. Available from: https://pl.wikipedia.org/wiki/Maszona_Wschodnia#/media/File:Mashonaland_East_districts.png (accessed May 25 2018).

Robertson, V, Maruta, A. Mashamba, A. Mutsvangwa, J. Jubenkanda, T. Chasokela, C. Gomo, E. & Dhliwayo, P. (2014). A national IPC training strategy: In Zimbabwe-rewards and challenges. ICAN: Harare. Available from:

<http://www.icanetwork.co.za/wp-content/uploads/2014/03/A-national-IPC-training-strategy-in-ZimbabweRobertson.pdf> (accessed 20 February 2015).

Rosenthal, V.D. Viegas, M. Sztokhamer, D. Benchetrit, G, Santoro, B. Lastra, C.E. Romani, A. Di Núbila B.M. Lanzetta, D. Fernández L.J. Rossetti M.A. Migazzi, C. Barolin, C. Martínez, E. Bonaventura, C. Caridi Mde, L. Messina, A. Ricci, B. Soroka, L.C. & Frías, M.L. (2015). Impact of INICC: Multidimensional Hand Hygiene Approach in ICUs in Four Cities in Argentina. *J Nurs Care Qual*, 30(4):E17-25.

Ross, S. & Furrows, S. (2014). *Rapid Infection Control Nursing*: Chichester: Wiley Blackwell.

Rothe, C. Schlaich, C. & Thompson, S. (2013). Healthcare- associated infections in sub-Saharan Africa. *J Hosp Infect*, 85 (4):257-67.

Rubin, A., & Babbie, E.R. (2011). *Research Methods for Social Work: 7th edition*. Belmont, CA: Brooks/Cole.

Russo, P.L, Barnett, A.G. Cheng, A.C. Richards, M. Graves, N., & Hall, L., (2015). Differences in identifying healthcare associated infections using clinical vignettes and the influence of respondent characteristics: a cross-sectional survey of Australian infection prevention staff. *Antimicrob Resist Infect Control*, (4):29.

Salmon, S., Pittet, D., Sax, H., & McLaws, M.L. (2015). The 'my five moments for hand hygiene concept for the overcrowded setting in resource-limited healthcare systems. *J Hosp Infect* 91(2):95-9.

Salmon, S., & McLaws, M.L., (2015). Qualitative findings, from focus group discussions on hand hygiene compliance: among health care workers in Vietnam. *American Journal of Infection Control*, (43), 10, 1086–1091. Available from: [https://www.ajicjournal.org/article/S0196-6553\(15\)00652-5/pdf](https://www.ajicjournal.org/article/S0196-6553(15)00652-5/pdf) (accessed 8 December 2018).

Sarma, J.B., Marshall, B., Cleeve, V., Tate, D., & Oswald, T., (2013). Impact of universal screening on MRSA bacteremias in a single acute NHS organisation (2006-12): interrupted time-series analysis. *Antimicrob Resist Infect Control*, 2(1):2.

SAS Institute Inc. (2009). SAS/STAT Institute Inc.9.2 *User's Guide*: 2nd edition. Cary, NC: SAS Institute Inc.

SAS Institute Inc. (2013). SAS/STAT, 13.1: *User's Guide Introduction to categorical data analysis procedures*, Cary, NC, USA.

SAS Institute Inc. SAS/STAT: Software – Fact Sheet. (2015). Available from: http://www.sas.com/content/dam/SAS/en_us/doc/factsheet/stat-101372.pdf. (accessed 1 September 2015).

Sax, H., Allegranzi, B., Uckay, I., Larson, E., Boyce, J., & Pittet, D. (2007). My five moments for hand hygiene: a user -centered design approach to understand, train, monitor and report hand hygiene. *Journal of Hospital Infection*, 67(7):9-21.

Sax, H. Allegranzi, B. Chraiti, M.N., Boyce, J. Larson, E. & Pittet, D. (2009). The World Health Organization hand hygiene observation method. *American Journal of Infection Control*, 37(10): 827-834.

Scambler, G., & Hopkins, A., (1986). 'Being epileptic: Coming to terms with stigma'. *Sociology of Health and illness*, Vol. 8, 26-43.

Schwandt, T.A. (2007). *The SAGE dictionary of qualitative inquiry*: 3rd edition. Thousand Oaks: CA Sage. In Patton, M.Q., (2015). *Qualitative research & evaluation methods: integrating theory and practice*. 4th edition. Thousand Oaks, CA: Sage Publications, Inc.

Schwandt, T.A. (2015). *The SAGE dictionary of qualitative inquiry*. 4th edition. Thousand Oaks: CA Sage.

Schmitz, K. Kempker, R.R. Tenna A, Stenehjem, E. Abebe, E. Tadesse, L. Jirru E.K. & Blumberg, H.M. (2014). Effectiveness of a multimodal hand hygiene campaign and obstacles to success in Addis Ababa: Ethiopia. *Antimicrob Resist Infect Control*, 3(1):8.

Schutz, A. (1973). *Collected papers I: The problem of social reality*. The Hague: Martinus Nijhoff.

Shadish, W.R., (1995). The logic of generalization: five principles common to experiments and ethnographies. *American Journal of Community Psychology*, 23(3), 419-428.

Shaikh, S. Fatima, J. Shakil, S. Rizvi, S.M. & Kamal, M.A., (2015). Antibiotic resistance and extended spectrum beta-lactamases: Types, epidemiology and treatment. *Saudi J Biol Sci*, 22(1):90-101.

Semmelweis Society International: (2009). Dr. Semmelweis' Biography: Available from <http://semmelweis.org/about/dr-semmelweis-biography/> (accessed 12 June 2017).

Serrant- Green, L. (2007). The importance of place in understanding experiences: *Nurse Researcher. The International Journal of Research Methodology in Nursing and Health Care*, (14)3. RCN Publishing Company.

Sergi, V. & Hallin, A., (2011). "Thick performances, not just thick descriptions; the processual nature of doing qualitative research": *Qualitative Research in Organizations and Management. An International Journal*, 6(2):191-208.

Siegel, J.D., Rhinehart, E., Jackson, M. & Chiarello, L. (2007). The Healthcare Infection Control Practices Advisory Committee. Guidelines for Isolation Precautions: Preventing transmission of Infections Agents in Healthcare settings: In Zelman, M. & Milne-Zelman, C.L., (2014). *Infection Control and Safety: A guide for Healthcare Providers*. New York: Pearson Education.

Simons, L. & Lathlean, J. *Mixed Methods*: In Gerrish, K., & Lacey, A. (2010). *The Research process in Nursing*: 6th edition. Oxford: Wiley-Blackwell.

Stern, P.N. In Morse, J.M. (1991a). (Ed.). Revised edition: *Are counting and coding a capella appropriate in qualitative research? Qualitative Nursing Research: A Contemporary Dialogue*. Newbury Park: Sage Publications.

Sundin, D., & Fahy, K., (2008). Critical post- structural interpretative interactionism: an update on Denzin's methodology. *Nurse Researcher. The International Journal of Research Methodology in Nursing and Health Care*, 16 (1). RCN Publishing Company.

Squires, J.E. Suh, K.N. Linklater S. Bruce, N. Gartke, K. Graham, I.D. Karovitch, A. Read, J. Roth, V. Stockton K, Tibbo E. Woodhall, K. Worthington, J. & Grimshaw J.M. (2013). Improving physician hand hygiene compliance; using behavioural theories: a study protocol. *Implementation Science* 8:16.

Srigley, J.A. Lightfoot, D. Fernie, G. Gardam, M.P. & Muller, M., (2013). Hand hygiene monitoring technology: protocol for a systematic review. *Systematic Reviews*, 2:101.

Starling, B., (2005). Postnote Infection control in healthcare settings. Number 247 July. Available from: <http://www.parliament.uk/documents/post/postpn247.pdf> (accessed 18 May 2017).

Storr, J., & Kilpatrick, C., (2013). Improving adherence to hand hygiene practice: *Nursing Times*, 109(38):12-13.

Su, D. Hu. B., Rosenthal, V.D., Li, R., Hao, C., Pan, W., Tao, L., Gao, X., & Liu, K. (2015). Impact of the International Nosocomial Infection Control Consortium (INICC): Multidimensional Hand Hygiene Approach in five intensive care units in three cities of China. *Public Health*, 129(7):979-88.

Sunkesula, V.C.K. Kundrapu, S. Zabarsky, T.F. McKee, M. Macinga, D.R. & Donskey, C.J. (2015). Comparison of hand hygiene monitoring using the 5 Moments for Hand Hygiene method versus a wash in–wash out method: *AJIC*, 43(1):16–19.

Süzük, S. Çiğdem, E. Çalık, A. Akdoğan, S. & Ünal, S. (2015). The Compliance Rates of Hand Hygiene in Intensive Care Unit and Surgical services at a State Hospital in Turkey. *J Turk Soc Intens Care*, 13:107-111.

Tan, A.K., & Olivo, J., (2015). Assessing Healthcare Associated Infections and Hand Hygiene Perceptions amongst Healthcare Professionals: *International Journal of Caring Sciences*, 8(1):108.

Taori, S.K. Wroe, A. Hardie, A. Gibb, A.P. & Poxton, I.R. (2014). A prospective study of community-associated *Clostridium difficile* infections: the role of antibiotics and co-infections. *J Infect*, 69(2):134-44.

Tashakkori, A., & Teddlie, C., (1998). *Mixed Methodology: Combining Qualitative and Quantitative Approaches*. Thousand Oaks, CA: Sage Publications.

Timmermans, S. & Tavory, I. (2012). Theory Construction in Qualitative Research: From Grounded Theory to Abductive Analysis. *Sociological Theory* 30(3), 167 – 186. Available from: <https://www.scribd.com/document/246707516/Sociological-Theory-2012-Timmermans-167-86-Theory-Construction-in-Qualitative-Research-From-Grounded-Theory-to-Abduc> (accessed 31 October 2017).

Tones, K., & Green, J., (2005). *Health Promotion Planning and Strategies*. SAGE Publications: London.

Uneke, C.J. Ndukwe, C.D. Oyibo, P.G. Nwakpu, K.O. Nnabu, R.C. & Prasopa-Plaizier, N. (2014). Promotion of hand hygiene strengthening initiative in a Nigerian teaching hospital: implication for improved patient safety in low-income health facilities. *Braz J Infect Dis*, 18(1):21-7.

University of South Africa (UNISA): Department of Health Studies. (2012). *Tutorial Letter MNUALLL: 301/0/2012. General tutorial letter for proposal, dissertation and thesis writing*: Pretoria: UNISA.

Valiquette, L. Chakra, C. & Laupland, K.B., (2014). Financial impact of healthcare-associated infections: When money talks. *Can J Infect Dis Med Microbiol*, 25: 71- 74.

van Bunnik, B.A. Ciccolini, M. Gibbons, C.L. Edwards, G. Fitzgerald, R. McAdam, P.R. Ward, M.J. Laurenson, I.F & Woolhouse, M.E. (2015). Efficient national surveillance for health-care-associated infections: *BMC Public Health*, 15:832.

Wang, R.F. Shen, S.H. Yen, A.M, Wang, T.L. Jang, T.N. Lee, S.H., Wang, J.T. & Chen, H.H. (2016). Risk factors for incidence and case-fatality rates of healthcare-associated infections: a 20-year follow-up of a hospital-based cohort. *Epidemiol Infect* 144(1):198-206.

Waziri, N.E. Cadmus, S. Nguku, P. Fawole, O. Owolodun, O.A. Waziri, H. Ibrahim, L. Biya, O. Gidado, S. Badung, S. Kumbish, P. & Nsubuga, P. (2014). Factors associated with tuberculosis among patients attending a treatment centre in Zaria, North-west Nigeria, 2010. *Pan Afr Med J*, 18(1):5.

Weng, Y.H., Bhembe, P.T., Chiou, H.Y., Yang, C.Y., & Chiu, Y.W., (2016). Perceived risk of tuberculosis infection among healthcare workers in Swaziland: *BMC Infectious Diseases*, 16:697. DOI 10.1186/s12879-016-2029-6. Available from: <https://bmcinfectdis.biomedcentral.com/track/pdf/10.1186/s12879-016-2029-6?site=bmcinfectdis.biomedcentral.com> (accessed 20 September 2018).

WHO, (2009a). World Health Organization (WHO) Patient safety: A World Alliance for Safer Health Care. Guidelines on hand hygiene in Health Care: First Global Patient Safety Challenge. Clean Care is Safer Care. Available from: http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf (accessed 6 June 2014).

WHO, (2009b). Guidelines on Hand Hygiene in Health Care: A Summary. WHO Press: Geneva. Available from:

http://whqlibdoc.who.int/hq/2009/WHO_IER_PSP_2009.07_eng.pdf (accessed 25 April 2014).

WHO, (2009c). A Guide to the Implementation of the WHO Multimodal Hand Hygiene Improvement Strategy: Available from:
http://apps.who.int/iris/bitstream/10665/70030/1/WHO_IER_PSP_2009.02_eng.pdf (accessed 4 April 2014).

WHO, (2009d). Africa Region. Country Cooperation Strategy: 2008-2013. Zimbabwe. Available from:
http://www.who.int/countryfocus/cooperation_strategy/ccs_zwe_en.pdf (accessed 10 August 2012).

WHO, (2009e). Hand Hygiene Technical Reference Manual: To be used by health-care workers, trainers and observers of hand hygiene practices. Geneva, Switzerland. Available From:
http://apps.who.int/iris/bitstream/10665/44196/1/9789241598606_eng.pdf (accessed 14 August 2014).

WHO, (2010). The Burden of Health Care-Associated Infection Worldwide: Available from:
http://www.who.int/gpsc/country_work/summary_20100430_en.pdf (accessed 4 April 2014).

WHO, (2011). Clean Care is Safer Care about SAVE LIVES: Clean Your Hands. Available from:
<http://www.who.int/gpsc/5may/background/5moments/en/index.html> (accessed 6 June 2013).

WHO, (2013). Evidence of hand hygiene to reduce transmission and infections by multidrug resistant organisms in health-care settings: Available from:

http://www.who.int/gpsc/5may/MDRO_literature-review.pdf

(accessed 10 December 2015).

WHO, (2014). Department of Health Statistics and Information Systems. Estimated DALYs, ('000) by cause, sex and WHO Member State (1) 2012. Available from: http://www.who.int/healthinfo/global_burden_disease/GHE_DALY_2012_country.xls?ua=1 (accessed 9 July 2015).

WHO, (2015a). International Classification of Diseases (ICD). Available from: <http://www.who.int/classifications/icd/en/> (accessed 7 July 2015).

WHO, (2015b). The burden of health care-associated infection worldwide. Available from: http://www.who.int/gpsc/country_work/burden_hcai/en/ (accessed 8 June 2015).

WHO, (2015c). Zimbabwe commemorates Global Handwashing Day. Available from: <http://www.afro.who.int/en/zimbabwe/press-materials/item/5063-zimbabwe-commemorates-global-handwashing-day.html> (accessed 5 December 2015).

WHO, (2017). Regional Office for Africa: Message of the WHO Regional Director for Africa, Dr. Matshidiso Rebecca Moeti, on the yearly campaign: "Save Lives: clean your hands". Available from: <http://www.afro.who.int/en/rdo/speeches/5189-message-of-the-who-regional-director-for-africa-dr-matshidiso-rebecca-moeti-on-the-yearly-campaign-save-lives-clean-your-hands.html> (accessed 19 May 2017).

Wonderling, D. Sawyer, L. Fenu, E. Lovibond, K. & Laramé, P. (2011). National Clinical Guideline Centre (NCGC). Cost-Effectiveness Assessment for the National Institute for Health and Clinical Excellence: *Ann Intern Med*, (154):758-765.

Yegidis, B.L., & Weinbach, R.W., (2009). *Research methods for social research workers*: 6th edition. Boston, MA, Pearson. In Lennon-Dearing, R., & Neely-Barnes, S.L., Quantitative Research. In Hall H.R., & Roussel, L.A., (2014). *Evidence –Based Practice: An Integrative Approach to Research, Administration and Practice*. Burlington, MA: Jones & Bartlett Learning.

Zimbabwe: MDG, (2012). Millenium Development Goals, (MDG): Progress Report. Available from:
<http://www.undp.org/content/dam/undp/library/MDG/english/MDG%20Country%20Reports/Zimbabwe/MDGR%202012final%20draft%208.pdf> (accessed 13 April 2015).

Zelman, M., & Milne - Zelman, C.L., (2014). *Infection Control and Safety: A guide for Healthcare Providers*. New York: Pearson Education.

LIST OF ANNEXES

ANNEXE 1



**UNIVERSITY OF SOUTH AFRICA
Health Studies Research & Ethics Committee
(HSREC)
College of Human Sciences**

CLEARANCE CERTIFICATE

Date of meeting: 19 April 2010 Project No: 6067662

Project Title: **Fostering hand hygiene compliance and infection control:
A safety perspective**

Researcher: **Jamera I**

Supervisor/Promoter: **Prof LI Zungu**

Joint Supervisor/Joint Promoter:

Department: **Health Studies**

Degree: **D Litt Et Phil**

DECISION OF COMMITTEE

Approved

Conditionally Approved

Date: 19 April 2010

**Prof ON Makhubela-Nkondo
RESEARCH COORDINATOR: DEPARTMENT OF HEALTH STUDIES**

**Prof MC Bezuidenhout
ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES**

PLEASE QUOTE THE PROJECT NUMBER IN ALL ENQUIRES



ANNEXE 2

Telephone: (263) - 4 - 791792/791193
Telefax: (263) - 4 - 790715
E-mail: mrcz@mrczimshared.co.zw
Website: <http://www.mrcz.org.zw>



Medical Research Council of Zimbabwe
Josiah Tongogara / Mazoe Street
P. O. Box CY 573
Causeway
Harare

APPROVAL LETTER

Ref: MRCZ/B/208

27 May 2011

Israel Kubatsirwa Jamera
University of South Africa
Department of Health Studies
South Africa

RE: Fostering Hand Hygiene Compliance and Infection Control : A Safety Perspective

Thank you for the above titled proposal that you submitted to the Medical Research Council of Zimbabwe (MRCZ) for review. Please be advised that the Medical Research Council of Zimbabwe has **reviewed** and **approved** your application to conduct the above titled study. This is based on the following documents that were submitted to the MRCZ for review:

a) Study protocol

• **APPROVAL NUMBER** : MRCZ/B/208

This number should be used on all correspondence, consent forms and documents as appropriate.

(i) **EFFECTIVE APPROVAL DATE** : 27 May 2011

(ii) **EXPIRATION DATE** : 26 May 2012

(iii) **TYPE OF MEETING** : Expedited Review

After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the MRCZ Offices should be submitted one month before the expiration date for continuing review.

- **SERIOUS ADVERSE EVENT REPORTING:** All serious problems having to do with subject safety must be reported to the Institutional Ethical Review Committee (IERC) as well as the MRCZ within 3 working days using standard forms obtainable from the MRCZ Offices.
- **MODIFICATIONS:** Prior MRCZ and IERC approval using standard forms obtainable from the MRCZ Offices is required before implementing any changes in the Protocol (including changes in the consent documents).
- **TERMINATION OF STUDY:** On termination of a study, a report has to be submitted to the MRCZ using standard forms obtainable from the MRCZ Offices.
- **QUESTIONS:** Please contact the MRCZ on Telephone No. (04) 791792, 791193 or by e-mail on mrcz@mrczimshared.co.zw.

Other

- Please be reminded to send in copies of your research results for our records as well as for Health Research Database.
- You're also encouraged to submit electronic copies of your publications in peer-reviewed journals that may emanate from this study.

Yours Faithfully


.....
**MRCZ SECRETARIAT
FOR CHAIRPERSON
MEDICAL RESEARCH COUNCIL OF ZIMBABWE**



PROMOTING THE ETHICAL CONDUCT OF HEALTH RESEARCH, HARARE
Registered with the USA Office for Human Research Protections (OHRP) as an International IRB (Number
IRB00002409 IORG0001913)

ANNEXE 3

Telephone: +263-4-798620
Telegraphic Address:
"MEDICUS", Harare
Fax: +263-4-720119/702293
Telex: MEDICUS 22211ZW



Reference:
Ministry of Health and Child
Welfare
P O Box CY1122
Causeway
HARARE

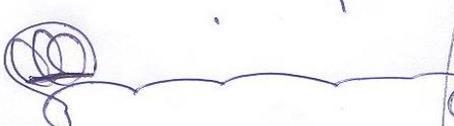
22 October 2010

Israel K Jamera
Doctoral Student
18 Eildon Crescent
Melrose
TD6 9QL
ROXBURGHSHIRE

**REQUEST FOR CLEARANCE PERMISSION FOR MR IK JAMERA: DOCTOR OF
LITERATURE AND PHILOSOPHY STUDENT TO CARRYOUT A RESEARCH STUDY**

This letter serves to inform you that authority has been granted for you to do a research study on "***Fostering hand hygiene compliance and infection control: a health and safety perspective in Mashonaland East Province in Zimbabwe: Mutoko and Mudzi districts***".

By copy of this letter you can directly liaise with relevant institutions and departments.


Brigadier General (Dr) G Gwinji
SECRETARY FOR HEALTH AND CHILD WELFARE

SECRETARY FOR HEALTH AND
CHILD WELFARE
SECRETARY'S OFFICE (01)
26 OCT 2010
P O BOX CY 1122, CAUSEWAY
ZIMBABWE

cc: Dr G Mhlanga – P D Preventive
Mr G Mangwandu – Director, Environmental Health
Dr Zizhou - PMD Mashonaland East Province

ANNEXE 4

Telephone: 24207/8, 24571

Telegraphic Address:
"PROVMED, MARONDERA"
Fax: 23967



ZIMBABWE

Reference:

MINISTRY OF HEALTH AND
CHILD WELFARE
PROVINCIAL MEDICAL DIRECTOR
(MASHONALAND EAST)
P.O.BOX 10
MARONDERA
ZIMBABWE

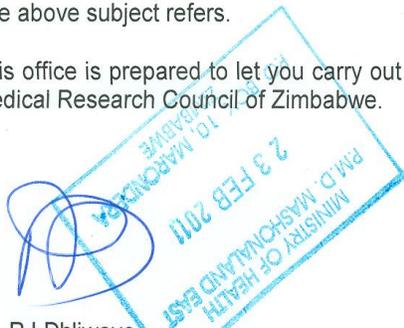
23 February 2011

Attention: Mr Israel K. Jemera

**RE: REQUEST CLEARANCE PERMISSION FOR MR I.K. JEMERA: DOCTOR OF LITERATURE
AND PHILOSOPHY STUDENT TO CARRY OUT A RESEARCH STUDY**

The above subject refers.

This office is prepared to let you carry out the study subject to submission of approval from the Medical Research Council of Zimbabwe.



Dr. P.I Dhiwayo
ACTING PROVINCIAL MEDICAL DIRECTOR MASHONALAND EAST

/mm

ANNEXE 5

Telephone: 242874, 24571
Telegraphic Address:
"PROV MED, MASHONDERA"
Fax: 25967


ZIMBABWE

Reference:
MINISTRY OF HEALTH AND
CHILD WELFARE
PROVINCIAL MEDICAL DIRECTOR
(MASHONALAND EAST)
P.O. BOX 18
MASHONDERA
ZIMBABWE

15 June 2011

The District Medical Officer
MUTOMO DISTRICT HOSPITAL

RE: PERMISSION TO CARRY OUT A RESEARCH STUDY : MR I.K. JEMERA : DOCTOR OF
LITERATURE AND PHILOSOPHY STUDENT

The above subject refers.

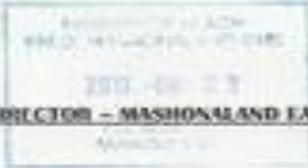
Mr I.K. Jemera has been authorized by the Provincial Medical Director, Mashonaland East
Province to carryout his research study within your district.

Please find attached his request letter, clearance letter and approval letter.

Your assistance in this matter is greatly appreciated.


Dr P. Dhlwayo
A. PROVINCIAL MEDICAL DIRECTOR – MASHONALAND EAST

ASK



ANNEXE 6



ANNEXE 7

Telephone (263) 072 2411/5

Telegraphic ADDRESS

FAX (263) 072 2416

EMAIL:



Zimbabwe

Reference:
MINISTRY OF HEALTH AND CHILD
WELFARE
MUTOKO DISTRICT HOSPITAL
P. O. BOX 59
MUTOKO
ZIMBABWE

01 February 2011

Doctoral Student
18 Eildon Crescent
Melrose
TD6 90L
ROXBURGHSHIRE

Attention: Israel K. Jamera

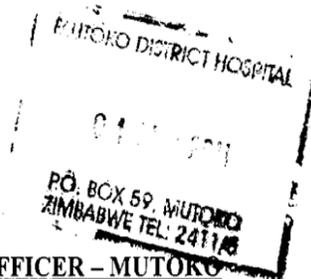
**RE: CLEARANCE PERMISSION TO CARRY OUT A RESEARCH STUDY IN
MUTOKO DISTRICT: MR. I. K. JAMERA OF: DOCTOR OF
LITERATURE AND PHILOSOPHY STUDENT**

This letter serves to inform you that permission has been granted for you to do a research study on “fostering hand hygiene compliance and infection control: a health and safety perspective in Mash East Province in Zimbabwe: Mutoko or Mudzi Districts”.

By copy of this letter you can go ahead and conduct the research.

A handwritten signature in black ink, appearing to read 'M. L. Ruziwa'.

Mr. M. L. Ruziwa
ACTING DISTRICT MEDICAL OFFICER – MUTOKO



ANNEXE 8

Telephone: 0272 2610-7

Email

kothosp@gmail.com



MINISTRY OF HEALTH AND CHILD
WELFARE

KOTWA DISTRICT HOSPITAL

P. O. BOX 67

MUDZI

2 February 2011

Doctoral Student
18 Eildon Crescent
Melrose
TD 6 9 QL
ROXBURGHSHIRE

Attention: Israel K. Jamera

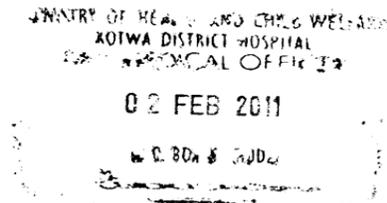
**RE: CLEARANCE PERMISSION TO CARRY OUT A RESEARCH STUDY IN MUDZI DISTRICT:
MR I K JAMERA: DOCTOR OF LITERATURE AND PHILOSOPHY STUDENT**

This letter serves to inform you that permission has been granted for you to do a research study on "fostering hand hygiene compliance and infection control: a health and safety perspective in Mash East Province in Zimbabwe: Mutoko and Mudzi District."

By copy of this letter, you can go ahead and conduct the research in Mudzi district.

A handwritten signature in black ink, appearing to be 'T. F. Chirima'.

Dr. Chirima T F
ACTING DISTRICT MEDICAL OFFICER - MUDZI



ANNEXE 9

18 EILDON CRESCENT

MELROSE

TD6 9QL

ROXBURGHSHIRE

UK

27/9/2010

E-mail: 6067662@mylife.unisa.ac.za

THE MINISTRY OF HEALTH AND CHILD WELFARE

THE PERMANENT SECRETARY

P.O.BOX CY1122

CAUSEWAY

HARARE

Dear Sir

RE: REQUEST CLEARANCE PERMISSION FOR MR IK JAMERA: DOCTOR OF LITERATURE AND PHILOSOPHY STUDENT TO CARRY OUT A RESEARCH STUDY

IK Jamera, a doctoral student requests for permission to carry out a study on "Fostering hand hygiene compliance and infection control: a health and safety perspective in Mashonaland East Province in Zimbabwe: Mutoko and Mudzi districts. "May you please find enclosed a copy of the University of South Africa decision of the ethical committee approval letter.

I thank you in advance for your assistance.

Yours sincerely

Israel K Jamera (Doctoral Student)

MSc NSc (University of Zimbabwe); BA (Cur) NUA et NUE (University of South Africa); Diploma Nurse Anaesthetist; Diploma Health Teachers; Diploma General Nursing (Zimbabwe); RN1 (United Kingdom); National Vocational Qualification Level 3 Health & Social Care Adults (United Kingdom).

ANNEXE 10

18 EILDON CRESCENT
MELROSE
TD6 9QL
ROXBURGHSHIRE
UK

13/01/2011

E-mail: 6067662@mylife.unisa.ac.za

israelkjamera@yahoo.com

THE PROVINCIAL MEDICAL DIRECTOR
MASHONALAND EAST PROVINCE
P.O.BOX 10
MARONDERA

Dear Sir

**RE: REQUEST CLEARANCE PERMISSION FOR MR IK JAMERA: DOCTOR
OF LITERATURE AND PHILOSOPHY STUDENT TO CARRY OUT A
RESEARCH STUDY**

IK Jamera, a doctoral student requests for permission to carry out a study on
“Fostering hand hygiene compliance and infection control: a health and safety
perspective in Mashonaland East Province in Zimbabwe: Mutoko and Mudzi
districts.”

May you please find enclosed a copy of the letter from the Ministry of Health &
Child Welfare head office approval letter. I thank you in advance for your
assistance.

Yours sincerely,

Israel K Jamera (Doctoral Student)

MSc NSc (University of Zimbabwe); BA (Cur) NUA Et NUE (UNISA); Diploma
Nurse Anaesthetist; Diploma Health Teachers; Diploma General Nursing
(Zimbabwe); RN1 (UK); National Vocational Qualification Level 3 Health & Social
Care Adults (UK).

ANNEXE 11

18 EILDON CRESCENT
MELROSE
TD6 9QL
ROXBURGHSHIRE
UK

27/9/2010

E-mail: 6067662@mylife.unisa.ac.za

THE MEDICAL SUPERINTENDENT
MUTOKO DISTRICT HOSPITAL
P.O.BOX 59
MUTOKO

Dear Sir

**RE: REQUEST CLEARANCE PERMISSION FOR MR IK JAMERA: DOCTOR
OF LITERATURE AND PHILOSOPHY STUDENT TO CARRY OUT A
RESEARCH STUDY**

IK Jamera, a doctoral student requests for permission to carry out a study
“Fostering hand hygiene compliance and infection control: a health and safety
perspective in Mashonaland East Province in Zimbabwe: Mutoko and Mudzi
districts.”

May you please find enclosed a copy of the University of South Africa decision of
the ethical committee approval letter.

I thank you in advance for your assistance.

Yours sincerely

Israel K Jamera (Doctoral Student)

MSc NSc (University of Zimbabwe); BA (Cur) NUA et NUE (UNISA); Diploma
Nurse Anaesthetist; Diploma Health Teachers; Diploma General Nursing
(Zimbabwe); RN1 (UK); National Vocational Qualification Level 3 Health & Social
Care Adults (UK).

ANNEXE 12

18 EILDON CRESCENT
MELROSE
TD6 9QL
ROXBURGHSHIRE
UK

27/9/2010

E-mail: 6067662@mylife.unisa.ac.za

THE MEDICAL SUPERINTENDENT
KOTWA DISTRICT HOSPITAL
P.O.BOX 67
MUDZI

Dear Sir

RE: REQUEST CLEARANCE PERMISSION FOR MR IK JAMERA: DOCTOR OF LITERATURE AND PHILOSOPHY STUDENT TO CARRY OUT A RESEARCH STUDY

IK Jamera, a doctoral student requests for permission to carry out a study "Fostering hand hygiene compliance and infection control: a health and safety perspective in Mashonaland East Province in Zimbabwe: Mutoko and Mudzi districts."

Please you may find a copy of the University of South Africa decision of the ethical committee approval letter that is enclosed.

I thank you in advance for your assistance.

Yours sincerely

Israel K Jamera (Doctoral Student)

MSc NSc (University of Zimbabwe); BA (Cur) NUA et NUE (UNISA); Diploma Nurse Anaesthetist; Diploma Health Teachers; Diploma General Nursing (Zimbabwe); RN1 (UK); National Vocational Qualification Level 3 Health & Social Care Adults (UK).

**HEALTHCARE WORKERS' HAND HYGIENE COMPLIANCE
QUESTIONNAIRE - HCWHHCQ**

Official
Use Only

The following questions are about Healthcare Workers' Hand Hygiene: Compliance. The answers you give are anonymous, May you please feel free to express your challenges?

1. What challenges do you face in accomplishing Hand Hygiene?

1

2. May you please indicate your recommendations in order to comply?

2

3. Please indicate your job title?

3

4. Please indicate your gender

4

1) Female

2) Male

THANK YOU FOR YOUR PARTICIPATION IN THIS STUDY

ANNEXE 15

Questions for Patients to establish relationship between Perceived Promotion Hand Hygiene among Patients (PPHHAPQ) and Healthcare Workers Hand Hygiene Compliance
PPHHAPQ QUESTIONNAIRE

The following are questions for patients to establish the influence between perceived promotion hand hygiene among Patients and Healthcare Workers hand hygiene compliance.

May you please answer to what your best attitude will be towards Healthcare Workers in their daily work?

•INSTRUCTIONS:

Please tick (☑) one of the described faces which best fits your best attitude or mood

If HCWs do not cleanse their hands to keep them clean before you are touched, which of the following faces will best represent your attitude or mood?

For Official
Use Only

1. Before being touched

- 1) Sad face
- 2) Happy face
- 3) Surprised face
- 4) None of the above

1

2. Before health care worker does on you a clean or aseptic procedure

- 1) Sad face
- 2) Happy face
- 3) Surprised face
- 4) None of the above

2

3. After body fluid exposure risk, glove removal and before you are touched

- 1) Sad face
- 2) Happy face
- 3) Surprised face
- 4) None of the above

3

4. After another patient contact and before touching you:

- 1) Sad face
- 2) Happy face
- 3) Surprised face
- 4) None of the above

4

5. After contact with patient surroundings and before touching you:

- 1) Sad face
- 2) Happy face
- 3) Surprised face
- 4) None of the above

5

6. Perceived promotion hand hygiene attitude levels:

If you are being treated by doctor nurse or any other Health care

Provider: in hospital or health care institution what will you do to make sure that each of your providers washes hands or rubs alcohol gel on their hands before touching you?

.....

.....

.....

.....

6

7. Will you please be able to name or describe by appearance the health care provider who will have skipped a wash or did not cleanse hands to the in- charge of the ward in which you are being treated in a calm manner?

- 1) Yes
- 2) No
- 3) Do not know

7

Official Use Only

8. Will you say something to correct your health care provider, doctor, nurse or any other health care provider about their failure to wash or rub alcohol gel on their hands or did not dry hands after washing them?

- 1) Yes
- 2) No
- 3) Uncertain
- 4) Do not know

9. Demographic Data Questionnaire among patients:
What is your gender?

9

- 1) Male
- 2) Female

10. What is your age in years?

10

- 1) 19 or younger
- 2) 20-29
- 4) 30-39
- 5) 40-49
- 6) 50-59
- 7) 60-69
- 8) 70-79
- 9) 80 or older

11. What is your social class in society?

11

.....

12. Where do you live most of the time?

1) Rural community small remote village

2) Urban area

3) Farming area

4) Very large community village

5) If none of the above please specify where you live

.....

12

THANK YOU FOR YOUR PARTICIPATION IN THIS STUDY

MIBVUNZO YACHO INONZI PPHAPQ QUESTIONNAIRE PACHIRUNGU

Zvinotevera mibvunzo kuvatenda yekutsvaga kusimbaradzwa pakati pemawonero anoitwa kusimudzirwa kwekugezwa kwemaoko nevatenda zvakanangana nekugezwa kwemaoko evashandi wezveutano muzvipatara nemumakiriniki. Ndapota pindurai mibvunzo zvakanangana nemaitiro enyu kuvashandi vezveutano mubasa rawo mazuva ese.

ZVEKUITA

Nyorai ne tick (✓) chiso chinonyatso enderana neunhu hwenyu mukurapiwa kwenyu nevashandi wezveutano.

Mibvunzo yevatenda: yekutsvaga simba pakati pemawonero ekusimudzirwa kwekugezwa kwemawoko muwashandi wezveutano nekuona kuti wanogezwa here mawoko awo achichena, vachichengetedza mawoko akachena, ngechipi chiso chenyu chinonyatsomiririra unhu kana maitiro enyu. Nyorai zvakanangana: zvinoenderana neunhu hwenyu kana maitiro enyu kuvashandi weutano wanokurapai mazuva ose.

1. Musati mabatwa nemushandi weutano

- 1) Chiso chisingafari
- 2) Chiso chinofara
- 3) Chiso chinoshamisika
- 4) Hapana zvese zvataurwa pamusoro

1

2. Mushandi weutano asati aita basa apo muri rinoda kucheneswa

kwemaoko kuti hutachiona husasvike apo muri

- 1) Chiso chisingafari
- 2) Chiso chinofara
- 3) Chiso chinoshamisika
- 4) Hapana zvese zvataurwa pamusoro

2

3. Mushandi kana abvisa magirovhisi, apedza kubata zvakadai nge

weti, ropa, kana mvura dzinobuda mumuviri uye asati akubatai

- 1) Chiso chisingafari
- 2) Chiso chinofara
- 3) Chiso chinoshamisika
- 4) Hapana zvese zvataurwa pamusoro

3

4. Mushandi apedza kubata mumwe murwere uye asati akubatai

- 1) Chiso chisingafari
- 2) Chiso chinofara
- 3) Chiso chinoshamisika
- 4) Hapana zvese zvataurwa pamusoro

4

5. Mushandiabata zvakatenderedza mutenda uye asati akubatai

- 1) Chiso chisingafari
- 2) Chiso chinofara
- 3) Chiso chinoshamisika
- 4) Hapana zvese zvataurwa pamusoro

5
For Official Use Only

6. Semaonero amunoita pakuita kwenyu kusimudzirwa kwekugezwa kwemaoko: Kana muchirapiwa newashandi weutano chiiko icho mungagona kuita kuti washandi awa wange wachigeza mawoko awo kana kuzora mafuta edoro mumaoko mawo achioma wasati wakubatai?

.....
.....

6

7. Mungagona here kudoma ngezita kana ngemapfekero emushandi wezveutano anenge asina kugeza mawoko kana kuzora mafuta edoro (Alcohol gel) kune anenge ari kutungamira bazi renzvimbo yezveutano apo munorapwa?

- 1) Hongu
- 2) Kwete
- 3) Handina chokwadi nazvo
- 4) Handizivi

7

8. Mune here izvo mungagona kutsiura nazvo munezvakanaka kumushandi wezveutano mukusakwanisa kwawo kugeza kana kuzora mafuta edoro mumawoko mawo kana kusaomesa maoko kuti achene utachiona hubve?

- 1) Hongu
- 2) Kwete
- 3) Handina chokwadi nazvo
-

8

4) Handizivi

9. Zvemagariro evanhu mudunhu.

Muri munhu rudzii?

- 1) Mukadzi
- 2) Murume

10. Mune makore mangani?

- 1) 19 zvichidzika
- 2) 20-29
- 3) 30-39
- 4) 40-49
- 5) 50-59
- 6) 60-69
- 7) 70-79
- 8) 80 zvichikwira

11. Muri muchikamu chipi murumana rwenyu umo munogara?

- 1) Wepamusorosoro
- 2) Wepakati
- 3) Wepasi
- 4) Wepasipasi

12. Munogara kupi nguva zhinji?

- 1) Kuruzevha kusina chii kana chii zvacho
- 2) Minda mirefu
- 3) Mupurazi
- 4) Kuruzevha asi kwakasimukira kwazvo
- 5) Hapana zvese zviripamusoro apo
- 6) Apa ndipo apo ndinogara

MAZVITA CHAIZVO NETSIGIRO YENYU MUCHIRONGWA CHINO

9	
For Official Use Only	

10	
----	--

11	
----	--

12	
----	--

Zimbabwe commemorates Global Handwashing Day

Harare, 17 Oct. 2012 -- Zimbabwe joined the rest of the world in commemorating Global Handwashing Day at an event held at Zengeza High School in Chitungwiza. The event, which was held under the theme Help more children reach their 5th birthday was targeted at schoolchildren, because children are enthusiastic and open to new ideas and often act as agents of change by taking the “handwashing lessons” back into their homes and communities.

The active participation and involvement of children who are ideally situated at the intersection of the home, school, and community can ensure sustained behavioural change when combined with culturally sensitive community based interventions. The commemoration therefore aimed at motivating children to embrace and share proper handwashing practices, and place them as handwashing ambassadors at the heart of national and local initiatives.

In a statement read on his behalf by Mr Maphosa NPO/DPR, the WHO Representative said that handwashing with soap or ash is the single most cost-effective health intervention. He said handwashing is cost effective when compared with other health interventions like immunization and responding to disease outbreaks. He also emphasised the importance of clean hands in preparing, dishing and eating food. “Hands often act as vectors that carry disease-causing pathogens from person to person, either through direct contact or indirectly via surfaces.

When not washed with soap, hands that have been in contact with human or animal faeces, bodily fluids, and contaminated foods or water can transport bacteria, viruses and parasites to unsuspecting hosts”, he said and emphasised that hand washing with soap is among the most effective and inexpensive ways to prevent diarrheal diseases and pneumonia, which together are responsible for the majority of child deaths. The same sentiments were also echoed by the UNICEF Representative who said with proper handwashing with soap and ash; more children will not succumb to diarrhoeal diseases and acute respiratory infections and will ultimately reach their 5th birthday.

In his statement, Dr Obadiah Moyo, the CEO of Chitungwiza General Hospital, who was the guest of honour said washing hands with alone, which is a common practice, is not enough. “Proper hand-washing requires soap or ash because with proper use, soap and ash are effective at rinsing away disease causing germs”, he said. Dr Moyo also encouraged the people of Chitungwiza to embrace proper handwashing techniques as it will go a long way in reducing the incidence of cholera and typhoid in their city which is one of the hardest hit areas.

The commemoration was characterised by poems, drama and songs extolling the virtues of proper handwashing, as well as demonstrations of the 10 steps of proper handwashing and a handwashing competition. The students demonstrated good knowledge of proper handwashing and the poems, songs and dramas all had pleas to parents and caregivers to embrace the handwashing practice and save Zimbabwe's children from unnecessary and preventable deaths from diarrheal diseases and acute respiratory infections.

Message from the WHO Regional Director for Africa, Dr Matshidiso Rebecca Moeti, on the yearly campaign: “Save Lives: clean your hands”

Today, 5 May 2017, we mark the annual global campaign the “SAVE LIVES: Clean your hands”. This initiative led by WHO is aimed at promoting improvements in hand hygiene practices at the point of care with a view to reducing the burden of healthcare associated infections and spread of antimicrobial resistant agents. In fact, a paradigm shift has occurred in our world that cannot be reversed – multidrug resistant pathogens are here to stay – we need to manage these through infection prevention action. Limited information is available on the endemic burden of these infections in Africa, but a recent review reveals that their prevalence, ranging from 2.5 % to 14.8%, is up to twice as high as the average European prevalence (7.1%).

The theme of this year is “Fight antibiotic resistance – it’s in your hands”, and there are four key calls for action, aimed at different target audiences, namely:

- Health workers: “Clean your hands at the right times and stop the spread of antibiotic resistance.”
- Hospital senior management: “Lead a year-round Infection Prevention and Control programme to protect your patients from resistant infections.”
- Policy-makers: “Stop antibiotic resistance by making infection prevention and hand hygiene a national policy priority.”
- Infection Prevention and Control leaders: “Implement WHO’s Core Components for Infection Prevention and Control, including hand hygiene to prevent antibiotic resistance.”

Hand hygiene remains at the heart of effective Infection Prevention and Control (IPC) programmes to fight healthcare associated infections and antibiotic resistance. Annual campaigns are important ways of encouraging behaviour change towards improving IPC best practices. In the recently issued WHO Guidelines on Core Components of IPC Programmes at the National and Acute Health Care Facility Level, hand hygiene is once again highlighted as the best example of successful implementation of these components with year-round commitment by many dedicated health workers.

Health facilities in every country in the African Region must take part in this global annual campaign to continue to promote hand hygiene, fight antibiotic resistance and commit to progressing towards adherence with all of the core components for IPC programmes. Every year more and more health facilities in the African Region have registered for the Save Lives: Clean Your Hands campaign. This year, we hope to see a big rise in these numbers. I encourage you to join me in promoting the campaign and to engage countries in our region to encourage all health facilities to sign up: www.who.int/gpsc/5may/register/en/index.html.

A number of useful resources are available in the WHO webpage: www.who.int/gpsc/5may/en.

I call upon health leaders, managers, health-care workers, consumer associations and similar bodies in the African region to implement a true safety culture in which both patients, (and their relatives and visitors) and health-care workers work together towards strengthening infection prevention and control, and promoting hand hygiene best practices. While the responsibility for hand hygiene in health facilities remains firmly with the health-care workers, patients should support them in improving hand hygiene by practicing and learning more about it.

I call upon Member States to take advantage of this year's Hand hygiene campaign to awaken to the real threat of healthcare associated infections in our region and consolidate our efforts to improve hand hygiene within our health services. No action today means more healthcare associated infections tomorrow.

Thank you.

ANNEXE 19

israel_jamera_confirmation_letter_02072017.docx

Dr. Yuhua Su
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Kaunakakai, HI 96748
Phone: 808-3540796
Email: drsustat@gmail.com
Web: <https://sites.google.com/site/drsustat>

Date: Feb 7, 2017

To whom it may concern,

This is a confirmation letter, to confirm that Dr. Yuhua Su had provided statistical consultation services in 2012 for Israel Kubatsirwa Jamera's thesis for DLitt et Phil as required by the University of South Africa (UNISA). The thesis title is "Guidelines for fostering hand hygiene compliance and infection control among Healthcare workers at Mutoko and Mudzi Districts in Zimbabwe".



(Signature)

02/01/2017 (Date)

Yuhua Su, Ph.D. (Print Name)

Professional editing of Israel Jamera's DLitt et Phil thesis

Proofreading Services for Academics and Students

United Kingdom PA17 5BH

20 October 2015

The University of South Africa
Preller Street, Muckleneuk Ridge
City of Tshwane
PO Box 392, UNISA 0003, South Africa

To whom it may concern,

Professional Editing of Israel Jamera's PhD Thesis

I am writing to confirm that I recently proofread and edited Israel Jamera's PhD thesis, *Practical guidelines for fostering hand hygiene compliance and infection control among health care workers at the Mutoko and Mudzi districts in Zimbabwe*.

I proofread chapters 1 through 8 between March and July earlier this year. I provided Israel with two versions of each chapter: one showing changes made (using Track Changes in MS Word), and an edited version. As a proofreader, I checked his thesis for spelling mistakes, grammatical errors, improper punctuation, and referencing mistakes. I do not address academic aspects such as the contents or layout of a thesis, key arguments or hypotheses, research methods, or data selection and processing.

Yours faithfully,



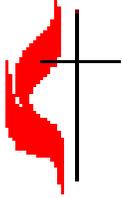
Dr Malcolm Sutherland

*Sutherland Press is an HMRC-registered sole-trading proofreading service run by
Dr John Sutherland (BSc, MSc, EdD) and Dr Malcolm Sutherland (BSc, PhD)*

ANNEXE 21

OLD MUTARE HOSPITAL

UNITED METHODIST CHURCH



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MUTARE

ZIMBABWE

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MUTARE

ZIMBABWE

20 August 2018

The University of South Africa
Preeler Street, Muckleneuk Ridge
City of Tswane
P. O. Box 392
UNISA 0003
South Africa

TO WHOM IT MAY CONCERN

This is a confirmation letter that I (Dr. Paul Tendai Manyeza, the Medical Superintendent of Old Mutare United Methodist Church Hospital (UMC), a hospital in Zimbabwe) have reviewed the Guidelines of Israel Kubatsirwa Jamera's thesis for DLitt et Phil in Health Studies as required by the University of South Africa (UNISA). The Guidelines are plausible. The thesis title is "Guidelines for fostering hand hygiene compliance and infection control among healthcare workers at Mutoko and Mudzi Districts in Zimbabwe."

Regards.

A handwritten signature in black ink, appearing to read 'Manyeza'.

Dr. Paul Tendai Manyeza.

MB, ChB (University of Zimbabwe), Post Graduate Diploma in Family Medicine (Christian Medical College (CMC) & Hospital, Vellore (India), MPH (Africa University, Zimbabwe).

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erasmta@unisa.ac.za

April 2011

Dear Student

The Unisa Library welcomes you as a postgraduate student. The library, with its extensive range of information resources, forms an integral part of your research towards your degree. Please read the attached leaflet as it will help you use the library optimally.

The services offered by the library have been streamlined to facilitate seamless access and online availability via the library's homepage (<http://www.unisa.ac.za> > Library).

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Or deliver it in person to your nearest branch library.

A request for Information form is also available at
<http://www.unisa.ac.za/Default.asp?Cmd=ViewContent&ContentID=20948>

Please contact me if you intend visiting the Pretoria campus to learn how to use the library's resources as a researcher.

With best wishes for your studies

Talana Erasmus

Talana Erasmus
Personal Librarian: School of Humanities & Theology

ANNEXE 23

CONFIRMATION LETTER FROM REVEREND N. MANYEZA

Old Mutare Mission Hospital
P.O.Box 807
Mutare

1 August 2018

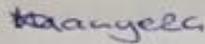
The University of South Africa
Pretorius Street, Muckleneuk Ridge
City of Tswane
P. O. Box 392
UNISA_0003
South Africa

To whom it may concern

Dear Sir/Madam

This is a confirmation letter that Rev Natallia Manyeza has reviewed the guidelines of Israel Kubatsirwa Jamera's thesis for D Litt et Phil in Health Studies as a requirement by the University of South Africa (UNISA). The guidelines could be used as valid and credible. The thesis title is, Guidelines for fostering hand hygiene compliance and infection control among health care workers at Mutoko and Mudzi District Hospitals in Zimbabwe.

Yours Faithfully



Reverend N Manyeza

Master of Peace and Governance (Africa University), Bachelor of Divinity (Africa University), BA with Education (Africa University), Certificate in Education (Belvedere Technical Teachers College-Harare)

EDITORIAL CERTIFICATE

**GUIDELINES FOR FOSTERING HAND HYGIENE COMPLIANCE AND
INFECTION CONTROL AMONG HEALTHCARE WORKERS AT MUTOKO
AND MUDZI DISTRICTS IN ZIMBABWE**

by

ISRAEL KUBATSIRWA JAMERA

Introduction

This serves to confirm that the above-named document has been edited for language. At general level, it communicates satisfactorily, but there are specific aspects, which the Editor attended to as follows.

Specific aspects

1. Repetition is a component of language editing, and the other repetition of less serious concern has been addressed in-text.
2. Citation of sources and referencing showed some challenges and the editor gave correct presentation. There are indications of where you have to do your own corrections following the example set by the Editor. These have been highlighted in red.

General observations

The following linguistic aspects have been closely attended to:

- a. General orthographic aspects, including the discourse of research and its application, were addressed.
- b. Tense usage was closely attended to.
- c. Attention has been paid to logical flow of argumentation, especially structuring of sentences, which sometimes proved difficult for the writer. Ambiguities were cleared in such sentences.
- d. Cohesion and coherence were given due attention, including the communicativeness of selected registers and specialist terms.

The red in-text represents suggestions made to facilitate smooth and unambiguous flow, while the red in square brackets stands for suggestions to be considered by the author. The red requires that you correct.

Cancellations have been made as suggestions to enhance both cohesion and coherence. It is noteworthy that all is left to the researcher's discretion to factor in suggestions, or not to do so. If, in the view of the researcher, the proposed changes are unwarranted, he/she is at liberty to leave text as it is.

The thesis should read proficiently after the researcher has closely worked on it the last time.

Best wishes.

Prof. S. Tichapondwa Modesto

A handwritten signature in black ink, appearing to read 'S. Modesto', is centered below the typed name.

Prof. S. Tichapondwa Modesto [25-11-2018]

